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DEPARTMENT OF TRANSPORTATION

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COAST GUARD

CHRIS

Hazardous Chemical Data

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UNITED STATES COAST GUARD

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COMMANDANT INSTRUCTION M16465.12 (old CG-446-2)

Subj: Manual Two of the Chemical Hazards Response Information System (CHRIS)

1. PURPOSE. This revision adds 500 chemicals, corrects errors, and adds new data to CHRIS. A further expansion from the present 900 to approximately 1000 chemicals will be made in the future. This manual provides the On-Scene Coordinator or other officials with some of the technical information necessary to properly respond to discharges of hazardous chemicals. The information provided in this manual may also be used for contingency planning and orientation. This manual is one part of CHRIS and is fully effective only when used in conjunction with the other system elements, COMDTINST's M16465.11, .13 and .14 (series).

2. DIRECTIVES AFFECTED. Manual Two of the Chemical Hazards Response Information System (CG-446-2) is hereby cancelled.

3. ACTION. District Commanders and appropriate unit commanding officers shall ensure that proper training in the use of CHRIS is conducted frequently for all response personnel.

4. CHANGES. The submittal of recommended changes and corrections to COMMANDANT (G-WEP) is encouraged.

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RECORD OF CHANGES

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1. INTRODUCTION

The Chemical Hazard Response Information System (CHRIS) is designed to provide information needed for decision-making by responsible Coast Guard personnel during emergencies that occur during the water transport of hazardous chemicals. CHRIS also provides much information that can be used by the Coast Guard in its efforts to achieve better safety procedures and so prevent accidents.

CHRIS consists of four handbooks or manuals, a hazard assessment computer system (HACS), and technical support personnel located at Coast Guard headquarters. These components and their relations to one another are described in Section 2 of this manual.

2. COMPONENTS OF CHRIS

2.1 A CONDENSED GUIDE TO CHEMICAL HAZARDS

The Condensed Guide contains information needed to help personnel make the proper *response* in an emergency situation; it is the only CHRIS handbook that will be carried to the actual scene of an accident. It is intended for use by port security personnel and others who may be the first to arrive at the site of an accidental discharge or fire and who need readily available and easily understood information about the hazardous properties of the chemical involved. It will be used to determine the proper actions that should be taken immediately to safeguard life and property and to prevent contamination of the environment.

The Condenced Guide briefly describes the chemical and biological hazards of various materials so that personnel at the scene of an accident can assess the danger and consider the appropriate large-scale response. It also lists the on-scene information needed for proper use of the Hazard Assessment Handbook. Selected information on each chemical covered by CHRIS is summarized from the more extensive material in the Hazardous Chemical Data Manual and is presented on a single page

2.2 HAZARDOUS CHEMICAL DATA

This manual is the cornerstone of CHRIS. For each substance, it lists the specific chemical, physical, and biological data needed for the preparation and use of the other components of the system. It can also be used after the initial response action, when there is sufficient time to use more detailed information.

The Hazardous Chemical Data Manual is intended for use primarily by the On-Scene Coordinator (OSC) and by Regional and National Response Centers for devising, evaluating, and carrying out response plans.

Much of the quantitave information found in the Hazardous Chemical Data Manual is needed for the hazard assessment calculations described in the Hazard Assessment Handbook. The Hazardous Chemical Data Manual contains the so-called Hazard Assessment Code which directs the user of the Hazard Assessment Handbook to the appropriate calculation procedure. The Hazardous Chemical Data Manual also suggests general responses to an accidental discharge which summarize the detailed information given in the Response Methods Handbook.

2.3 HAZARD ASSESSMENT HANDBOOK (CG-446-3)

The Hazard Assessment Handbook describes procedures to be used for estimating the quantity of a hazardous chemical that may be released accidentally during shipment. It also describes how to estimate its concentration in air and in water as a function of time and distance from the discharge. Methods for predicting the resulting toxicity, fire, and explosion effects are also described. The calculations use data from the Hazardous Chemical Data Handbook.

2.4 HAZARD ASSESSMENT COMPUTER SYSTEM

The Hazard Assessment Computer System (HACS) is a computerized version of the Hazard Assessment Handbook. It permits trained headquarters specialists to obtain very detailed hazard evaluations quickly, when requested by OSC personnel. Methods for using HACS are described in the Hazard Assessment Handbook.

Although HACS and the Hazardous Chemical Data Handbook are based on the same original body of data, differences will occasionally arise because HACS is more readily updated than the printed manual.

2.5 RESPONSE METHODS HANDBOOK

The Response Methods Handbook is written specifically for Coast Guard OSC personnel who have had some training or experience in hazard and pollution response. The handbook describes cautionary and corrective response methods for reducing and eliminating hazards that result from chemical discharge.

Although general types of response are suggested in the Hazardous Chemical Data Handbook, the specific response, to be chosen from among those described in the Response Methods Handbook, should be determined by the results from the Hazard Assessment Handbook.

2.6 REGIONAL DATA BASE

The Coast Guard's Regional Contingency Plans, although not considered a part of CHRIS, are an important adjunct to the system. Each Regional Contingency Plan contains a section (Annex XX) that presents data on a specific region, sub-region, or locale. These data, which are intended for use by OSC personnel, include such information as the following:

- An inventory of physical resources and strike forces;
- Vulnerable or exposed resources (critical water-use areas);
- Potential pollution sources;
- Geographic and environmental features;
- Cooperating organizations;
- Recognized experts with identified skills.

3. EXPLANATION OF TERMS

This section explains the special terms used in the data sheets in Section 11, gives the sources of specific items, and includes other information that will be useful to the reader in interpreting the data. The paragraphs below are keyed to the relevant portions of Section 11 by the subheading and number used in the data sheets.

The expression "Not pertinent" means that the data item either has no real meaning (such as the flash point of a nonflammable chemical) or is not required for assessing a hazardous situation. The expression "Data not available" means that the information sought was not found in the general or specialized data sources listed in Section 10 of this manual. In a few cases where important data were not available, values were estimated by usually reliable procedures: all such values are labeled "(est.)". If more accurate values for those items are found, they will be included in later revisions.

The *name* used for each of the chemicals included in the CHRIS manuals is either (1) that specified in the Code of Federal Regulations, Title 46, Table 151.01-10(b) (Compounds Regulated by Subchapter 0) and Table 151.01-10(d) (Compounds to be Regulated by Subchapter D) or (2) a common name for those chemicals not now regulated by Subchapters O and D but known to be hazardous during shipment. The data sheets are arranged in alphabetical order by chemical name, not by the 3-letter code.

The *3-letter code* is designed to facilitate correct identification of chemicals in oral or written communication. The code should be used only *in addition* to the compound name: it should not be used alone. For transmitting the code, use the phonetic alphabet given in the "International Code of Signals."

1. RESPONSE TO DISCHARGE

In every case of a discharge or leak, it is obvious that an effort should be made to reduce, stop, or contain the flow of material at its source if this can be done safely. The purpose of the terms used in this section is to describe in a general way the cautionary and corrective responses that are described in greater detail in the Response Methods Handbook.

- *"Issue warning"* is used when the chemical is a *poison*, has a *high flammability*, is a *water contaminant*, is an *air contaminant* (so as to be hazardous to life), is an *oxidizing material*, or is *corrosive*. In the Response Methods Handbook the italicized properties are the bases for cautionary responses to restrict ignition, and to restrict contaminated water for human use, farm use, and industrial use.

- *"Restrict access"* is used only for those chemicals that are unusually and immediately hazardous to personnel unless they are protected properly by gas masks, eye goggles, protective clothing, etc. In the Response Methods Handbook this cautionary response is sometimes used in a broader sense to ensure exclusion of spectators and others who might ignite flammable compounds.

- *"Evacuate area"* is used primarily for unusually poisonous chemicals or those that ignite easily. The same expression is used in the Response Methods Handbook for this cautionary response.

- *"Mechanical containment"* is used for water-insoluble chemicals that float and do not evaporate readily. In the Response Methods Handbook the corresponding corrective response is "Contain".

- *"Should be removed"* is used for chemicals that cannot be allowed to disperse because of their harmful effect on humans or on the ecological system in general. The term is not used unless there is a reasonable chance of preventing dispersal, after a discharge or leak, by chemical and physical treatment.

- *"Chemical and physical treatment"* is recommended for chemicals that can be removed by skimming, pumping, dredging, burning, neutralization, absorption, coagulation, or precipitation. The corrective response may also include the use of dispersing agents, sinking agents, and biological treatment. Specific procedures to be followed are found in the Response Methods Handbook. Cleaning of the shoreline is also specified there for some compounds.

- *"Disperse and flush"* is used for chemicals that can be made non-hazardous to humans by simple dilution with water; a corresponding corrective response is used in the Response Methods Handbook. In a few cases the response is indicated even when the compound reacts with water because, when proper care is taken, dilution is still the most effective way of removing the primary hazard.

2. LABELS

The labels illustrated in Section 2 are those specified by the United Nations Labelling System (see Code of Federal Regulations, Title 49, Part 172). Labels are shown for all chemicals that are listed by name in the Code of Federal Regulations and also for most flammable chemicals that fall under listed generic categories, such as "Solvents," "Distillates," or "Alcohols."

3. CHEMICAL DESIGNATIONS

3.1 Synonyms –Alternative systematic chemical names and commonly used trivial names are given. Commercial or trade names are shown in a few cases where they are in common use. An index of synonyms is included in this manual (Section 8); it includes only those names given in Section 3.1.

3.2 Coast Guard Compatibility Classification – An entry is made when the chemical has been assigned to one of the 43 cargo groups listed in Navigation and Vessel Inspection Circular No. 4-75, "Guide to Compatibility of Chemicals." Appropriate parts of the Guide are included in this manual. Some chemicals not now included in the Guide were assigned to a group by the Cargo and Hazardous Materials Division, Coast Guard Headquarters. If the chemical is not a liquid carried in bulk in ships' tanks, this data item is "Not applicable."

3.3 Chemical Formula – This has been limited to a commonly used one-line formula. In the case of some organic compounds it has not been possible to represent chemical structure within such a limitation.

3.4 IMCO/United Nations Numerical Designation – The designation is that of the "International Maritime Dangerous Goods Code" published by the Inter-Governmental Maritime Consultative Organization (IMCO), London, 1972.

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped) – All chemicals that are listed in Code of Federal Regulations, Title 46, Tables 151.01-10(b) and 151.01-10(d) are shipped as liquids. Other designations include liquefied gas, liquefied compressed gas, and solid. Where a compound may be shipped either as a liquid or solid, both designations are given.

4.2 Color – All color descriptions found in the common reference sources are included. The color description is that for pure material. Occasionally the color of a chemical changes when it dissolves in water or becomes a gas.

4.3 Odor – All odor descriptions found in the common reference sources are included. The expression "characteristic" is used only when no other reasonable description was found. The odor description is that for pure material.

5. HEALTH HAZARDS

5.1 Personal Protective Equipment – The items listed are those recommended by (a) manufacturers, either in technical bulletins or in Material Safety Data Sheets, (b) the Manufacturing Chemists Association, or (c) the National Safety Council, for use by personnel while responding to fire or accidental discharge of the chemical. They are intended to protect the lungs, eyes, and skin. Safety showers and eyewash fountains are considered to be important protective equipment for the handling of almost all chemicals; they are not usually listed.

5.2 Symptoms Following Exposure – These are brief descriptions of the effects observed in humans when the vapor (gas) is inhaled, when the liquid or solid is ingested (swallowed), and when the liquid or solid comes in contact with the eyes or skin.

5.3 Treatment for Exposure – "First-aid" procedures are recommended. They deal with exposure to the vapor (gas), liquid, or solid and include inhalation, ingestion (swallowing) and contact with eyes or skin. The instruction "Do NOT induce vomiting" is given if an unusual hazard is associated with the chemical being sucked into the lungs (aspiration) while the patient is vomiting. "Seek medical attention" or "Call a doctor" is recommended in those cases where only competent medical personnel can treat the injury properly. In all cases of human exposure, seek medical assistance as soon as possible.

5.4 Toxicity by Inhalation (Threshold Limit Value) – The threshold limit value (TLV) is usually expressed in units of parts per million (ppm) – i.e., the parts of vapor (gas) per million parts of contaminated air by volume at 25°C (77°F) and atmospheric pressure. For a chemical that forms a fine mist or dust, the concentration is given in milligrams per cubic meter (mg/m^3). The TLV is defined as the concentration of the substance in air that can be breathed for five consecutive eight-hour workdays (40-hour work week) by most people without adverse effect.* As some people become ill after exposure to concentrations lower than the TLV, this value cannot be used to define exactly what is a "safe" or "dangerous" concentration.

No entry appears when the chemical is a mixture; it is possible to calculate the TLV for a mixture only when the TLV for each component of the mixture is known and the composition of the mixture by weight is also known.

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*American Conference of Governmental Industrial Hygienists, "Threshold Limit Values for Substance in Workroom Air, Adopted by ACGIH for 1972"

5.5 Short-Term Inhalation Limits – The parts of vapor (gas per million parts of contaminated air by volume at 25°C (77°F) and atmospheric pressure is given. The limits are given in milligrams per cubic meter for chemicals that can form a fine mist or dust. The values given are the maximum permissible average exposures for the time periods specified. Most of the data came from the Commonwealth of Pennsylvania, Department of Environmental Resources, Title 25, Article IV, Chapter 201 (1971). Some of the data (called "Emergency Exposure Limits") were provided by the Committee on Toxicology, National Academy of Science – National Academy of Engineering, National Research Council.

In some instances the values disagree, or the short-term limits overlap the TLV given in 5.4. These are not errors; the values were supplied by several laboratories, each of which used its own experimental techniques and methods of calculation.

5.6 Toxicity by Ingestion – The Grade and corresponding LD_{50} value are those defined by the National Academy of Sciences, Committee on Hazardous Materials, "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," Washington, D.C., 1972. Data were also collected from other sources and converted to the appropriate Grade before entry in this manual. The term LD_{50} signifies that about 50% of the animals given the specified dose by mouth will die. Thus, for a Grade 4 chemical (below 50 mg/kg) the toxic dose for 50% of animals weighing 70 kg (150 lb) is 70 x 50 = 3500 mg = 3.5 g, or less than 1 teaspoonful; it might be as little as a few drops. For a Grade 1 chemical (5 to 15g/kg), the LD_{50} would be between a pint and a quart for a 150-lb man. All LD_{50} values have been obtained using small laboratory animals such as rodents, cats, and dogs. The substantial risks taken in using these values for estimating human toxicity are the same as those taken when new drugs are administered to humans for the first time.

5.7 Late Toxicity – Where there is evidence that the chemical can cause cancer, mutagenic effects, teratogenic effects, or a delayed injury to vital organs such as the liver or kidney, a qualitative description of the effect is given.

5.8 Vapor (Gas) Irritant Characteristics – The most appropriate of five statements listed below is given. (Source: National Academy of Sciences, Committee on Hazardous Materials, "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," Washington, D.C., 1970.)

(1) Vapors are nonirritating to eyes and throat.

(2) Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

(3) Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

(4) Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.

(5) Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5.9 Liquid or Solid Irritant Characteristics – The most appropriate of the following five statements is given (same source as 5.8 above):

(1) No appreciable hazard. Practically harmless to the skin.

(2) Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.

(3) Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.

(4) Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.

(5) Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

5.10 Odor Threshold – This is the lowest concentration in air that most humans can detect by smell. The value cannot be relied on to prevent over-exposure, because human sensitivity to odors varies over wide limits, some chemicals cannot be smelled at toxic concentrations, odors can be masked by other odors, and some compounds rapidly deaden the sense of smell.

6. FIRE HAZARDS

6.1 Flash Point – This is defined as the lowest temperature at which vapors above a volatile combustible substance will ignite in air when exposed to a flame. Depending on the test method used, the values given are either Tag closed cup (C.C.) (ASTM D56) or Cleveland open cup (O.C.) (ASTM D93). The values, along with those in 6.2 and 6.7 below, give an indication of the relative flammability of the chemical. In general, the open cup value is about 10° to 15°F higher than the closed cup value.

6.2 Flammable Limits in Air – The percent concentration in air (by volume) is given for the lower (LFL) and upper (UFL) limit. The values, along with those in 6.1 and 6.7, give an indication of the relative flammability of the chemical. The limits are sometimes referred to as "lower explosive limit" (LEL) and "upper explosive limit" (UEL).

6.3 Fire Extinguishing Agents – The agents are listed in decreasing order of importance. The general capabilities of all agents are described by G.H. Tryon, "Fire Protection Handbook," 13th ed., National Fire Protection Association, Boston, Mass., 1969.

6.4 Fire Extinguishing Agents Not to be Used – The agents listed must not be used because they react with the chemical and create an additional hazard. In some cases they are listed because they are ineffective in putting out the fire.

6.5 Special Hazards of Combustion Products -- Some chemicals decompose or burn to give off toxic and irritating gases. Such gases may also be given off by chemicals that vaporize in the heat of a fire without either decomposing or burning. If no entry appears, the combustion products are thought to be similar to those formed by the burning of oil, gasoline, or alcohol; they include carbon monoxide (poisonous), carbon dioxide, and water vapor. The specific combustion products are usually not well known over the wide variety of conditions existing in fires; some may be hazardous.

6.6 Behavior in Fire – Any characteristic behavior that might increase significantly the hazard involved in a fire is described. The formation of dense smoke or flammable vapor clouds, and the possibility of polymerization and explosions is stated. Unusual difficulty in extinguishing the fire is also noted.

6.7 Ignition Temperature – This is the minimum temperature at which the material will ignite without a spark or flame being present. Along with the values in 6.1 and 6.2 above, it gives an indication of the relative flammability of the chemical. It is sometimes called the "autoignition temperature." The method of measurement is given in ASTM D-2155.

6.8 Electrical Hazard – The ease with which the chemical is ignited by electrical equipment is indicated by the *Group* and *Class* assignment made in "Fire Codes," Vol. 5, National Fire Protection Association, Boston, Mass., 1972, pp. 70-289. This information is available for relatively few chemicals, so an absence of data does not necessarily mean that the substance is not hazardous in the presence of electrical equipment.

6.9 Burning Rate – The value is the rate (in millimeters per minute) at which the depth of a pool of liquid decreases as the liquid burns. Details of measurement are given by D.S. Burgess, A. Strasser, and J. Grumer, "Diffusive Burning of Liquid Fuels in Open Trays," Fire Research Abstracts and Reviews, 3, 177 (1961).

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water – The term "No reaction" means that no hazard results when the chemical reacts or mixes with water. Where a hazard does result, it is described.

7.2 Reactivity with Common Materials – This is limited to hazardous reactions with fuels and with common materials of construction such as metal, wood, plastics, cement, and glass. The nature of the hazard, such as severe corrosion or formation of a flammable gas, is described.

7.3 Stability During Transport – The term "Stable" means that the chemical will not decompose in a hazardous manner under the conditions of temperature, pressure, and mechanical shock that are normally encountered during shipment; the term does *not* apply to fire situations. Where there is a possibility of hazardous decomposition, an indication of the conditions and the nature of the hazard is given.

7.4 Neutralizing Agents for Acids and Caustics – In all cases involving accidental discharge, dilution with water may be followed by use of the agent specified, particularly if the material cannot be flushed away; the agent specified need not necessarily be used. More detailed information for this kind of response is given in the Response Methods Handbook, CG-446-4.

7.5 Polymerization – A few chemicals can undergo rapid polymerization to form sticky, resinous materials, with the liberation of much heat. The containers may explode. For these chemicals the conditions under which the reaction can occur are given. See Section 13.16 for quantitative data.

7.6 Inhibitor of Polymerization – The chemical names and concentrations of inhibitors added by the manufacturer to prevent polymerization are given.

8. WATER POLLUTION

8.1 Aquatic Toxicity – The form of data presentation used by the Environmental Protection Agency's "Oil and Hazardous Material-Technical Assistance Data System (OHM-TADS)" is used here. Reading from left to right and separated by slashes (/) are the following data:

- Concentration in parts per million by weight (or milligrams per liter) at which the chemical was tested;

- Time of exposure in hours;

- Name of the aquatic species studied;

- Effect observed; LC_{50} means that approximately 50% of the fish will die under the conditions of concentration and time given. TL_m (Median Tolerance Limit) means that approximately 50% of the fish will show abnormal behavior (including death) under the conditions of concentration and time given; the term EC_{50} (Effective Concentration$_{50}$) is used sometimes instead of TL_m;

- The kind of water used in the test (fresh or salt).

Some chemicals have been tested with many species of fish. Where the data were available, the data sheet cites one illustrative test in fresh water and one in salt water.

8.2 Waterfowl Toxicity –Very little information is available. In a few cases there is entered the LD_{50} value, which indicates the dose (in milligrams per kilogram of body weight) that is lethal to about half the waterfowl tested.

8.3 Biological Oxygen Demand (BOD) – Also called "biochemical oxygen demand," this is a standard way of describing how much oxygen dissolved in water is consumed by biological oxidation of the chemical during the stated period of time. The unit *lb/lb* indicates the pounds of oxygen consumed by each pound of chemical during the time stated. When given in *percent,* the values indicate the pounds of oxygen consumed by each 100 pounds of chemical during the time stated. If the percentage is followed by "(theor.)", it indicates the pounds of oxygen theoretically required to completely oxidize 100 pounds of the chemical.

8.4 Food Chain Concentration Potential – If the chemical is consumed by fish, marine plants, waterfowl, etc., that are in turn eaten by other species, the substance may accumulate and ultimately be consumed by humans. Where this occurs, an indication of the potential hazard and its significance is given.

9. SELECTED MANUFACTURERS

Three manufacturers are named wherever possible. When production data for the chemical were available, the manufacturers were selected from among the major producers. The "1972 Directory of Chemical Producers, United States of

America" (Chemical Information Services, Stanford Research Institute, Menlo Park, California) and "Buyers Guide Issue," *Chemical Week,* 111, No. 7, Part Two (October 25, 1972) were the sources used.

10. SHIPPING INFORMATION

10.1 Grades or Purity – The grades USP (United States Pharmacopoeia) and CP (chemically pure) are quite pure. Where "Technical" or "Commercial" grades are given, the percent by weight of the pure chemical present is usually indicated. In a few cases the identity of the major impurities is given. If the properties of the less pure grades differ significantly from those of the pure substance, the differences in properties are described in general terms.

10.2 Storage Temperature – The range of temperatures at which the chemical is normally shipped in bulk by water transport is given. "Ambient" means the temperature of the surroundings.

10.3 Inert Atmosphere – The terms used are "inerted," "padded," "ventilated (forced)," "ventilated (natural)," and "no requirement." They are given when found in the Code of Federal Regulations, Title 46, beginning in Part 151.05.

10.4 Venting – The terms used are "open," "pressure-vacuum," and "safety relief" (same source as 10.3 above).

11. HAZARD ASSESSMENT CODE

The code designates the assessment calculation route to be used in the Hazard Assessment Handbook when evaluating the hazard.

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations – This is the hazard class specified in the Code of Federal Regulations, Title 49, Part 172, December 31, 1976. Chemicals not specifically listed therein have been classified as "Flammable" if their flash point (closed cup) is below 100°F.

12.2 NAS Hazard Rating for Bulk Water Transportation – The indicated ratings are given in "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," National Academy of Sciences, Committee on Hazardous Materials, Washington, D.C., 1972. An outline of the rating system is given in Table 1.

TABLE 1

EXPLANATION OF NAS HAZARD RATINGS

		Health		
Rating	Fire	Vapor Irritant	Liquid or Solid Irritant	Poisons
0	No hazard	No effect	No effect	No effect
1	Flash point (C.C.) above 140°F	Slight effect	Causes skin smarting	Slightly toxic
2	Flash point (C.C.) 100 to 140°F	Moderate irritation; temporary effect	First-degree burns, short exposure	Intermediate toxicity
3	Flash point (C.C.) below 100°F; boiling point above 100°F	Irritating; cannot be tolerated	Second-degree burns, few minutes' exposure	Moderately toxic
4	Flash point (C.C.) below 100°F; boiling point below 100°F	Severe effect; may do permanent injury	Second-degree and third-degree burns	Severely toxic

	Water Pollution		
Rating	Human Toxicity	Aquatic Toxicity	Aesthetic Effect
0	Nontoxic; $LD_{50} > 15$ g/kg	Acute threshold limits above 10,000 ppm	No significant pollution; gases and odorless liquids
1	Practically nontoxic; LD_{50} 5 to 15 g/kg	Threshold limits 1,000 to 10,000 ppm	Mild-odored light oils and soluble chemicals
2	Slightly toxic; LD_{50} 0.5 to 5 g/kg	Threshold limits 100 to 1,000 ppm	Mild-odored, colorless, water-insoluble oils; boiling point 150-450°F
3	Moderately toxic; LD_{50} 50 to 500 mg/kg	Threshold limits 1 to 100 ppm	Light-colored high-boiling oils; odorous water-soluble compounds
4	Toxic; $LD_{50} < 50$ mg/kg	Threshold limits below 1 ppm	Heavy oils, colored or bad odors

TABLE 1 (Continued)

Rating	Reactivity: Other Chemicals	Reactivity: Water	Reactivity: Self-reaction
0	Inactive; may be attacked by materials rated 4	No reaction	No reaction
1	React only with materials rated 4	Mild reaction; unlikely to be hazardous	Mild self-reaction under some conditions
2	React with materials rated 3 or 4	Moderate reaction	Will undergo self-reaction if contaminated; do not require stabilizer
3	React with each other and with materials rated 2 or 4	More vigorous reaction; may be hazardous	Vigorous self-reaction; require stabilizer
4	React with each other and materials rated 0-3	Vigorous reaction; likely to be hazardous	Self-oxidizing chemical; capable of explosion or detonation

12.3 NFPA Hazard Classifications – The indicated ratings are given in "Fire Protection Guide on Hazardous Materials," Code 704M, 4th ed., National Fire Protection Association, Boston, Mass., 1972. Changes in the rating that are described in "1973 NFPA Technical Committee Reports, Volume A" are included. The classifications are defined in Table 2 below. The symbol used in conjunction with these ratings is illustrated in Section 4.2.

TABLE 2

EXPLANATION OF NFPA HAZARD CLASSIFICATIONS

Classification	Definition
Health Hazard (blue)	
4	Materials which on very short exposure could cause death or major residual injury even though prompt medical treatment were given.
3	Materials which on short exposure could cause serious temporary or residual injury even though prompt medical treatment were given.
2	Materials which on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.
1	Materials which on exposure would cause irritation but only minor residual injury even if no treatment is given.
0	Materials which on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material.
Flammability (red)	
4	Materials which will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or which are readily dispersed in air and which will burn readily.
3	Liquids and solids that can be ignited under almost all ambient temperature conditions.
2	Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.

TABLE 2 (Continued)

Classification	Definition
Flammability (red) cont'd	
1	Materials that must be preheated before ignition can occur.
0	Materials that will not burn.
Reactivity (yellow)	
4	Materials which in themselves are readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.
3	Materials which in themselves are capable of detonation or explosive reaction but require a strong initiating source or which must be heated under confinement before initiation or which react explosively with water.
2	Materials which in themselves are normally unstable and readily undergo violent chemical change but do not detonate. Also materials which may react violently with water or which may form potentially explosive mixtures with water.
1	Materials which in themselves are normally stable, but which can become unstable at elevated temperatures and pressures or which may react with water with some release of energy but not violently.
0	Materials which in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.
Other (white)	
~~W~~	Materials which react so violently with water that a possible hazard results when they come in contact with water, as in a fire situation. Similar to Reactivity Classification 2.
Oxy	Oxidizing material; any solid or liquid that readily yields oxygen or other oxidizing gas, or that readily reacts to oxidize combustible materials.

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm – The statement indicates whether the chemical is a solid, liquid, or gas after it has reached equilibrium with its surroundings at "ordinary" conditions of temperature and pressure.

13.2 Molecular Weight – The value given is the weight of a molecule of the chemical relative to a value of 12 for one atom of carbon.

The molecular weight is useful in converting from molecular units to weight units, and in calculating the pressure, volume and temperature relationships for gaseous materials. The ratio of the densities of any two gases is approximately equal to the ratio of their molecular weights (see 13.10).

The molecular weights of mixtures can be calculated if both the identity and quantity of each component of the mixture are known. Because the composition of mixtures described in this manual is not known exactly, or because it varies from one shipment to another, no molecular weights are given for such mixtures.

13.3 Boiling Point at 1 atm – The value is the temperature of a liquid when its vapor pressure is 1 atm. For example, when water is heated to 100°C (212°F) its vapor pressure rises to 1 atm and the liquid boils.

The boiling point at 1 atm indicates whether a liquid will boil and become a gas at any particular temperature and sea-level atmospheric pressure.

13.4 Freezing Point – The freezing point is the temperature at which a liquid changes to a solid. For example, liquid water changes to solid ice at 0°C (32°F). Some liquids solidify very slowly even when cooled below their freezing point. When liquids are not pure (for example, salt water) their freezing points are lowered slightly.

13.5 Critical Temperature – The maximum temperature at which a liquid can exist, no matter what the pressure on it, is called the critical temperature. For example, the critical temperature of water is 372°C (705°F). The value can be used to estimate many properties whose values are not immediately available.

13.6 Critical Pressure – The vapor pressure of a chemical at the critical temperature (see 13.5) is called the critical pressure. For example, the critical pressure of water is 218 atm. Values are given in pounds per square inch absolute, atmospheres, and meganewtons per square meter. The value can be used for estimating many property values that are not immediately available.

13.7 Specific Gravity – The specific gravity of a chemical is the ratio of the weight of the solid or liquid to the weight of an equal volume of water at 4°C (or at some other specified temperature).

If the specific gravity is less than 1.0 (or less than 1.03 in seawater) the chemical will float; if higher, it will sink. Where the change in the value with temperature is important, more data are found in 13.17.

13.8 Liquid Surface Tension – This property is a measure of the tensile force at the surface of a liquid that tends to shape liquid fragments into spherical drops. Values are expressed in dynes per centimeter and newtons per meter. Liquids with high surface tensions show less tendency to spread. Water has a surface tension of about 73 dynes/cm; seawater has a slightly higher value.

13.9 Liquid-Water Interfacial Tension – The value is a measure of the tensile forces existing at the interface between a liquid and water. Approximately, it is the difference between the individual surface tension of the liquid and that of water. Low values of the interfacial tension indicate that the chemical spreads readily on a water surface. The units are the same as in 13.8.

13.10 Vapor (Gas) Specific Gravity – The value is the ratio of the weight of vapor to the weight of an equal volume of dry air at the same conditions of temperature and pressure. Buoyant vapors have a vapor specific gravity less than one. The value may be approximated by the ratio M/29, where M is the molecular weight of the chemical (see 13.2).

In some cases the vapor may be at a temperature different from that of the surrounding air. For example, the vapor from a container of boiling methane at -172°F sinks in warm air, even though the vapor specific gravity of methane at 60°F is about 0.6.

For the effect of temperature on vapor density, see 13.23.

13.11 Ratio of Specific Heats of Vapor (Gas) – This property is the ratio of the specific heat at constant pressure (C_p) to the specific heat at constant volume (C_v); its value is always greater than one. In most cases it was calculated by use of the expression

$$\frac{C_p}{C_v} = \frac{C_p}{(C_p - R)}$$

where R is the Universal Gas Constant.

The ratio varies slightly with temperature; the value given is at 20°C (68°F). The ratio is often of value in estimating temperature changes when gases are compressed or expanded. Higher values of the ratio lead to larger temperature changes for a given pressure change.

13.12 Latent Heat of Vaporization – The value is the heat that must be added to the specified weight of a liquid before it can change to vapor (gas). It varies with temperature; the value given is that at the boiling point at 1 atm (see 13.3). The units used are Btu per pound, calories per gram, and joules per kilogram.

No value is given for chemicals with very high boiling points at 1 atm, because such substances are considered essentially nonvolatile.

13.13 Heat of Combustion – The value is the amount of heat liberated when the specified weight is burned in oxygen at 25°C. The products of combustion, including water, are assumed to remain as gases; the value given is usually referred to as the "lower heat value." The negative sign before the value indicates that heat is given off when the chemical burns. Units are the same as in 13.12.

13.14 Heat of Decomposition – The value is the amount of heat liberated when the specified weight decomposes to more stable substances. The value is given for very few chemicals, because most are stable and do not decompose under the conditions of temperature and pressure encountered during shipment. The negative sign before the value simply indicates that heat is given off during the decomposition. The value does *not* include heat given off when the chemical burns. Units are the same as in 13.13.

13.15 Heat of Solution – The value represents the heat liberated when the specified weight of chemical is dissolved in a relatively large amount of water at 25°C ("infinite dilution"). A negative sign before the value indicates that heat is given off, causing a rise in temperature. (A few chemicals absorb heat when they dissolve, causing the temperature to fall.) Units are the same as in 13.12.

In those few cases where the chemical reacts with water and the reaction products dissolve, the heat given off during the reaction is included in the heat of solution.

13.16 Heat of Polymerization – The value is the heat liberated when the specified weight of the compound (usually called the monomer) polymerizes to form the polymer. In some cases the heat liberated is so great that the temperature rises significantly, and the material may burst its container or

catch fire. The negative sign before the value indicates that heat is given off during the polymerization reaction. Units are the same as in 13.12.

Items 13.17 through 13.24 consist of graphs. The temperature range over which each graph is reliable is indicated by the length of the curve.

13.17 Saturated Liquid Density – The value is the weight (in pounds) of one cubic foot of liquid that is in equilibrium with its vapor. Liquid densities decrease slightly with an increase in temperature; where literature data or reliable estimation methods were applicable, a graph shows this effect.

13.18 Liquid Heat Capacity – The value is the heat (in Btu) required to raise the temperature of one pound of the liquid one degree Fahrenheit at constant pressure. For example, it requires almost 1 Btu to raise the temperature of 1 pound of water from 68°F to 69°F. The value is useful in calculating the increase in temperature of a liquid when it is heated, as in a fire. The value increases slightly with an increase in temperature; the graph shows this effect.

13.19 Liquid Thermal Conductivity – The value is a measure of the ability of a liquid to conduct heat. It represents the number of Btu per hour that pass through an area of liquid one square foot in cross-section when the temperature gradient is 1°F per inch of depth. Higher values indicate that the liquid conducts heat more readily.

Liquid thermal conductivities decrease slightly with an increase in temperature. Where applicable, the graph shows this effect.

A basic law of heat conduction states that the energy flow per unit area per unit time is proportional to the gradient in temperature. The constant of proportionality is the liquid thermal conductivity.

13.20 Liquid Viscosity – The value (in centipoise) is a measure of the ability of a liquid to flow through a pipe or a hole; higher values indicate that the liquid flows less readily under a fixed pressure head. For example, heavy oils have higher viscosities (i.e., are more viscous) than gasoline.

Liquid viscosities decrease rapidly with an increase in temperature. In some cases a graph is given to show the effect. In other cases only a single data point was found in the literature.

A basic law of fluid mechanics states that the force per unit area needed to shear a fluid is proportional to the velocity gradient. The constant of proportionality is the viscosity.

13.21 Solubility in Water – The value represents the pounds of a chemical that will dissolve in 100 pounds of pure water. Solubility usually increases when the temperature increases; where the change has been measured, a graph is given to show the effect. The following terms are used when numerical data are either unavailable or not applicable:

The term "Miscible" means that the chemical mixes with water in all proportions. The term "Reacts" means that the substance reacts chemically with water; thus, its solubility has no real meaning. "Insoluble" usually means that one pound of the chemical does not dissolve entirely in 100 pounds of water. (Weak solutions of "Insoluble" materials may still be hazardous to humans, fish, and waterfowl, however.)

13.22 Saturated Vapor Pressure – The value is the pressure (in pounds per square inch absolute) of the vapor in equilibrium with the liquid form at the specified temperature. Vapor pressure values can be used to estimate the relative volatility of chemicals at a given temperature, and to calculate the pressure over a liquid that is shipped in a closed container.

The vapor pressure increases as temperature increases; a graph is given to show this effect. Note that the vapor pressure scale is logarithmic.

13.23 Saturated Vapor Density – The value is the weight (in pounds) of one cubic foot of vapor that is in equilibrium with the liquid form.

If it is assumed that the vapor behaves as an ideal gas, the relation pM/RT holds, where p is the vapor pressure, M is the molecular weight, R is the gas constant, and T is the temperature (in absolute units).

Since the vapor pressure varies with temperature (see 13.22), the saturated vapor density also varies with temperature, as shown on the graph. Note that the density scale is logarithmic.

13.24 Ideal Gas Heat Capacity – The value is the number of Btu needed to raise the temperature of one pound of gas by 1° Fahrenheit. The property can be used only when the pressure of the gas is less than about 10 atm. The ideal gas heat capacity is not a function of pressure (below about 10 atm), but it does increase with temperature, and a graph is given to show the effect.

4. OTHER INFORMATION SYSTEMS

4.1 CHEMICAL TRANSPORTATION EMERGENCY CENTER (CHEMTREC)

The Manufacturing Chemists Association operates CHEMTREC 24 hours a day. By calling the appropriate toll-free number listed below, one can consult experts on chemicals and spill response.

Continental United States (except Alaska & District of Columbia)	800-424-9300
Alaska, Hawaii, and District of Columbia	202-483-7616

4.2 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

The NFPA's "Recommended System for the Identification of the Fire Hazards of Materials" (NFPA No. 704M) provides basic warning information to fire fighters in industrial plants and storage facilities. This system uses a diamond-shaped warning symbol (Figure 4.1). The top, left, and right boxes refer to flammability, health, and reactivity hazards respectively and contain a number from 0 to 4. The exact meaning of each number is explained in Section 3 (¶ 12.3) of this manual, and the applicable numbers for each chemical are listed in Section 11 under "NFPA Hazard Classifications." The bottom box is used for special hazards; the most common of these is a warning against the use of water. indicated by the symbol ~~W~~.

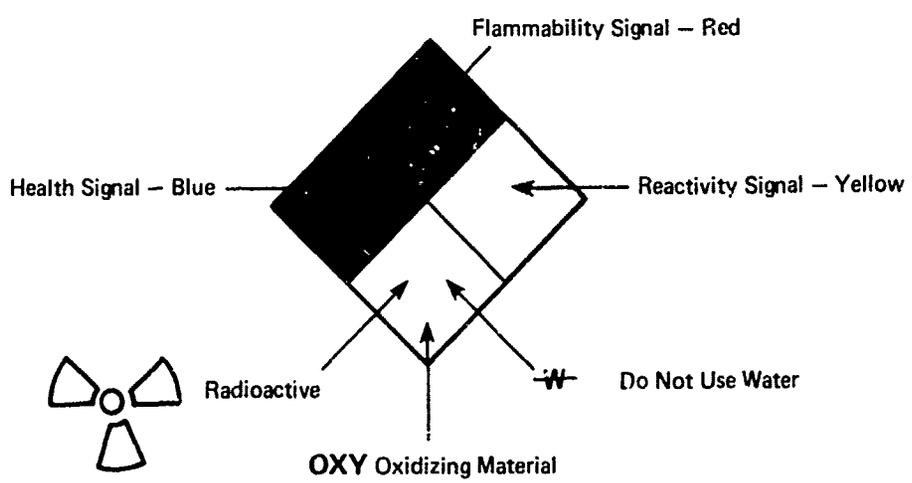

FIGURE 4.1 NFPA 704M SYMBOL

4.3 INTERNATIONAL MARITIME CONSULTATIVE ORGANIZATION (IMCO)

Foreign vessels using U.S. waterways generally utilize, in addition to U.S. requirements, an international labeling system developed by IMCO. This system consists of 15 diamond-shaped labels (Figure 4.2). Each identifies a particular hazard by a descriptive picture, a word, and a distinctive color.

The number at the bottom of each diamond identifies the class to which IMCO has assigned the chemical and is the same as the first digit in the IMCO/UN numerical designation, one of the items given under "Chemical Designations" in Section 11 of this manual.

4.4 DEPARTMENT OF TRANSPORTATION (DOT)

At the time this manual was in preparation, a Hazard Information (HI) System had been proposed by the Department of Transportation – Hazardous Materials Regulation Board. It uses IMCO-type warning labels with a number between 1 and 89 added at the bottom of the diamond. This number refers to the section number in a guide containing general hazard and response information for 89 categories of chemicals. The information is similar to that provided in this manual, except that it does not consider water pollution. At the time of publication of this manual, the HI System had not yet been adopted.

4.5 NATIONAL ACADEMY OF SCIENCES (NAS)

A booklet entitled "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals – A Tentative Guide" was prepared for the USCG by the Committee on Hazardous Materials of the National Academy of Sciences, National Research Council. It rates the fire, health, water pollution, and radioactivity hazards of over 200 chemicals on a scale of 0 to 4; the meaning of each number is explained in Section 3 of this manual, and the applicable numbers for each chemical are listed in Section 11 under "NAS Hazard Rating for Bulk Water Transportation." No response guidance is provided.

4.6 OHM-TADS (EPA)

The Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) has been developed by the Environmental Protection Agency (EPA) to provide information on physical and chemical properties, hazards, pollution characteristics, and shipping information for over 800 hazardous materials. OHM-TADS consists of a computerized data base which can be accessed from terminals at the 10 EPA Regional Offices and from EPA Headquarters in Washington, D.C. The System can provide either information on specifically requested properties for a material, or it can print all the information in its files for that material.

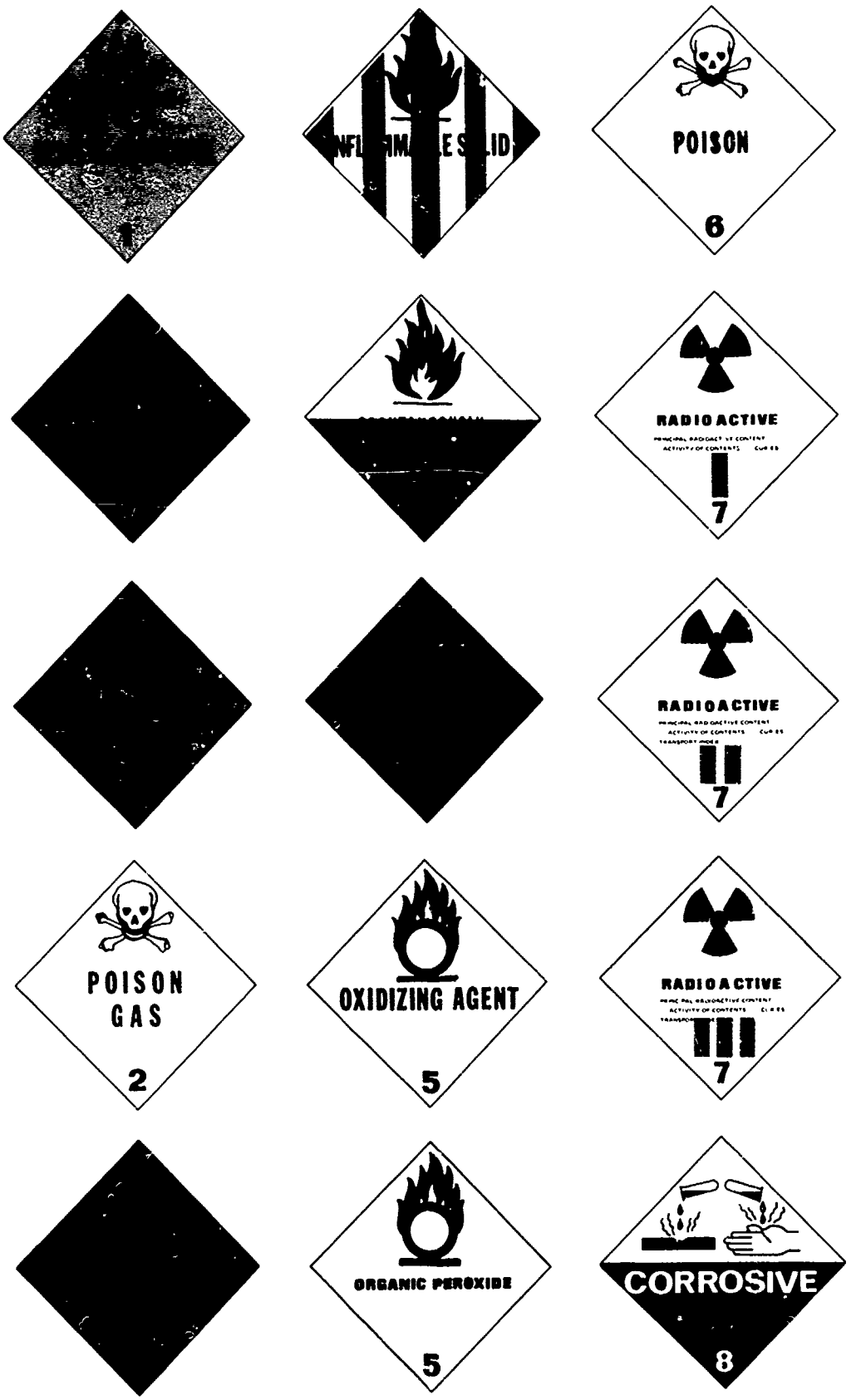

FIGURE 4-2
IMCO SHIPPING LABELS

Some of the same information appears in both this manual and OHM-TADS, but each contains some information not found in the other.

4.7 POISON CONTROL CENTERS

Throughout the country, local Poison Control Centers are maintained at hospitals. These Centers can provide information on the chemical composition, appearance, and toxicity of common poisonous materials as well as information on the symptoms of exposure and on the emergency procedures recommended in the event of exposure. The information available at these centers deals mainly with common household materials.

Poison Control Centers are coordinated through the Department of Health, Education and Welfare in Washington, D.C., but information should be requested through the local centers.

The telephone number of the local Poison Control Center can be found in a local telephone directory or in the Regional Contingency Plan.

5. CONVERSION FACTORS

To Convert	To	Multiply by
Length		
inches	millimeters	25.4*
inches	feet	0.0833
feet	inches	12*
feet	meters	0.3048*
feet	yards	0.3333
feet	miles (U.S. statute)	0.0001894
yards	feet	3*
yards	miles (U.S. statute)	0.0005682
miles (U.S. statute)	feet	5280*
miles (U S. statute)	yards	1760*
miles (U.S. statute)	meters	1609
miles (U.S. statute)	nautical miles	0.868
meters	feet	3.231
meters	yards	1.094
meters	miles (U.S. statute)	0.0006214
nautical miles	miles (U.S. statute)	1.152
Area		
square inches	square centimeters	6.452
square inches	square feet	0.006944
square feet	square inches	144*
square feet	square meters	0.09290
square meters	square feet	10.76
square miles	square yards	3,097,600*
square yards	square feet	9*
Volume		
cubic inches	cubic centimeters	16.39
cubic inches	cubic feet	0.0005787
cubic feet	cubic inches	1728*
cubic feet	cubic meters	0.02832
cubic feet	U.S. gallons	7.481
cubic meters	cubic feet	35.31
liters	quarts (U.S. liquid)	1.057
quarts (U.S. liquid)	liters	0.9463
U.S. gallons	barrels (petroleum)	0.02381
U.S. gallons	cubic feet	0.1337
U.S. gallons	Imperial gallons	0.8327
barrels (petroleum)	U.S. gallons	42*
Imperial gallons	U.S. gallons	1.201
milliliters	cubic centimeters	1*

*Exact value

To Convert	To	Multiply by
Time		
seconds	minutes	0.01667
seconds	hours	0.0002778
seconds	days	0.00001157
minutes	seconds	60*
minutes	hours	0.01667
minutes	days	0.0006944
hours	seconds	3600*
hours	minutes	60*
hours	days	0.04167
Mass or Weight		
pounds	kilograms	0.4536
pounds	short tons	0.0005*
pounds	long tons	0.0004464
pounds	metric tons	0.0004536
tons (short)	pounds	2000*
tons (metric)	pounds	2205
tons (long)	pounds	2240*
kilograms	pounds	2.205
tonnes (metric tons)	kilograms	1000*
Energy		
calories	Btu	0.003968
calories	joules	4.187
Btu (British thermal units)	calories	252.0
Btu	joules	1055
joules	calories	0.2388
joules	Btu	0.0009479
Velocity		
feet per second	meters per second	0.3048
feet per second	miles per hour	0.6818
feet per second	knots	0.5921
meters per second	feet per second	3.281
meters per second	miles per hour	2.237
miles per hour	meters per second	0.4470
miles per hour	feet per second	1.467
knots	meters per second	0.5148
knots	miles per hour	1.151
knots	feet per second	1.689
Density		
pounds per cubic foot	grams per cubic centimeter	0.01602
grams per cubic centimeter	pounds per cubic foot	62.42
grams per cubic centimeter	kilograms per cubic meter	1000*
kilograms per cubic meter	grams per cubic centimeter	0.001

*Exact value

To Convert	To	Multiply by
Pressure		
pounds per square inch (absolute)(psia)	kilonewtons per square meter (kN/m^2)	6.895
psia	atmospheres	0.0680
psia	inches of water	27.67
psia	millimeters of mercury (torr)	51.72
pounds per square inch (gauge) (psig)	psia	add 14.70
millimeters of mercury (torr)	psia	0.01934
millimeters of mercury (torr)	kN/m^2	0.1333
inches of water	psia	0.03614
kilograms per square centimeter	millimeters of mercury (torr)	735.6
inches of water	kN/m^2	0.2491
kilograms per square centimeter	atmospheres	0.9678
atmospheres	kN/m^2	101.3
kilograms per square centimeter	psia	14.22
atmospheres	psia	14.70
bars	kN/m^2	100*
kilonewtons per square meter (kN/m^2)	psia	0.1450
bars	atmospheres	0.9869
kilonewtons per square meter (kN/m^2)	atmospheres	0.009869
bars	kilograms per square centimeter	1.020
Viscosity		
centipoises	pounds per foot per second	0.0006720
pounds per foot per second	centipoises	1488
centipoises	poises	0.01*
centipoises	newton seconds per square meter	0.001*
poises	grams per centimeter per second	1*
grams per centimeter per second	poises	1*
newton seconds per square meter	centipoises	1000*
Thermal Conductivity		
Btu per hour per foot per °F	watts per meter-kelvin	1.731
Btu per hour per foot per °F	kilocalories per hour per meter per °C	1.488
watts per meter-kelvin	Btu per hour per foot per °F	0.5778
kilocalories per hour per meter per °C	watts per meter-kelvin	1.163
kilocalories per hour per meter per °C	Btu per hour per foot per °F	0.6720
Heat Capacity		
Btu per pound per °F	calories per gram per °C	1*
Btu per pound per °F	joules per kilogram-kelvin	4187
joules per kilogram-kelvin	Btu per pound per °F	0.0002388
calories per gram per °C	Btu per pound per °F	1*
Concentration (in water solution)		
parts per million (ppm)	milligrams per liter	1*
milligrams per liter	ppm	1*
milligrams per cubic meter	grams per cubic centimeter	1×10^{-9}
grams per cubic centimeter	milligrams per cubic meter	1×10^{9}

*Exact value

To Convert	To	Multiply by
Concentration (in water solution) (Continued)		
grams per cubic centimeter	pounds per cubic foot	62.42
pounds per cubic foot	grams per cubic centimeter	0.01602
Temperature		
degrees Kelvin (°K)	degrees Rankine (°R)	1.8*
degrees Rankine (°R)	degrees Kelvin (°K)	0.5556
degrees centigrade (°C)	degrees Fahrenheit (°F)	First multiply by 1.8, then add 32
degrees Fahrenheit (°F)	degrees centigrade (°C)	First subtract 32, then multiply by 0.5556
degrees centigrade (°C)	degrees Kelvin (°K)	add 273.2
degrees Fahrenheit (°F)	degrees Rankine (°R)	add 459.7
Flow		
cubic feet per second	U.S. gallons per minute	448.9
U.S. gallons per minute	cubic feet per second	0.002228

Universal Gas Constant (R)

8.314 joules per gram mole-kelvin
1.987 calories per gram mole-kelvin
1.987 Btu per pound mole per °F
10.73 psia-cubic feet per pound mole per °F
82.057 atm-cubic centimeters per gram mole-kelvin
62.361 millimeters mercury liter per gram mole-kelvin

*Exact value

6. SELECTED PROPERTIES OF FRESH WATER, SEA WATER, ICE, AND AIR

The following properties are useful for engineering calculations described in the Hazard Assessment Handbook. The values for *fresh water* are those recorded for pure water. The values for the water of lakes and streams differ somewhat from those of pure water, but since no "standard" fresh water has ever been defined, the values for pure water must be used.

A "standard" *sea water* has been defined as one containing 35 grams of salts per kilogram of solution. The values for the water of tidal estuaries differ somewhat from those of "standard" sea water because the water has a salinity somewhere between those of fresh and sea waters.

The value for the density of *air* was derived from the ideal gas law: the air is assumed to be dry and at 1 atmosphere pressure.

6.1 FREEZING POINT

Fresh Water	0°C	32°F
Sea Water	−1.91°C	28.6°F

6.2 LATENT HEAT OF FUSION OF ICE

79.6 cal/g = 143.3 Btu/lb

6.3 DENSITY (See Figures 6.1, 6.2, and 6.3)

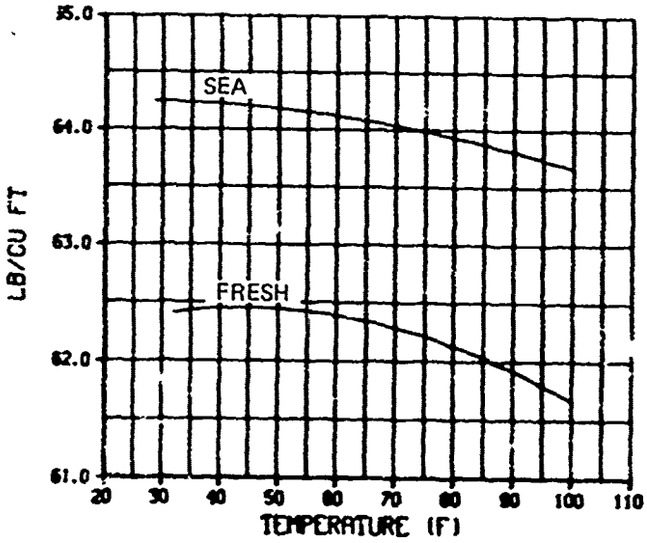

FIGURE 6.1 DENSITY OF WATER

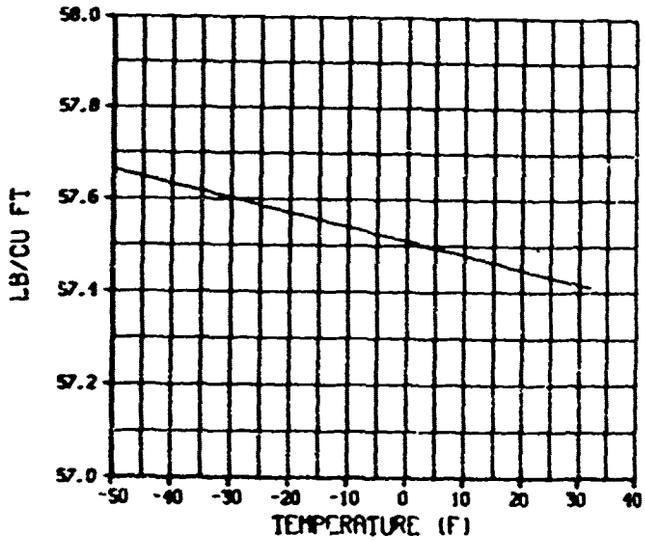

FIGURE 6.2 DENSITY OF ICE

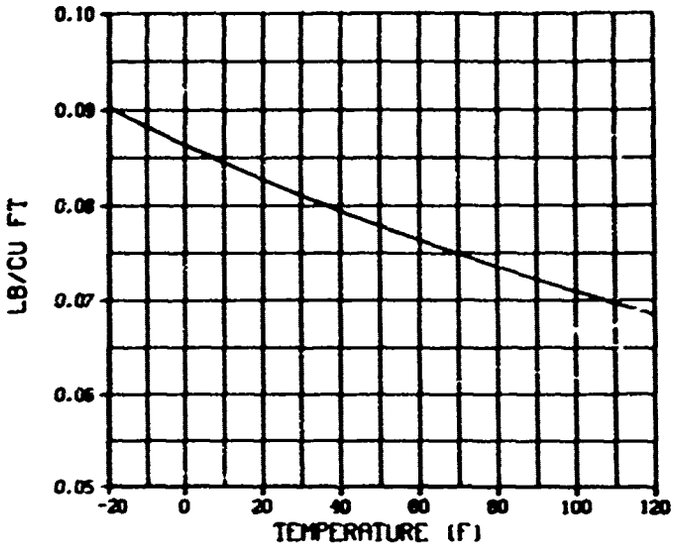

FIGURE 6.3 DENSITY OF DRY AIR (1 atm.)

6.4 VISCOSITY (See Figure 6.4)

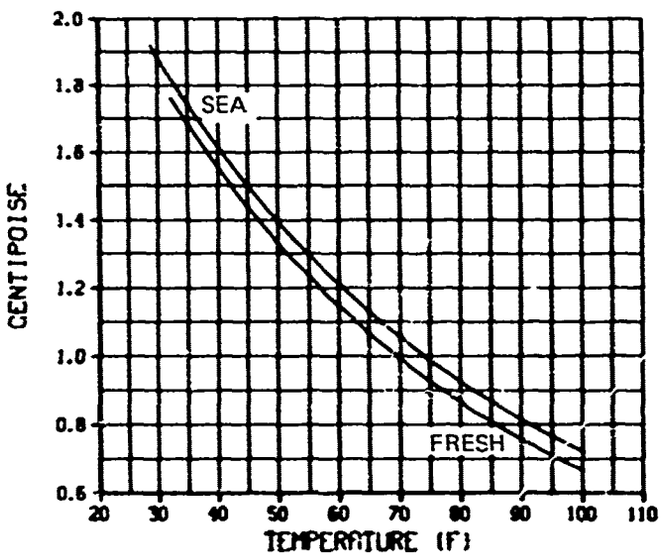

FIGURE 6.4 VISCOSITY OF WATER

6.5 HEAT CAPACITY (See Figures 6.5 and 6.6)

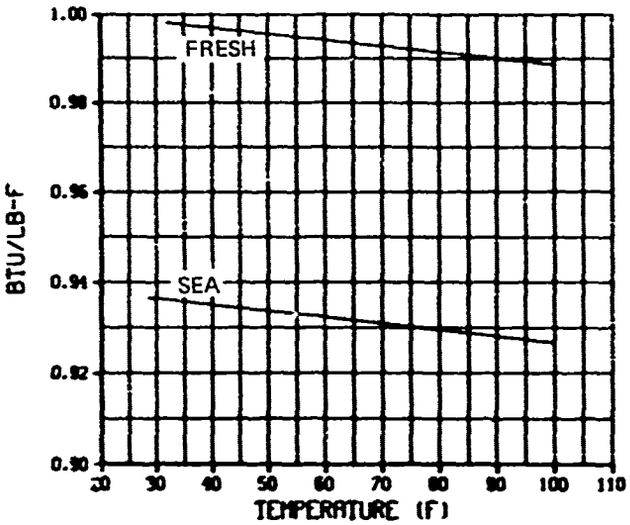

FIGURE 6.5 HEAT CAPACITY OF WATER

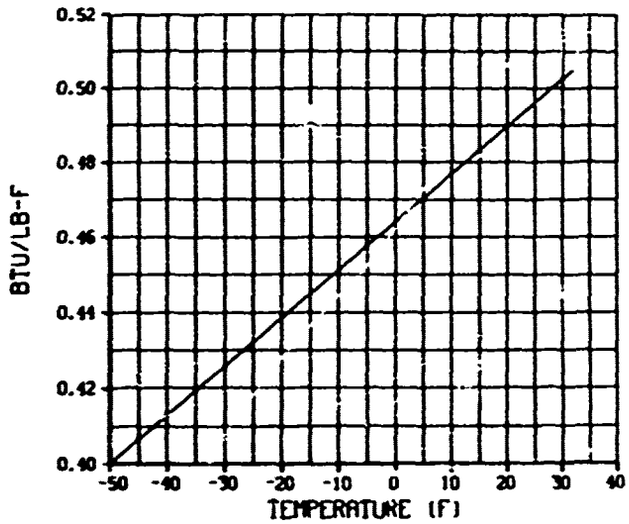

FIGURE 6.6 HEAT CAPACITY OF ICE

6.6 THERMAL CONDUCTIVITY (See Figures 6.7 and 6.8)

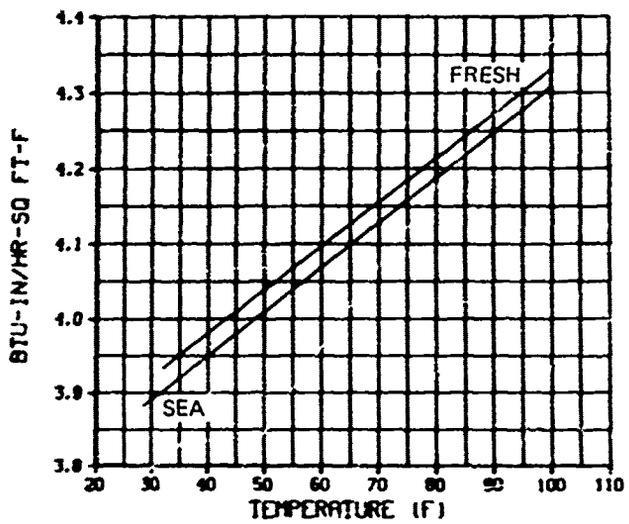

FIGURE 6.7 THERMAL CONDUCTIVITY OF WATER

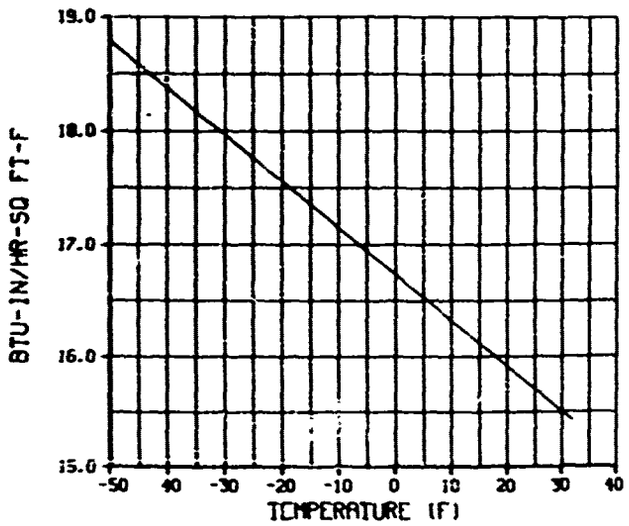

FIGURE 6.8 THERMAL CONDUCTIVITY OF ICE

6.7 VAPOR PRESSURE (See Figures 6.9 and 6.10)

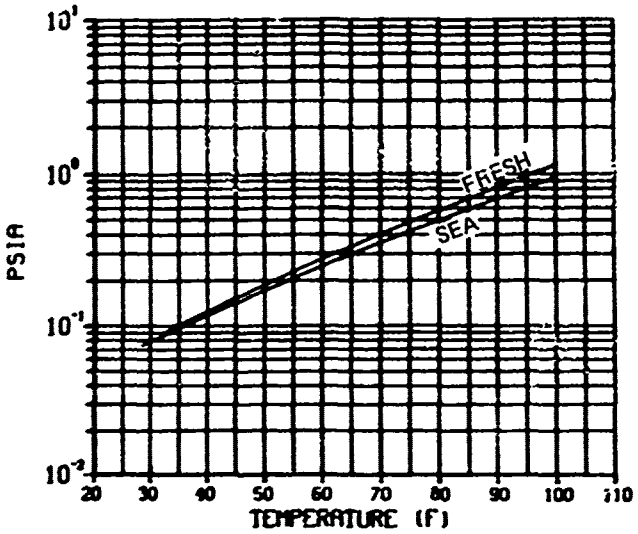

FIGURE 6.9 SATURATED VAPOR PRESSURE OF WATER

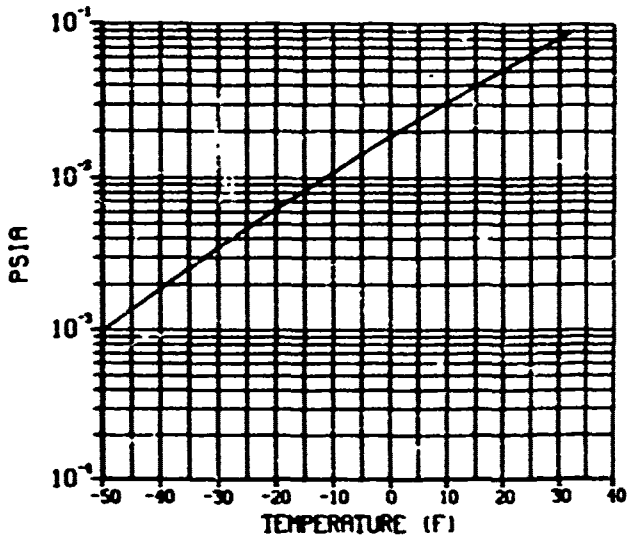

FIGURE 6.10 SATURATED VAPOR PRESSURE OF ICE

7. GUIDE TO COMPATIBILITY OF CHEMICALS

The Guide is based in part upon information provided to the Coast Guard by the National Academy of Sciences – U.S. Coast Guard Advisory Committee on Hazardous Materials and represents the latest information available to the Coast Guard on chemical compatibility.

The accidental mixing of one chemical cargo with another can in some cases be expected to result in a vigorous and hazardous chemical reaction. The generation of toxic gases, the heating, overflow, and rupture of cargo tanks, and fire and explosion are possible consequences of such reactions.

The purpose of the Compatibility Chart is to show chemical combinations believed to be dangerously reactive in the case of accidental mixing. It should be recognized, however, that the Chart provides a broad grouping of chemicals with an extensive variety of possible binary combinations. Although one group, generally speaking, can be considered dangerously reactive with another group where an "X" appears on the Chart, there may exist between the groups some combinations which would not dangerously react. The Chart should therefore not be used as an infallible guide. It is offered as an aid in the safe loading of bulk chemical cargoes, with the recommendation that proper safeguards be taken to avoid accidental mixing of binary mixtures for which an "X" appears on the Chart. Proper safeguards would include consideration of such factors as avoidance of the use of common cargo and vent lines and carriage in adjacent tanks having a common bulkhead.

The following procedure explains how the Guide should be used in determining compatibility information:

(1) Determine the reactivity group of a particular product by referring to the alphabetical list in Table 7.1.

(2) Enter the Chart with the reactivity group. Proceed across the page. An "X" indicates a reactivity group that forms an unsafe combination with the product in question.

For example, crotonaldehyde is listed in Table 7.1 as belonging in Group 19 (Aldehydes). The Chart shows that chemicals in this group should be segregated from sulfuric and nitric acids, caustics, ammonia, and all types of amines (aliphatic, alkanol, and aromatic). According to note A, crotonaldehyde is also incompatible with non-oxidizing mineral acids.

It is recognized there are wide variations in the reaction rates of individual chemicals within the broad groupings shown reactive by the Compatibility Chart. Some individual materials in one group will react violently with some of the materials in another group and cause great hazard; others will react slowly, or not at all. Accordingly, a useful addition to the Guide would be the identification of specific binary combinations which are found *not* to be dangerously reactive, even though an "X" appears on the chart for those two chemicals. A few such combinations are listed in Table 7.3; other safe combinations will be listed in subsequent revisions.

COMPATIBILITY CHART

CARGO GROUPS \ REACTIVE GROUPS	1 NON OXIDIZING MINERAL ACIDS	2 SULFURIC ACID	3 NITRIC ACID	4 ORGANIC ACIDS	5 CAUSTICS	6 AMMONIA	7. ALIPHATIC AMINES	8 ALKANOLAMINES	9 AROMATIC AMINES	10 AMIDES	11 ORGANIC ANHYDRIDES	12 ISOCYANATES	13 VINYL ACETATE	14 ACRYLATES	15 SUBSTITUTED ALLYLS	16. ALKYLENE OXIDES	17. EPICHLOROHYDRIN	18 KETONES	19 ALDEHYDES	20 ALCOHOLS, GLYCOLS	21 PHENOLS, CRESOLS	22. CAPROLACTAM SOLUTION	
1 NON OXIDIZING MINERAL ACIDS		X			X	X	X	X	X	X	X	X	X			X	X		A	E			1
2 SULFURIC ACID	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	2
3 NITRIC ACID		X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		3
4 ORGANIC ACIDS		X			X	X	X	X	C			X				X	X			F			4
5 CAUSTICS	X	X	X	X							X	X				X	X		X	X	X	X	5
6 AMMONIA	X	X	X	X						X	X	X	X			X	X		X				6
7 ALIPHATIC AMINES	X	X	X	X							X	X	X	X	X	X	X	X	X	X	X	X	7
8 ALKANOLAMINES	X	X	X	X							X	X	X	X	X	X	X	B	X				8
9 AROMATIC AMINES	X	X	X	C							X	X							X				9
10 AMIDES	X	X	X			X						X									X		10
11 ORGANIC ANHYDRIDES	X	X	X		X	X	X	X	X														11
12 ISOCYANATES	X	X	X	X	X	X	X	X	X	X					D					X		X	12
13 VINYL ACETATE	X	X	X			X	X	X															13
14 ACRYLATES		X	X				X	X															14
15 SUBSTITUTED ALLYLS		X	X				X	X				D											15
16 ALKYLENE OXIDES	X	X	X	X	X	X	X	X															16
17 EPICHLOROHYDRIN	X	X	X	X	X	X	X	X															17
18 KETONES		X	X				X	B															18
19 ALDEHYDES	A	X	X		X	X	X	X	X														19
20 ALCOHOLS, GLYCOLS	E	X	X	F	X		X					X											20
21. PHENOLS, CRESOLS		X	X		X		X			X													21
22. CAPROLACTAM SOLUTION		X			X		X					X											22
30 OLEFINS		X	X																				30
31. PARAFFINS																							31
32. AROMATIC HYDROCARBONS			X																				32
33. MISCELLANEOUS HYDROCARBON MIXTURES			X																				33
34 ESTERS		X	X																				34
35 VINYL HALIDES			X																			X	35
36. HALOGENATED HYDROCARBONS		G			H		I																36
37 NITRILES		X																					37
38. CARBON DISULFIDE							X	X															38
39. SULFOLANE																							39
40. GLYCOL ETHERS		X										X											40
41. ETHERS		X	X																				41
42 NITROCOMPOUNDS					X	X	X	X	X														42
43. MISCELLANEOUS WATER SOLUTIONS		X										X											43
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

(Letters refer to notes on following page)

NOTES: COMPATIBILITY CHART: REACTIVITY DIFFERENCES (DEVIATIONS) WITHIN CHEMICAL GROUPS

A Acrolein (19), Crotonaldehyde (19), and 2-Ethyl-3-propyl acrolein (19) are not compatible with Group 1, Non-Oxidizing Mineral Acids.

B Isophorone (18), and Mesityl Oxide (18) are not compatible with Group 8, Alkanolamines.

C Acrylic Acid (4) is not compatible with Group 9, Aromatic Amines.

D Allyl Alcohol (15) is not compatible with Group 12, Isocyanates.

E Furfuryl Alcohol (20) is not compatible with Group 1, Non-oxidizing Mineral Acids.

F Furfuryl Alcohol (20) is not compatible with Group 4, Organic Acids.

G Dichloroethyl Ether (36) is not compatible with Group 2, Sulfuric Acid.

H Trichloroethylene (36) is not compatible with Group 5, Caustics.

I Ethylenediamine (7) is not compatible with Ethylene Dichloride (36).

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS

Name	Group No.
Acetaldehyde	19
Acetic Acid	4
Acetic Anhydride	11
Acetone	18
Acetonitrile	37
Acrolein (inhibited)	19
Acrylic Acid (inhibited)	4
Acrylonitrile (inhibited)	15
Adiponitrile	37
Allyl Alcohol	15
Allyl Chloride	15
Aminoethylethanolamine	8
Ammonia, Anhydrous	6
Ammonium Hydroxide (28% or less)	6
Ammonium Nitrate, Urea, Water Solutions (containing Ammonia)	6
Ammonium Nitrate, Urea, Water Solutions (not containing Ammonia)	43
Amyl Acetate	34
Amyl Alcohol	20
Amyl Tallate	34
Aniline	9
Asphalt	33
Asphalt Blending Stocks:	
Roofers Flux	33
Straight Run Residue	33
Benzene	32
Benzene, Toluene Xylene (crude)	32
Butadiene (inhibited)	30
Butane	31
Butyl Acrylate (inhibited)	14
Butyl Acetate	34
Butyl Alcohol	20
Butylamine	7
Butyl Benzyl Phthalate	34
Butylene	30
1,3-Butylene Glycol	20
Butylene Oxide	16
Butyl Ether	41
Butyl Methacrylate (inhibited)	14
Butyraldehyde	19
Butyric Acid	4
Camphor Oil (light)	18
Caprolactam Solution	22
Carbolic Oil	21
Carbon Disulfide	38
Carbon Tetrachloride	36
Caustic Potash Solution	5
Caustic Soda Solution	5
Chlorine	*
Chlorobenzene	36
Chloroform	36
Chlorosulfonic Acid	*
Corn Syrup	43
Creosote, Coal Tar	21
Cresols	21
Cresylate Spent Caustic Solution	5
Crotonaldehyde	19
Cumene	32
Cycloaliphatic Resins	31
Cyclohexane	31
Cyclohexanol	20
Cyclohexanone	18
Cyclohexylamine	7
Cymene	32
Decaldehyde	19
Decane	31
Decene	30
Decyl Alcohol	20
Decyl Acrylate (inhibited)	14

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS (Continued)

Decylbenzene	32
Dextrose Solution	43
Diacetone Alcohol	20
Dibutylamine	7
Dibutyl Phthalate	34
Dichlorobenzene	36
Dichlorodifluoromethane	36
1,1-Dichloroethane	36
Dichloroethyl Ether	41
Dichloromethane	36
1,1-Dichloropropane	36
1,2-Dichloropropane	36
1,3-Dichloropropene	15
Dicyclopentadiene	30
Diethanolamine	8
Diethylamine	7
Diethylbenzene	32
Diethylene Glycol	40
Diethylene Glycol Monobutyl Ether	40
Diethylene Glycol Monobutyl Ether Acetate	34
Diethylene Glycol Monoethyl Ether	40
Diethylene Glycol Monomethyl Ether	40
Diethylenetriamine	7
Diethylethanolamine	8
Diheptyl Phthalate	34
Diisobutylene	30
Diisobutyl Carbinol	20
Diisobutyl Ketone	18
Diisodecyl Phthalate	34
Diisopropanolamine	8
Diisopropylamine	7
Dimethylamine	7
Dimethylethanolamine	8
Dimethylformamide	10
Dinonyl Phthalate	34
Dioctyl Phthalate	34
1,4-Dioxane	41
Diphenyl-Diphenyl Oxide	33
Diphenylmethane Diisocyanate	12
Di-n-propylamine	7
Dipropylene Glycol	40
Distillates:	
Straight Run	33
Flashed Feed Stocks	33
Diundecyl Phthalate	34
Dodecane	31
Dodecanol	20
Dodecene	30
Dodecylbenzene	32
Epichlorohydrin	17
Ethane	31
Ethanolamine	8
Ethoxylated Alcohols C_{11}-C_{15}	40
Ethoxy Triglycol	40
Ethyl Acetate	34
Ethyl Alcohol	20
Ethyl Acrylate (inhibited)	14
Ethylamine	7
Ethyl Benzene	32
Ethyl Butanol	20
Ethyl Chloride	36
Ethylene	30
Ethylene Chlorohydrin	20
Ethylene Cyanohydrin	20
Ethylenediamine	7
Ethylene Dibromide	36
Ethylene Dichloride	36
Ethylene Glycol	20
Ethylene Glycol Monobutyl Ether	40
Ethylene Glycol Monobutyl Ether Acetate	34
Ethylene Glycol Monoethyl Ether	40
Ethylene Glycol Monoethyl Ether Acetate	34
Ethylene Glycol Monomethyl Ether	40
Ethylene Oxide	*
Ethyl Ether	41
Ethylhexaldehyde	19
2-Ethyl Hexanol	20
2-Ethylhexyl Acrylate (inhibited)	14

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS (Continued)

Ethyl Hexyl Tallate	34
Ethyl Methacrylate (inhibited)	14
2-Ethyl-3-Propyl Acrolein	19
Formaldehyde Solution (37-50%)	19
Formic Acid	4
Furfural	19
Furfuryl Alcohol	20
Gas Oil:	
Cracked	33
Gasoline Blending Stocks:	
Alkylates	33
Reformates	33
Gasolines:	
Casinghead (natural)	33
Automotive (containing over 4.23 grams lead per gallon)	33
Aviation (containing not over 4.86 grams lead per gallon)	33
Polymer	33
Straight Run	33
Glutaraldehyde Solution	19
Glycerine	20
Glycol Diacetate	34
Glyoxal Solution	19
Heptane	31
Hexamethyleneimine	7
Hexane	31
Hexanol	20
Hexene	30
Hexylene Glycol	20
Hydrochloric Acid	1
Hydrofluoric Acid	1
Isophorone	18
Isoprene (inhibited)	30
Jet Fuels:	
JP-1 (Kerosene)	33
JP-3	33
JP-4	33
JP-5 (Kerosene, Heavy)	33
Kerosene	33
Latex, Liquid Synthetic	43
Mesityl Oxide	18
Methane	31
Methyl Acetate	34
Methyl Acetylene, Propadiene Mixture (Stabilized)	30
Methyl Acrylate (inhibited)	14
Methyl Alcohol	20
Methyl Amyl Acetate	34
Methyl Amyl Alcohol	20
Methyl Bromide	36
3-Methyl Butyraldehyde	19
Methyl Chloride	36
Methyl Ethyl Ketone	18
2-Methyl-5-Ethyl Pyridine	9
Methyl Formal (Dimethyl Formal)	41
Methyl Isobutyl Ketone	18
Methyl Isobutyl Carbinol	20
Methyl Methacrylate (inhibited)	14
(alpha-) Methyl Styrene (inhibited)	30
Mineral Spirits	33
Monochlorodifluoromethane	36
Morpholine	7
Motor Fuel Antiknock Compounds Containing Lead Alkyls	*

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS (Continued)

Naphtha:	
Coal Tar	33
Solvent	33
Stoddard Solvent	33
Varnish Markers' and Painters' (75%)	33
Naphthalene (molten)	32
Nitric Acid (70% or less)	3
Nitric Acid (95%)	*
Nitrobenzene	43
1- or 2-Nitropropane	43
Nitrotoluene	43
Nonane	31
Nonene	30
Nonyl Alcohol	20
Nonyl Phenol	21
Nonyl Phenol (ethoxylated)	40
Octane	31
Octene	30
Octyl Alcohol	20
Octyl Aldehyde	19
Octyl Epoxytallate	34
Oils:	
Clarified	33
Coal Oil	33
Crude Oil	33
Diesel Oil	33
Fuel Oils:	
No. 1 (Kerosene)	33
No. 1-D	33
No. 2	33
No. 2-D	33
No. 4	33
No. 5	33
No. 6	33
Residual	33
Road	33
Transformer	33
Edible Oils, including:	
Castor	34
Coconut	34
Cotton Seed	34
Fish	34
Lard	34
Olive	34
Palm	34
Peanut	34
Safflower	34
Soya Bean	34
Tucum	34
Vegetable	34
Miscellaneous Oils, including:	
Absorption	33
Aromatic	33
Coal Tar	33
Heartcut Distillate	33
Linseed	33
Lubricating	33
Mineral	33
Mineral Seal	33
Motor	33
Neatsfoot	33
Penetrating	33
Range	33
Resin	33
Resinous Petroleum	33
Rosin	33
Sperm	33
Spindle	33
Spray	33
Tall	34
Tanner's	33
Turbine	33
Oleum	*
Pentadecanol	22
Pentane	31
Pentene	30
Pentyl Aldehyde	19
Perchloroethylene	36
Petrolatum	33
Petroleum Naphtha	33
Phenol	21
Pentachloroethane	36
Phosphoric Acid	1
Phosphorus	*
Phthalic Anhydride (molten)	11

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS (Continued)

Polybutene	30
Polyethylene Glycols	40
Polymethylene Polyphenyl-isocyanate	12
Polypropylene	30
Polypropylene Glycol Methyl Ether	40
Polypropylene Glycols	40
Propane	31
Propanolamine	8
Propionaldehyde	19
Propionic Acid	4
Propionic Anhydride	11
Propyl Acetate	34
Propyl Alcohol	20
Propylamine	7
Propylene	30
Propylene Butylene Polymer	30
Propylene Glycol	20
Propylene Oxide	16
Propylene Tetramer	30
Propyl Ether	41
Pyridine	9
Sodium Hydrosulfide Solution (45% or less)	5
Sorbitol	20
Styrene (inhibited)	30
Sulfolane	39
Sulfur (molten)	*
Sulfuric Acid	2
Sulfuric Acid, Spent	2
Tallow	34
Tallow Fatty Alcohol	20
1,1,2,2-Tetrachloro-ethane	36
Tetradecanol	20
Tetradecene	30
Tetradecylbenzene	32
Tetraethylene Glycol	40
Tetraethylenepentamine	7
Tetrahydrofuran	41
Tetrahydronaphthalene	32
Tetrasodium Salt of EDTA Solution	43
Toluene	32
Toluene Diisocyanate	12
1,2,4-Trichlorobenzene	36
Trichloroethylene	36
Tridecanol	20
Tridecene	30
Tridecylbenzene	32
Triethanolamine	8
Triethylamine	7
Triethyl Benzene	32
Triethylene Glycol	40
Triethylenetetramine	7
Tripropylene Glycol	40
Turpentine	30
Undecanol	20
Undecene	30
Undecylbenzene	32
Valeraldehyde	19
Vinyl Acetate (inhibited)	13
Vinyl Chloride (inhibited)	35
Vinylidene Chloride (inhibited)	35
Vinyl Toluene (inhibited)	30
Xylene	32

* Because of very high reactivity or unusual conditions of carriage, this product is not included in the Compatibility Chart. If compatibility information is needed for a shipment, contact Commandant (G-MHM-1/83), U.S. Coast Guard, 400 Seventh Street, S.W., Washington, D. C. 20590.

TABLE 7.2

REACTIVITY GROUPS

1. Non-Oxidizing Mineral Acids

Hydrochloric Acid
Hydrofluoric Acid
Phosphoric Acid

2. Sulfuric Acids

Spent Sulfuric Acid
Sulfuric Acid (98% or less)

3. Nitric Acid

Nitric Acid (70% or less)

4. Organic Acids

Acetic Acid
Butyric Acid
Formic Acid
Propionic Acid
Acrylic Acid (inhibited)

5. Caustics

Caustic Potash Solution
Caustic Soda Solution
Cresylate Spent Caustic Solution
Sodium Hydrosulfide Solution (45% or less)

6. Ammonia

Ammonia, Anhydrous
Ammonium Hydroxide (28% or less)
Ammonium Nitrate, Urea, Water Solutions (containing Ammonia)

7. Aliphatic Amines

Butylamine
Cyclohexylamine
Dibutylamine
Diethylamine
Diethylenetriamine
Diisopropylamine
Dimethylamine
Di-n-propylamine
Ethylamine
Ethylenediamine
Hexamethyleneimine
Methylamine
Morpholine
Propylamine
Tetraethylenepentamine
Triethylamine
Triethylenetetramine

8. Alkanolamines

Aminoethylethanolamine
Diethanolamine
Diethylethanolamine
Diisopropanolamine
Dimethylethanolamine
Ethanolamine
Propanolamine
Triethanolamine

9. Aromatic Amines

Aniline
Pyridine
2-Methyl-5-Ethylpyridine

10. Amides

Dimethylformamide

TABLE 7.2

REACTIVITY GROUPS (Continued)

11. Organic Anhydrides

Acetic Anhydride
Phthalic Anhydride
Propionic Anhydride

12. Isocyanates

Diphenylmethane Diisocyanate
Polyphenyl Polymethylene-isocyanate
Toluene Diisocyanate

13. Vinyl Acetate

Vinyl Acetate (inhibited)

14. Acrylates

Butyl Acrylate (inhibited)
Butyl Methacrylate (inhibited)
Decyl Acrylate (inhibited)
Ethyl Acrylate (inhibited)
2-Ethylhexyl Acrylate (inhibited)
Ethyl Methacrylate (inhibited)
Methyl Acrylate (inhibited)
Methyl Methacrylate (inhibited)

15. Substituted Allyls

Acrylonitrile (inhibited)
Allyl Alcohol
Allyl Chloride
1,3-Dichloropropene

16. Alkylene Oxides

Propylene Oxide
Butylene Oxide

17. Epichlorohydrin

Epichlorohydrin

18. Ketones

Acetone
Camphor Oil
Cyclohexanone
Diisobutyl Ketone
Isophorone
Mesityl Oxide
Methyl Ethyl Ketone
Methyl Isobutyl Ketone

19. Aldehydes

Acetaldehyde
Acrolein (inhibited)
Butyraldehyde
Decaldehyde
Ethylhexaldehyde
Formaldehyde
Glutaraldehyde Solution
Glyoxal Solution
Methylbutyraldehyde
Octyl Aldehyde
Pentyl Aldehyde
Propionaldehyde
Valeraldehyde

20. Alcohols, Glycols

Amyl Alcohol
Butyl Alcohol
1,3-Butylene Glycol
Cyclohexanol
Decyl Alcohol
Diacetone Alcohol
Diisobutyl Carbinol
Dodecanol
Ethanol
Ethoxylated Alcohols
C_{11}-C_{15}

TABLE 7.2

REACTIVITY GROUPS (Continued)

Ethyl Alcohol
Ethylbutanol
Ethylene Chlorohydrin
Ethylene Cyanohydrin
Ethylene Glycol
2-Ethyl Hexanol
Furfuryl Alcohol
Glycerin
Hexanol
Hexylene Glycol
Methanol
Methyl Alcohol
Methylamyl Alcohol
Methylisobutyl Carbinol
Octyl Alcohol
Nonyl Alcohol
Pentadecanol
Propyl Alcohol
Propylene Glycol
Sorbitol
Tallow Fatty Alcohol
Tetradecanol
Tridecanol
Undecanol

21. Phenols and Cresols

Carbolic Oil
Creosote, Coal Tar
Cresols
Nonyl Phenol
Phenol

22. Caprolactam Solution

Caprolactam Solution

23 - 29. Unassigned

30. Olefins

Butadiene (inhibited)
Butene
Butylene
Decene
Dicyclopentadiene
Diisobutylene
Dodecene
Ethylene
Hexene
Isoprene (inhibited)
Methyl Acetylene, Propadiene Mixture (stabilized)
(alpha-) Methyl Styrene (inhibited)
Nonene
Octene
Pentene
Polybutene
Polypropylene
Propylene
Propylene Butylene Polymer
Propylene Tetramer
Styrene (inhibited)
Vinyl Toluene (inhibited)
Tetradecene
Tridecene
Turpentine
Undecene

31. Paraffins

Butane
Cycloaliphatic Resins
Cyclohexane
Decane
Dodecane
Ethane
Heptane
Hexane
Methane
Nonane
Octane
Pentane
Propane

TABLE 7.2

REACTIVITY GROUPS (Continued)

32. Aromatic Hydrocarbons

Benzene
Benzene, Toluene, Xylene (crude)
Cumene
Cymene
Decylbenzene
Diethylbenzene
Dodecylbenzene
Ethylbenzene
Naphthalene
Tetradecylbenzene
Tetrahydronaphthalene
Toluene
Tridecylbenzene
Triethylbenzene
Undecylbenzene
Xylene

33. Misc. Hydrocarbon Mixtures

Asphalt
Asphalt Blending Stocks
Diphenyl - Diphenyl Oxide
Distillates
Gas Oil, Cracked
Gasoline Blending Stocks
Gasolines
Jet Fuels
Kerosene
Mineral Spirits
Naphtha
Oils, Crude
Oils, Diesel
Oils, Coal
Oils, Fuel (No. 1 thru No. 6)
Oils, Residual
Oils, Road
Oils, Transformer
Petrolatum
Petroleum Naphtha

34. Esters

Amyl Acetate
Amyl Tallate
Butyl Acetate
Butyl Benzyl Phthalate
Castor Oil
Coconut Oil
Cottonseed Oil
Dibutyl Phthalate
Diethylene Glycol Monobutyl Ether Acetate
Diheptyl Phthalate
Diisodecyl Phthalate
Dinonyl Phthalate
Dioctyl Phthalate
Diundecyl Phthalate
Ethyl Acetate
Ethylene Glycol Monobutyl Ether Acetate
Ethylene Glycol Monoethyl Ether Acetate
Ethylhexyl Tallate
Fish Oil
Glycol Diacetate
Lard
Methyl Acetate
Methyl Amyl Acetate
Octyl Epoxy Tallate
Olive Oil
Palm Oil
Peanut Oil
Propyl Acetate
Safflower Oil
Soybean Oil
Tallow
Tucum Oil
Vegetable Oil

35. Vinyl Halides

Vinyl Chloride (inhibited)
Vinylidene Chloride (inhibited)

36. Halogenated Hydrocarbons

Carbon Tetrachloride
Chlorobenzene

TABLE 7.2

REACTIVITY GROUPS (Continued)

Chloroform
Dichlorobenzene
1,1-Dichloroethane
Dichloroethyl Ether
Dichloromethane
1,1-Dichloropropane
1,2-Dichloropropane
Ethyl Chloride
Ethylene Dibromide
Ethylene Dichloride
Methyl Bromide
Methyl Chloride
Pentachloroethane
Perchloroethylene
1,1,2,2-Tetrachloroethane
1,2,4-Trichlorobenzene
Trichloroethylene

37 Nitriles

Acetonitrile
Adiponitrile

38. Carbon Disulfide

39. Sulfolane

40. Glycol Ethers

Diethylene Glycol
Diethylene Glycol Monobutyl Ether
Diethylene Glycol Monoethyl Ether
Diethylene Glycol Monomethyl Ether
Dipropylene Glycol
Ethoxy Triglycol
Ethylene Glycol Monobutyl Ether
Ethylene Glycol Monethyl Ether
Ethylene Glycol Monomethyl Ether
Nonylphenol, Ethoxylated
Polyethylene Glycols
Polypropylene Glycols
Polypropylene Glycol Methyl Ether
Soybean Oil, Epoxidized
Tetraethylene Glycol
Triethylene Glycol
Tripropylene Glycol

41. Ethers

Butyl Ether
1,4-Dioxane
Ethyl Ether
Methyl Formal (Dimethyl Formal)
Propyl Ether
Tetrahydrofuran

42. Nitrocompounds

(mono-) Nitrobenzene
1- or 2-Nitropropane
Nitrotoluene

43. Miscellaneous Water Solutions

Ammonium Nitrate, Urea, Water Solutions (not containing Ammonia)
Corn Syrup
Dextrose Solution
Latex Solutions
Tetrasodium Salt of EDTA Solution

TABLE 7.3

COMBINATIONS NOT DANGEROUSLY REACTIVE
(as tested in accordance with procedure outlined in NVC 5-70)

Acetone (8)	Caustic soda solution (3)
Acrylonitrile (inhibited) (14)	Methyl alcohol (6)
Acrylonitrile (inhibited) (14)	Niax polyol (6)*
Acrylonitrile (inhibited) (14)	Polyol 3030 (6)*
Acrylonitrile (inhibited) (14)	Propylene glycol (6)
Acrylonitrile (inhibited) (14)	Voranol CP 4100 (6)*
Benzene (10)	Phosphoric acid (1)
Butyl acetate (n-, iso-*) (13)	Caustic soda solution (3)
Butyl acrylate (inhibited) (14)	Methyl alcohol (6)
Butyl acrylate (inhibited) (14)	Voranol CP 4100 (6)*
n-Butyl alc ıol (6)	Styrene (inhibited) (14)
n-Butyl alcohol (6)	Vinyl acetate (inhibited) (14)
Carbon tetrachloride (5)	Caustic soda solution (3)
Caustic soda solution (3)	Acetone (8)
Caustic soda solution (3)	Butyl acetate (iso-*, n-) (13)
Caustic soda solution (3)	Carbon tetrachloride (5)
Caustic soda solution (3)	Oils, dible: coconut (13)*
Caustic soda solution (3)	Oils, edible: cottonseed (13)
Caustic soda solution (3)	Dichloropropane (5)
Caustic soda solution (3)	Dichloropropene (5)
Caustic soda solution (3)	Diisodecyl phthalate (13)*
Caustic soda solution (3)	Di-normal-alkyl phthalate (13)*
Caustic soda solution (3)	Dioctyl phthalate (13)
Caustic soda solution (3)	Ethyl acetate (13)
Caustic soda solution (3)	Ethylene dichloride (5)
Caustic soda solution (3)	Oils, edible: fish (13)
Caustic soda solution (3)	Grease (inedible, yellow) (13)*
Caustic soda solution (3)	Lard (edible) (13)*
Caustic soda solution (3)	Linseed oil (raw) (13)*
Caustic soda solution (3)	Methylene chloride (5)*

Caustic soda solution (3)	Methyl ethyl ketone (8)
Caustic soda solution (3)	Methyl isobutyl ketone (8)
Caustic soda solution (3)	Palm oil (13)*
Caustic soda solution (3)	Perchloroethylene (5)*
Caustic soda solution (3)	Propyl acetate (iso-*, n-) (13)
Caustic soda solution (3)	Oils, edible: soya bean (13)
Caustic soda solution (3)	Oils, miscellaneous: sperm
Caustic soda solution (3)	Styrene (inhibited) (14)
Caustic soda solution (3)	Tallow (13)
Caustic soda solution (3)	Trichloroethane (5)
Dichloropropane (5)	Caustic soda solution (3)
Dichloropropene (5)	Caustic soda solution (3)
Diisodecyl phthalate (13)*	Caustic soda solution (3)
Di-normal-alkyl phthalate (13)*	Caustic soda solution (3)
Dimethylformamide (4)	Furfural (7)
Dimethylformamide (4)	Phenol (15)
Dioctyl phthalate (13)	Caustic soda solution (3)
Dioctyl phthalate (13)	Ethylenediamine (4)
Diphenylmethanediisocyanate	Ethylene dichloride (5)
Ethyl acetate (13)	Caustic soda solution (3)
Ethyl acrylate (inhibited) (14)	Ethylene glycol (6)
Ethyl acrylate (inhibited) (14)	2-Ethyl hexanol (6)
Ethyl acrylate (inhibited) (14)	Voranol CP 4100 (6)*
Ethyl alcohol (6)	Methyl methacrylate (inhibited) (14)
Ethylenediamine (4)	Dioctyl phthalate (13)
Ethylene dichloride (5)	Caustic soda solution (3)
Ethylene dichloride (5)	Diphenylmethanediisocyanate
Ethylene glycol (6)	Ethyl acrylate (inhibited) (14)
Ethylene glycol (6)	Styrene (inhibited) (14)
Ethylene glycol (6)	Vinyl acetate (inhibited) (14)

*Not presently included in CHRIS.

TABLE 7.3

COMBINATIONS NOT DANGEROUSLY REACTIVE (Continued)

2-Ethyl hexanol (6)	Ethyl acrylate (inhibited) (14)
2-Ethyl hexanol (6)	Styrene (inhibited) (14)
Furfural (7)	Dimethylformamide (4)
Furfural (7)	Isopropyl alcohol (6)
Furfural (7)	Methyl ethyl ketone (8)
Grease (inedible, yellow) (13)*	Caustic soda solution (3)
Isobutyl alcohol (6)	Styrene (inhibited) (14)
Isobutyl alcohol (6)	Vinyl acetate (inhibited) (14)
Isodecyl alcohol (6)	Vinyl acetate (inhibited) (14)
Isooctyl alcohol (6)	Methyl methacrylate (inhibited) (14)
Isooctyl alcohol (6)	Styrene (inhibited) (14)
Isooctyl alcohol (6)	Vinyl acetate (inhibited) (14)
Isopropyl alcohol (6)	Furfural (7)
Isopropyl alcohol (6)	Styrene (inhibited) (14)
Isopropyl alcohol (6)	Vinyl acetate (inhibited) (14)
Lard (edible) (13)*	Caustic soda solution (3)
Linseed oil (raw) (13)*	Caustic soda solution (3)
Methyl alcohol (6)	Acrylonitrile (inhibited) (14)
Methyl alcohol (6)	Butyl acrylate (inhibited) (14)
Methyl alcohol (6)	Styrene (inhibited) (14)
Methyl alcohol (6)	Vinyl acetate (inhibited) (14)
Methylene chloride (5)*	Caustic soda solution (3)
Methyl ethyl ketone (8)	Caustic soda solution (3)
Methyl ethyl ketone (8)	Furfural (7)
Methyl isobutyl ketone (8)	Caustic soda solution (3)
Methyl methacrylate (inhibited) (14)	Ethyl alcohol (6)
Methyl methacrylate (inhibited) (14)	Isooctyl alcohol (6)
Niax polyol (6)*	Acrylonitrile (inhibited) (14)
Niax polyol (6)*	Vinyl acetate (inhibited) (14)
Oils, edible: coconut (13)*	Caustic soda solution (3)
Oils, edible: cottonseed (13)	Caustic soda solution (3)
Oils, edible: fish (13)	Caustic soda solution (3)
Oils, edible: soya bean (13)	Caustic soda solution (3)
Oils, miscellaneous: sperm	Caustic soda solution (3)
Palm oil (13)*	Caustic soda solution (3)
Perchloroethylene (5)*	Caustic soda solution (3)
Phenol (15)	Dimethyl formamide (4)
Phosphoric acid (1)	Benzene (10)
Phosphoric acid (1)	Toluene (10)
Phosphoric acid (1)	Xylene (10)
Polyol 3030 (6)*	Acrylonitrile (inhibited) (14)
Propyl acetate (iso-*, n-) (13)	Caustic soda solution (3)
Propylene glycol (6)	Acrylonitrile (inhibited) (14)
Propylene glycol (6)	Styrene (inhibited) (14)
Styrene (inhibited) (14)	n-Butyl alcohol (6)
Styrene (inhibited) (14)	Caustic soda solution (3)
Styrene (inhibited) (14)	Ethylene glycol (6)
Styrene (inhibited) (14)	2-Ethyl hexanol (6)
Styrene (inhibited) (14)	Isobutyl alcohol (6)
Styrene (inhibited) (14)	Isooctyl alcohol (6)
Styrene (inhibited) (14)	Isopropyl alcohol (6)
Styrene (inhibited) (14)	Methyl alcohol (6)
Styrene (inhibited) (14)	Propylene glycol (6)
Styrene (inhibited) (14)	Trichloroethylene (5)
Tallow (13)	Caustic soda solution (3)
Toluene (10)	Phosphoric acid (1)
Trichloroethane (5)	Caustic soda solution (3)
Trichloroethylene (5)	Styrene (inhibited) (14)
Vinyl acetate (inhibited) (14)	n-Butyl alcohol (6)
Vinyl acetate (inhibited) (14)	Ethylene glycol (6)

*Not presently included in CHRIS.

TABLE 7.3

COMBINATIONS NOT DANGEROUSLY REACTIVE (Continued)

Vinyl acetate (inhibited) (14)	Isobutyl alcohol (6)
Vinyl acetate (inhibited) (14)	Isodecyl alcohol (6)
Vinyl acetate (inhibited) (14)	Isooctyl alcohol (6)
Vinyl acetate (inhibited) (14)	Isopropyl alcohol (6)
Vinyl acetate (inhibited) (14)	Methyl alcohol (6)
Vinyl acetate (inhibited) (14)	Niax polyol (6)*
Vinyl acetate (inhibited) (14)	Voranol CP 4100 (6)*
Voranol CP 4100 (6)*	Acrylonitrile (inhibited) (14)
Voranol CP 4100 (6)*	Butyl acrylate (inhibited) (14)
Voranol CP 4100 (6)*	Ethyl acrylate (inhibited) (14)
Voranol CP 4100 (6)*	Vinyl acetate (inhibited) (14)
Xylene (10)	Phosphoric acid (1)

Toluene 2,4-diisocyanate (TDI), diphenylmethanediisocyanate (MDI), and polymethylene polyphenyl isocyanate (PAPI)* are considered compatible with reactivity groups 9, 10, 11, 12, 18, and 21.

*Not presently included in CHRIS.

8. INDEX OF SYNONYMS

SYNONYM		COMPOUND NAME
AATREX HERBICIDE	=	ATRAZINE
ABSORBENT OIL	=	OIL: ABSORPTION
ACETALDEHYDE	=	ACETALDEHYDE
ACETIC ACID	=	ACETIC ACID
ACETIC ACID, AMMONIUM SALT	=	AMMONIUM ACETATE
ACETIC ACID, BUTYL ESTER	=	N-BUTYL ACETATE
ACETIC ACID, CUPRIC SALT	=	COPPER ACETATE
ACETIC ACID, DIMETHYLAMIDE	=	DIMETHYLACETAMIDE
ACETIC ACID, ETHYL ESTER	=	ETHYL ACETATE
ACETIC ACID, ISOBUTYL ESTER	=	ISOBUTYL ACETATE
ACETIC ACID, ISOPROPYL ESTER	=	ISOPROPYL ACETATE
ACETIC ACID, METHYL ESTER	=	METHYL ACETATE
ACETIC ACID, NICKEL (II) SALT	=	NICKEL ACETATE
ACETIC ACID, PROPYL ESTER	=	N-PROPYL ACETATE
ACETIC ACID, SEC-BUTYL ESTER	=	SEC-BUTYL ACETATE
ACETIC ACID,ZINC SALT	=	ZINC ACETATE
ACETIC ALDEHYDE	=	ACETALDEHYDE
ACETIC ANHYDRIDE	=	ACETIC ANHYDRIDE
ACETIC ESTER	=	ETHYL ACETATE
ACETIC ETHER	=	ETHYL ACETATE
ACETOACETIC ACID, ETHYL ESTER	=	ETHYL ACETOACETATE
ACETOACETIC ESTER	=	ETHYL ACETOACETATE
ACETONE	=	ACETONE
ACETONE CYANOHYDRIN	=	ACETONE CYANOHYDRIN
ACETONITRILE	=	ACETONITRILE
ACETOPHENONE	=	ACETOPHENONE
ACETYLACETONE	=	ACETYLACETONE
ACETYLBENZENE	=	ACETOPHENONE
ACETYL BROMIDE	=	ACETYL BROMIDE
ACETYL CHLORIDE	=	ACETYL CHLORIDE
ACETYLENE	=	ACETYLENE
ACETYLENE DICHLORIDE	=	1,2-DICHLOROETHYLENE
ACETYLENE TETRACHLORIDE	=	TETRACHLOROETHANE
ACETYLENOGEN	=	CALCIUM CARBIDE
ACETYL HYDROPEROXIDE	=	PERACETIC ACID
ACETYL PEROXIDE SOLUTION	=	ACETYL PEROXIDE SOLUTION
ACID AMMONIUM CARBONATE	=	AMMONIUM BICARBONATE
ACID AMMONIUM FLUORIDE	=	AMMONIUM BIFLUORIDE
ACID CALCIUM PHOSPHATE	=	CALCIUM PHOSPHATE
ACRALDEHYDE	=	ACROLEIN
ACRIDINE	=	ACRIDINE
ACROLEIN	=	ACROLEIN
ACRYLALDEHYDE	=	ACROLEIN
ACRYLAMIDE	=	ACRYLAMIDE
ACRYLIC ACID	=	ACRYLIC ACID
ACRYLIC ACID, BUTYL ESTER	=	N-BUTYL ACRYLATE
ACRYLIC ACID, ETHYL ESTER	=	ETHYL ACRYLATE
ACRYLIC ACID, 2-ETHYLHEXYL ESTER	=	2-ETHYLHEXYL ACRYLATE,INHIBITED
ACRYLIC ACID, ISOBUTYL ESTER	=	ISO-BUTYL ACRYLATE
ACRYLIC ACID, METHYL ESTER	=	METHYL ACRYLATE
ACRYLIC ALDEHYDE	=	ACROLEIN
ACRYLIC AMIDE 50 PER CENT	=	ACRYLAMIDE
ACRYLONITRILE	=	ACRYLONITRILE
ACTIVATED CHARCOAL	=	CHARCOAL
ADACENE-12	=	1-DODECENE
ADIPIC ACID	=	ADIPIC ACID
ADIPIC ACID, BIS(2-ETHYLHEXYL) ESTER	=	DIOCTYL ADIPATE
ADIPINIC ACID	=	ADIPIC ACID
ADIPOL 2 EH	=	DIOCTYL ADIPATE
ADIPONITRILE	=	ADIPONITRILE
ADRONAL	=	CYCLOHEXANOL
AEROSOL SURFACTANT	=	DIOCTYL SODIUM SULFOSUCCINATE
AEROTHENE	=	TRICHLOROETHANE

SYNONYM	COMPOUND NAME
AFICIDE	BENZENE HEXACHLORIDE
AGROCIDE	BENZENE HEXACHLORIDE
ALBONE	HYDROGEN PEROXIDE
ALBUS	MERCURIC AMMONIUM CHLORIDE
ALCOHOL	ETHYL ALCOHOL
ALCOHOL C-10	N-DECYL ALCOHOL
ALCOHOL C-8	OCTANOL
ALDEHYDE C-10	DECALDEHYDE
ALDEHYDE-COLLIDINE	METHYLETHYLPYRIDINE
ALDEHYDINE	METHYLETHYLPYRIDINE
ALDIFEN	2,4-DINITROPHENOL
ALDRIN	ALDRIN
ALFA-TOX	DIAZINON
ALGYLEN	TRICHLOROETHYLENE
ALKAWAY LIQUID ALKALINE DERUSTER	BOILER COMPOUND, LIQUID
ALKYLBENZENESULFONIC ACIDS	ALKYLBENZENESULFONIC ACIDS
ALKYLBENZENESULFONIC ACID, SODIUM SALT	SODIUM ALKYLBENZENESULFONATES
ALLENE-METHYLACETYLENE MIXTURE	METHYLACETYLENE - PROPADIENE MIXTURE
ALLOMALEIC ACID	FUMARIC ACID
ALLYL ALCOHOL	ALLYL ALCOHOL
ALLYL BROMIDE	ALLYL BROMIDE
ALLYL CHLORIDE	ALLYL CHLORIDE
ALLYL CHLOROCARBONATE	ALLYL CHLOROFORMATE
ALLYL CHLOROFORMATE	ALLYL CHLOROFORMATE
ALLYLSILICONE TRICHLORIDE	ALLYLTRICHLOROSILANE
ALLYLTRICHLOROSILANE	ALLYLTRICHLOROSILANE
ALROWET D65	DIOCTYL SODIUM SULFOSUCCINATE
ALUMINUM CHLORIDE	ALUMINUM CHLORIDE
ALUMINUM ETHYL DICHLORIDE EADC	ETHYLALUMINUM DICHLORIDE
ALUMINUM ETHYL DICHLORIDE	ETHYLALUMINUM DICHLORIDE
ALUMINUM FLUORIDE	ALUMINUM FLUORIDE
ALUMINUM NITRATE	ALUMINUM NITRATE
ALUMINUM NITRATE NONAHYDRATE	ALUMINUM NITRATE
ALUMINUM SULFATE	ALUMINUM SULFATE
ALUMINUM TRIETHYL	TRIETHYLALUMINUM
ALUMINUM TRIISOBUTYL	TRIISOBUTYLALUMINUM
AMCHLOR	AMMONIUM CHLORIDE
AMERICAN PALM KERNEL OIL	OILS EDIBLE: TUCUM
AMINOBENZENE	ANILINE
1-AMINOBUTANE	N-BUTYLAMINE
AMINOCAPROIC LACTAM	CAPROLACTAM, LIQUID
1-AMINO-4-CHLOROBENZENE	P-CHLOROANILINE
2-AMINO-5-CHLOROTOLUENE	4-CHLORO-O-TOLUIDINE
AMINOCYCLOHEXANE	CYCLOHEXYLAMINE
AMINOETHANE	ETHYLAMINE
2-AMINOETHANOL	MONOETHANOLAMINE
BETA-AMINOETHYL ALCOHOL	MONOETHANOLAMINE
2-((2-AMINOETHYL)AMINO)ETHANOL	AMINOETHYLETHANOLAMINE
N-(2-AMINOETHYL)ETHANOLAMINE	AMINOETHYLETHANOLAMINE
AMINOETHYLETHANOLAMINE	AMINOETHYLETHANOLAMINE
AMINOFORM	HEXAMETHYLENETETRAMINE
2-AMINOISOBUTANE	TERT-BUTYLAMINE
AMINOMERCURIC CHLORIDE	MERCURIC AMMONIUM CHLORIDE
AMINOMETHANE	METHYLAMINE
2-AMINO-1-METHYLBENZENE	O-TOLUIDINE
1-AMINO-2-METHYLPROPANE	ISOBUTYLAMINE
2-AMINO-2-METHYLPROPANE	TERT-BUTYLAMINE
1-AMINONAPHTHALENE	1-NAPHTHYLAMINE
1-AMINONAPHTHALENE ALPHA-NAPHTHYLAMINE	1-NAPHTHYLAMINE
1-AMINO-2-NITROBENZENE	2-NITROANILINE
1-AMINO-4-NITROBENZENE	4-NITROANILINE
2-AMINOPROPANE	ISOPROPYLAMINE
1-AMINO-2-PROPANOL	MONOISOPROPANOLAMINE
2-AMINOTOLUENE	O-TOLUIDINE
ALPHA-AMINOTOLUENE	BENZYLAMINE

SYNONYM	COMPOUND NAME
AMMATE	AMMONIUM SULFAMATE
AMMOFORM	HEXAMETHYLENETETRAMINE
AMMONERIC	AMMONIUM CHLORIDE
AMMONIA ANHYDROUS	AMMONIA ANHYDROUS
AMMONIA SOAP	AMMONIUM OLEATE
AMMONIATED MERCURY	MERCURIC AMMONIUM CHLORIDE
AMMONIA WATER	AMMONIUM HYDROXIDE
AMMONIOFORMALDEHYDE	HEXAMETHYLENETETRAMINE
AMMONIUM ACETATE	AMMONIUM ACETATE
AMMONIUM ACID FLUORIDE	AMMONIUM BIFLUORIDE
AMMONIUM AMIDOSULFONATE	AMMONIUM SULFAMATE
AMMONIUM AMIDOSULPHATE	AMMONIUM SULFAMATE
AMMONIUM BENZOATE	AMMONIUM BENZOATE
AMMONIUM BICARBONATE	AMMONIUM BICARBONATE
AMMONIUM BICHROMATE	AMMONIUM DICHROMATE
AMMONIUM BIFLUORIDE	AMMONIUM BIFLUORIDE
AMMONIUM CARBONATE	AMMONIUM CARBONATE
AMMONIUM CHLORIDE	AMMONIUM CHLORIDE
AMMONIUM CITRATE	AMMONIUM CITRATE
AMMONIUM CITRATE, DIBASIC	AMMONIUM CITRATE
AMMONIUM DECABORATE OCTAHYDRATE	AMMONIUM PENTABORATE
AMMONIUM DICHROMATE	AMMONIUM DICHROMATE
AMMONIUM DISULFATO-NICKELATE (II)	NICKEL AMMONIUM SULFATE
AMMONIUM FERRIC CITRATE	FERRIC AMMONIUM CITRATE
AMMONIUM FERRIC OXALATE TRIHYDRATE	FERRIC AMMONIUM OXALATE
AMMONIUM FERROUS SULFATE	FERROUS AMMONIUM SULFATE
AMMONIUM FLUORIDE	AMMONIUM FLUORIDE
AMMONIUM FLUOSILICATE	AMMONIUM SILICOFLUORIDE
AMMONIUM FORMATE	AMMONIUM FORMATE
AMMONIUM GLUCONATE	AMMONIUM GLUCONATE
AMMONIUM HYDROGEN CARBONATE	AMMONIUM BICARBONATE
AMMONIUM HYDROGEN FLUORIDE	AMMONIUM BIFLUORIDE
AMMONIUM HYDROGEN SULFIDE SOLUTION	AMMONIUM SULFIDE
AMMONIUM HYDROXIDE	AMMONIUM HYDROXIDE
AMMONIUM HYPO	AMMONIUM THIOSULFATE
AMMONIUM HYPOSULFITE	AMMONIUM THIOSULFATE
AMMONIUM IODIDE	AMMONIUM IODIDE
AMMONIUM IRON SULFATE	FERROUS AMMONIUM SULFATE
AMMONIUM LACTATE	AMMONIUM LACTATE
AMMONIUM LACTATE SYRUP	AMMONIUM LACTATE
AMMONIUM LAURYL SULFATE	AMMONIUM LAURYL SULFATE
AMMONIUM MOLYBDATE	AMMONIUM MOLYBDATE
AMMONIUM MURIATE	AMMONIUM CHLORIDE
AMMONIUM NICKEL SULFATE	NICKEL AMMONIUM SULFATE
AMMONIUM NITRATE	AMMONIUM NITRATE
AMMONIUM NITRATE-PHOSPHATE MIXTURE	AMMONIUM NITRATE-PHOSPHATE MIXTURE
AMMONIUM NITRATE-SULFATE MIXTURE	AMMONIUM NITRATE-SULFATE MIXTURE
AMMONIUM NITRATE-UREA SOLUTION	AMMONIUM NITRATE-UREA SOLUTION
AMMONIUM OLEATE	AMMONIUM OLEATE
AMMONIUM OXALATE	AMMONIUM OXALATE
AMMONIUM OXALATE HYDRATE	AMMONIUM OXALATE
AMMONIUM PENTABORATE	AMMONIUM PENTABORATE
AMMONIUM PENTABORATE TETRAHYDRATE	AMMONIUM PENTABORATE
AMMONIUM PENTACHLOROZINCATE	ZINC AMMONIUM CHLORIDE
AMMONIUM PERCHLORATE	AMMONIUM PERCHLORATE
AMMONIUM PEROXYDISULFATE	AMMONIUM PERSULFATE
AMMONIUM PERSULFATE	AMMONIUM PERSULFATE
AMMONIUM PHOSPHATE	AMMONIUM PHOSPHATE
AMMONIUM PHOSPHATE, DIBASIC	AMMONIUM PHOSPHATE
AMMONIUM RHODANATE	AMMONIUM THIOCYANATE
AMMONIUM RHODANIDE	AMMONIUM THIOCYANATE
AMMONIUM SILICOFLUORIDE	AMMONIUM SILICOFLUORIDE
AMMONIUM STEARATE	AMMONIUM STEARATE
AMMONIUM STEARATE DISPERSION	AMMONIUM STEARATE
AMMONIUM SULFAMATE	AMMONIUM SULFAMATE

SYNONYM		COMPOUND NAME
AMMONIUM SULFATE	=	AMMONIUM SULFATE
AMMONIUM SULFHYDRATE SOLUTION	=	AMMONIUM SULFIDE
AMMONIUM SULFIDE	=	AMMONIUM SULFIDE
AMMONIUM SULFIDE SOLUTION	=	AMMONIUM SULFIDE
AMMONIUM SULFITE	=	AMMONIUM SULFITE
AMMONIUM SULFOCYANATE	=	AMMONIUM THIOCYANATE
AMMONIUM SULFOCYANIDE	=	AMMONIUM THIOCYANATE
AMMONIUM TARTRATE	=	AMMONIUM TARTRATE
AMMONIUM THIOCYANATE	=	AMMONIUM THIOCYANATE
AMMONIUM THIOSULFATE	=	AMMONIUM THIOSULFATE
AMMONIUM TRIOXALATOFERRATE TRIHYDRATE	=	FERRIC AMMONIUM OXALATE
AMMONIUM ZINC CHLORIDE	=	ZINC AMMONIUM CHLORIDE
AMORPHOUS PHOSPHORUS	=	PHOSPHORUS, RED
AMS	=	AMMONIUM SULFAMATE
AMYL ACETATE	=	AMYL ACETATE
AMYL ACETATES, MIXED ISOMERS	=	AMYL ACETATE
N-AMYL ALCOHOL	=	N-AMYL ALCOHOL
1-AMYL ALCOHOL	=	N-AMYL ALCOHOL
AMYL ALDEHYDE	=	VALERALDEHYDE
AMYL CARBINOL	=	HEXANOL
AMYL CHLORIDE	=	N-AMYL CHLORIDE
N-AMYL CHLORIDE	=	N-AMYL CHLORIDE
ALPHA-N-AMYLENE	=	1-PENTENE
AMYL HYDROSULFIDE	=	N-AMYL MERCAPTAN
N-AMYL MERCAPTAN	=	N-AMYL MERCAPTAN
N-AMYL METHYL KETONE	=	N-AMYL METHYL KETONE
N-AMYL NITRATE	=	N-AMYL NITRATE
AMYL NITRITE	=	ISO-AMYL NITRITE
ISO-AMYL NITRITE	=	ISO-AMYL NITRITE
AMYL SULFHYDRATE	=	N-AMYL MERCAPTAN
AMYL THIOALCOHOL	=	N-AMYL MERCAPTAN
N-AMYLTRICHLOROSILANE	=	N-AMYLTRICHLOROSILANE
ANESTHESIA ETHER	=	ETHYL ETHER
ANHYDRONE	=	MAGNESIUM PERCHLORATE
ANHYDROUS ALUMINUM CHLORIDE	=	ALUMINUM CHLORIDE
ANILINE	=	ANILINE
ANILINE OIL	=	ANILINE
ANILINOBENZENE	=	DIPHENYLAMINE
ANILINOMETHANE	=	N-METHYLANILINE
ANIMAL CARBON	=	CHARCOAL
ANIMAL CHARCOAL	=	CHARCOAL
ANISOYL CHLORIDE	=	ANISOYL CHLORIDE
P-ANISOYL CHLORIDE	=	ANISOYL CHLORIDE
ANOL	=	CYCLOHEXANOL
ANONE	=	CYCLOHEXANONE
ANSAR	=	CACODYLIC ACID
ANSUL ETHER 121	=	ETHYLENE GLYCOL DIMETHYL ETHER
ANTHRACENE	=	ANTHRACENE
ANTHRACIN	=	ANTHRACENE
ANTIMONY BUTTER	=	ANTIMONY TRICHLORIDE
ANTIMONY (III) CHLORIDE	=	ANTIMONY TRICHLORIDE
ANTIMONY (V) CHLORIDE	=	ANTIMONY PENTACHLORIDE
ANTIMONY PENTACHLORIDE	=	ANTIMONY PENTACHLORIDE
ANTIMONY PENTAFLUORIDE	=	ANTIMONY PENTAFLUORIDE
ANTIMONY PERCHLORIDE	=	ANTIMONY PENTACHLORIDE
ANTIMONY POTASSIUM TARTRATE	=	ANTIMONY POTASSIUM TARTRATE
ANTIMONY TRICHLORIDE	=	ANTIMONY TRICHLORIDE
ANTIMONY TRIFLUORIDE	=	ANTIMONY TRIFLUORIDE
ANTIMONY TRIOXIDE	=	ANTIMONY TRIOXIDE
AOUARA OIL	=	OILS EDIBLE: TUCUM
APARASIN	=	BENZENE HEXACHLORIDE
APHTIRIA	=	BENZENE HEXACHLORIDE
APO	=	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
AQUEOUS AMMONIA	=	AMMONIUM HYDROXIDE
ARASAN	=	THIRAM

SYNONYM		COMPOUND NAME
ARCTON 9	=	TRICHLOROFLUOROMETHANE
ARGENTOUS FLUORIDE	=	SILVER FLUORIDE
ARGENTOUS OXIDE	=	SILVER OXIDE
AROCHLOR	=	POLYCHLORINATED BIPHENYL (PCB)
ARSECODILE	=	SODIUM CACODYLATE
ARSENIC ACID	=	ARSENIC ACID
ARSENIC CHLORIDE	=	ARSENIC TRICHLORIDE
ARSENIC DISULFIDE	=	ARSENIC DISULFIDE
ARSENIC PENTOXIDE	=	ARSENIC ACID
ARSENIC SESQUIOXIDE	=	ARSENIC TRIOXIDE
ARSENIC TRICHLORIDE	=	ARSENIC TRICHLORIDE
ARSENIC (III) TRICHLORIDE	=	ARSENIC TRICHLORIDE
ARSENIC TRIOXIDE	=	ARSENIC TRIOXIDE
ARSENIC TRISULFIDE	=	ARSENIC TRISULFIDE
ARSENIC YELLOW	=	ARSENIC TRISULFIDE
ARSENIOUS CHLORIDE	=	ARSENIC TRICHLORIDE
ARSENOUS ACID	=	ARSENIC TRIOXIDE
ARSENOUS ACID ANHYDRIDE	=	ARSENIC TRIOXIDE
ARSENOUS CHLORIDE	=	ARSENIC TRICHLORIDE
ARSENOUS OXIDE	=	ARSENIC TRIOXIDE
ARSICODILE	=	SODIUM CACODYLATE
ARSYCODILE	=	SODIUM CACODYLATE
ARTIC	=	METHYL CHLORIDE
ARTIFICIAL CINNABAR	=	MERCURIC SULFIDE
ASPHALT	=	ASPHALT
ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
ASPHALT BLENDING STOCK:ROOFERS FLUX	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
ASPHALT CEMENTS	=	ASPHALT
ASPHALTIC BITUMEN	=	ASPHALT
ASPHALTUM OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
ATE	=	TRIETHYLALUMINUM
ATRAZINE	=	ATRAZINE
10-AZAANTHRACENE	=	ACRIDINE
AZACYCLOHEPTANE	=	HEXAMETHYLENEIMINE
1-AZANAPHTHALENE	=	QUINOLINE
AZINPHOSMETHYL	=	AZINPHOSMETHYL
AZIRANE	=	ETHYLENEIMINE
AZIRIDINE	=	ETHYLENEIMINE
TRIS (1-AZIRIDINYL) PHOSPHINE OXIDE	=	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
AZOIC DIAZO COMPONENT 6	=	2-NITROANILINE
AZOIC DIAZO COMPONENT 37	=	4-NITROANILINE
BARIUM BINOXIDE	=	BARIUM PEROXIDE
BARIUM CARBONATE	=	BARIUM CARBONATE
BARIUM CHLORATE	=	BARIUM CHLORATE
BARIUM CHLORATE MONOHYDRATE	=	BARIUM CHLORATE
BARIUM DIOXIDE	=	BARIUM PEROXIDE
BARIUM NITRATE	=	BARIUM NITRATE
BARIUM PERCHLORATE	=	BARIUM PERCHLORATE
BARIUM PERCHLORATE TRIHYDRATE	=	BARIUM PERCHLORATE
BARIUM PERMANGANATE	=	BARIUM PERMANGANATE
BARIUM PEROXIDE	=	BARIUM PEROXIDE
BARIUM SUPEROXIDE	=	BARIUM PEROXIDE
BASIC BISMUTH CHLORIDE	=	BISMUTH OXYCHLORIDE
BASIC ZIRCONIUM CHLORIDE	=	ZIRCONIUM OXYCHLORIDE
BATTERY ACID	=	SULFURIC ACID
BBH	=	BENZENE HEXACHLORIDE
BEARING OIL	=	OIL: SPINDLE
BEET SUGAR	=	SUCROSE
BEN-HEX	=	BENZENE HEXACHLORIDE
BENZALDEHYDE	=	BENZALDEHYDE
1-BENZAZINE	=	QUINOLINE
BENZENE	=	BENZENE
BENZENE, MIXTURE WITH TOLUENE AND XYLENES	=	NAPHTHA COAL TAR

SYNONYM		COMPOUND NAME
BENZENECARBINOL	=	BENZYL ALCOHOL
BENZENECARBONYL CHLORIDE	=	BENZOYL CHLORIDE
BENZENECARBOXYLIC ACID	=	BENZOIC ACID
1,2-BENZENEDICARBOXYLIC ACID ANHYDRIDE	=	PHTHALIC ANHYDRIDE
1,2-BENZENEDICARBOXYLIC ACID, DIETHYL ESTER	=	DIETHYL PHTHALATE
BENZENE CHLORIDE	=	CHLOROBENZENE
BENZENE-1,3-DICARBOXYLIC ACID	=	ISOPHTHALIC ACID
1,4-BENZENEDIOL	=	HYDROQUINONE
1,3-BENZENEDIOL	=	RESORCINOL
1,2-BENZENEDIOL	=	CATECHOL
BENZENE HEXACHLORIDE	=	BENZENE HEXACHLORIDE
BENZENE PHOSPHORUS DICHLORIDE	=	BENZENE PHOSPHORUS DICHLORIDE
BENZENE PHOSPHORUS THIODICHLORIDE	=	BENZENE PHOSPHORUS THIODICHLORIDE
BENZENETHIOPHOSPHONYL CHLORIDE	=	BENZENE PHOSPHORUS THIODICHLORIDE
1,2,3-BENZENETRIOL	=	PYROGALLIC ACID
BENZINOFORM	=	CARBON TETRACHLORIDE
BENZOIC ACID	=	BENZOIC ACID
BENZOIC ACID, AMMONIUM SALT	=	AMMONIUM BENZOATE
BENZOIC ACID NITRILE	=	BENZONITRILE
BENZOIC ALDEHYDE	=	BENZALDEHYDE
BENZOL	=	BENZENE
BENZOLE	=	BENZENE
BENZONITRILE	=	BENZONITRILE
BENZOPHENONE	=	BENZOPHENONE
BENZO(B)PYRIDINE	=	QUINOLINE
BENZO(B)QUINOLINE	=	ACRIDINE
BENZOYLBENZENE	=	BENZOPHENONE
BENZOYL CHLORIDE	=	BENZOYL CHLORIDE
BENZOYL PEROXIDE	=	DIBENZOYL PEROXIDE
BENZOYL SUPEROXIDE	=	DIBENZOYL PEROXIDE
BENZYL ALCOHOL	=	BENZYL ALCOHOL
BENZYLAMINE	=	BENZYLAMINE
BENZYL BROMIDE	=	BENZYL BROMIDE
BENZYL N-BUTYL PHTHALATE	=	BENZYL N-BUTYL PHTHALATE
BENZYLCARBONYL CHLORIDE	=	BENZYL CHLOROFORMATE
BENZYL CHLORIDE	=	BENZYL CHLORIDE
BENZYL CHLOROCARBONATE	=	BENZYL CHLOROFORMATE
BENZYL CHLOROFORMATE	=	BENZYL CHLOROFORMATE
BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE	=	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE
BENZYLDIMETHYLSTEARYLAMMONIUM CHLORIDE	=	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE
BENZYLTRIMETHYLAMMONIUM CHLORIDE	=	BENZYLTRIMETHYLAMMONIUM CHLORIDE
BERYLLIA	=	BERYLLIUM OXIDE
BERYLLIUM CHLORIDE	=	BERYLLIUM CHLORIDE
BERYLLIUM FLUORIDE	=	BERYLLIUM FLUORIDE
BERYLLIUM, METALLIC	=	BERYLLIUM, METALLIC
BERYLLIUM NITRATE	=	BERYLLIUM NITRATE
BERYLLIUM NITRATE TRIHYDRATE	=	BERYLLIUM NITRATE
BERYLLIUM OXIDE	=	BERYLLIUM OXIDE
BERYLLIUM SULFATE	=	BERYLLIUM SULFATE
BERYLLIUM SULFATE TETRAHYDRATE	=	BERYLLIUM SULFATE
BETAPRONE	=	BETA-PROPIOLACTONE
BHC	=	BENZENE HEXACHLORIDE
BICHROME	=	POTASSIUM DICHROMATE
BICYCLO (4.4.0) DECANE	=	DECAHYDRONAPHTHALENE
BIEBERITE	=	COBALT SULFATE
BIETHYLENE	=	BUTADIENE, INHIBITED
BIFORMAL	=	GLYOXAL, 40% SOLUTION
BIFORMYL	=	GLYOXAL, 40% SOLUTION
BIPHENYL-DIPHENYL ETHER	=	DOWTHERM
BIS(ACETATO)DIOXOURANIUM	=	URANYL ACETATE
BIS(2-AMINOETHYL)AMINE	=	DIETHYLENETRIAMINE
N,N -BIS(2-AMINOETHYL) ETHYLENEDIAMINE	=	TRIETHYLENETETRAMINE

SYNONYM		COMPOUND NAME
BIS(P-CHLOROBENZOYL)PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
BIS-(P-CHLOROBENZOYL) PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
BIS(2-CHLOROETHYL)ETHER	=	DICHLOROETHYL ETHER
BIS (2-CHLOROETHYL) ETHER	=	DICHLOROETHYL ETHER
1,1-BIS(P-CHLOROPHENYL)-2,2,2-TRICHOROETHANOL	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
BIS (DIMETHYLTHIOCARBAMOYL) DISULFIDE	=	THIRAM
BIS(DIMETHYLTHIOCARBAMYL) DISULFIDE	=	THIRAM
S-(1,2-BIS(ETHOXYCARBONYL)ETHYL)-O,O-DIMETHYL PHOSPHORODITHIOATE	=	MALATHION
BIS(2-ETHYLHEXYL) HYDROGEN PHOSPHATE	=	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
BIS-(2-ETHYLHEXYL) HYDROGEN PHOSPHATE	=	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
BIS(2-ETHYLHEXYL)PHTHALATE	=	DIOCTYL PHTHALATE
BIS(2-ETHYLHEXYL)SODIUM SULFOSUCCINATE	=	DIOCTYL SODIUM SULFOSUCCINATE
BIS(2-(2-HYDROXYETHOXY)ETHYL)ETHER	=	TETRAETHYLENE GLYCOL
BIS(2-HYDROXYETHYL)AMINE	=	DIETHANOLAMINE
BIS(2-HYDROXYETHYL)ETHER	=	DIETHYLENE GLYCOL
2,2-BIS(4-HYDROXYPHENYL)PROPANE	=	BISPHENOL A
BIS(2-METHOXYETHYL)ETHER	=	DIETHYLENE GLYCOL DIMETHYL ETHER
2,2-BIS(P-METHOXYPHENYL)-1,1,1 -TRICHLOROETHANE	=	METHOXYCHLOR
BISMUTH CHLORIDE OXIDE	=	BISMUTH OXYCHLORIDE
BISMUTH OXYCHLORIDE	=	BISMUTH OXYCHLORIDE
BISMUTH SUBCHLORIDE	=	BISMUTH OXYCHLORIDE
BISMUTHYL CHLORIDE	=	BISMUTH OXYCHLORIDE
BISPHENOL A	=	BISPHENOL A
BISPHENOL A DIGLYCIDYL ETHER	=	BISPHENOL A DIGLYCIDYL ETHER
BISPHENOL A EPICHLOROHYDRIN CONDENSATE	=	BISPHENOL A DIGLYCIDYL ETHER
BITUMEN	=	ASPHALT
BIVINYL	=	BUTADIENE, INHIBITED
BLACK LEAF 40 (40 PER CENT WATER SOLUTION)	=	NICOTINE SULFATE
BLACK OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
BLADAN	=	TETRAETHYL PYROPHOSPHATE
BLUE OIL	=	ANILINE
BLUE VITRIOL	=	COPPER SULFATE
BOILER COMPOUND, LIQUID	=	BOILER COMPOUND, LIQUID
BOLETIC ACID	=	FUMARIC ACID
BORACIC ACID	=	BORIC ACID
BORAX,ANHYDROUS	=	SODIUM BORATE
BORIC ACID	=	BORIC ACID
BORON CHLORIDE	=	BORON TRICHLORIDE
BORON TRIBROMIDE	=	BORON TRIBROMIDE
BORON TRICHLORIDE	=	BORON TRICHLORIDE
BOTTLED GAS	=	LIQUEFIED PETROLEUM GAS (LPG)
BOX TOE GUM	=	COLLODION
BP	=	DIBENZOYL PEROXIDE
BPO	=	DIBENZOYL PEROXIDE
BRIMSTONE (LIQUID)	=	SULFUR(LIQUID)
BROCIDE	=	ETHYLENE DICHLORIDE
BROMALLYLENE	=	ALLYL BROMIDE
BROMELLITE	=	BERYLLIUM OXIDE
BROMINE	=	BROMINE
BROMINE PENTAFLUORIDE	=	BROMINE PENTAFLUORIDE
BROMINE TRIFLUORIDE	=	BROMINE TRIFLUORIDE
BROMOBENZENE	=	BROMOBENZENE
BROMOBENZOL	=	BROMOBENZENE
BROMOFUME	=	ETHYLENE DIBROMIDE
BROMOMETHANE	=	METHYL BROMIDE
3-BROMOPROPENE	=	ALLYL BROMIDE
3-BROMOPROPYLENE	=	ALLYL BROMIDE
ALPHA-BROMOTOLUENE	=	BENZYL BROMIDE
BROMOTOLUENE, ALPHA	=	BENZYL BROMIDE
OMEGA-BROMOTOLUENE	=	BENZYL BROMIDE
BRUCINE	=	BRUCINE

SYNONYM		COMPOUND NAME
BRUCINE DIHYDRATE	=	BRUCINE
BTMAC	=	BENZYLTRIMETHYLAMMONIUM CHLORIDE
BUNKER C OIL	=	FUEL OIL: 6
1,3-BUTADIENE	=	BUTADIENE, INHIBITED
BUTADIENE, INHIBITED	=	BUTADIENE, INHIBITED
BUTAL	=	N-BUTYRALDEHYDE
BUTALDEHYDE	=	N-BUTYRALDEHYDE
BUTANAL	=	N-BUTYRALDEHYDE
1-BUTANAMINE, N-BUTYL	=	DI-N-BUTYLAMINE
BUTANE	=	BUTANE
N-BUTANE	=	BUTANE
1,4-BUTANEDICARBOXYLIC ACID	=	ADIPIC ACID
1,4-BUTANEDIOL	=	1,4-BUTANEDIOL
1-BUTANETHIOL	=	N-BUTYL MERCAPTAN
BUTANIC ACID	=	N-BUTYRIC ACID
BUTANOIC ACID	=	N-BUTYRIC ACID
BUTANOL	=	N-BUTYL ALCOHOL
1-BUTANOL	=	N-BUTYL ALCOHOL
2-BUTANOL	=	SEC-BUTYL ALCOHOL
2-BUTANONE	=	METHYL ETHYL KETONE
TRANS-2-BUTENAL	=	CROTONALDEHYDE
1-BUTENE	=	BUTYLENE
CIS-BUTENEDIOIC ACID	=	MALEIC ACID
TRANS-BUTENEDIOIC ACID	=	FUMARIC ACID
CIS-BUTENEDIOIC ANHYDRIDE	=	MALEIC ANHYDRIDE
1,4-BUTENEDIOL	=	1,4-BUTENEDIOL
CIS-2-BUTENE-1,4-DIOL	=	1,4-BUTENEDIOL
3-BUTEN-2-ONE	=	METHYL VINYL KETONE
1-BUTENE OXIDE	=	BUTYLENE OXIDE
BUTENE RESINS	=	POLYBUTENE
1-BUTOXYBUTANE	=	DI-N-BUTYL ETHER
BUTOXYDIETHYLENE GLYCOL	=	DIETHYLENE GLYCOL MONOBUTYL ETHER
BUTOXYDIGLYCOL	=	DIETHYLENE GLYCOL MONOBUTYL ETHER
2-BUTOXYETHANOL	=	ETHYLENE GLYCOL MONOBUTYL ETHER
2-BUTOXYETHANOL, ACETATE	=	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
2-(2-BUTOXYETHOXY)ETHYL ACETATE	=	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
2-BUTOXYETHYL ACETATE	=	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
BUTOXYETHYL 2,4-DICHLOROPHENOXYACETATE	=	2,4-D ESTERS
BUTOXYPROPYL TRICHLOROPHENOXYACETATE	=	2,4,5-T(ESTERS)
BUTTERCUP YELLOW	=	ZINC CHROMATE
BUTTER OF ANTIMONY	=	ANTIMONY TRICHLORIDE
BUTTER OF ARSENIC	=	ARSENIC TRICHLORIDE
BUTYL ACETATE	=	N-BUTYL ACETATE
N-BUTYL ACETATE	=	N-BUTYL ACETATE
SEC-BUTYL ACETATE	=	SEC-BUTYL ACETATE
BUTYL ACRYLATE	=	N-BUTYL ACRYLATE
ISO-BUTYL ACRYLATE	=	ISO-BUTYL ACRYLATE
N-BUTYL ACRYLATE	=	N-BUTYL ACRYLATE
BUTYL ALCOHOL	=	N-BUTYL ALCOHOL
N-BUTYL ALCOHOL	=	N-BUTYL ALCOHOL
SEC-BUTYL ALCOHOL	=	SEC-BUTYL ALCOHOL
TERT-BUTYL ALCOHOL	=	TERT-BUTYL ALCOHOL
BUTYL ALDEHYDE	=	N-BUTYRALDEHYDE
N-BUTYL ALPHA-METHYL ACRYLATE	=	N-BUTYL METHACRYLATE
BUTYLAMINE	=	N-BUTYLAMINE
N-BUTYLAMINE	=	N-BUTYLAMINE
SEC-BUTYLAMINE	=	SEC-BUTYLAMINE
TERT-BUTYLAMINE	=	TERT-BUTYLAMINE
BUTYL BENZYL PHTHALATE	=	BENZYL N-BUTYL PHTHALATE
N-BUTYLCARBINOL	=	N-AMYL ALCOHOL
N-BUTYLCARBINYL CHLORIDE	=	N-AMYL CHLORIDE
BUTYL CARBITOL	=	DIETHYLENE GLYCOL MONOBUTYL ETHER

SYNONYM		COMPOUND NAME
BUTYL CARBITOL ACETATE	=	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
BUTYL CELLOSOLVE	=	ETHYLENE GLYCOL MONOBUTYL ETHER
BUTYL [CELLOSOLVE] ACETATE	=	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
BUTYL 2,4-DICHLOROPHENOXYACETATE	=	2,4-D ESTERS
BUTYLENE	=	BUTYLENE
2-BUTYLENE DICHLORIDE	=	DICHLOROBUTENE
BUTYLENE HYDRATE	=	SEC-BUTYL ALCOHOL
BUTYLENE OXIDE	=	BUTYLENE OXIDE
ALPHA-BUTYLENE OXIDE	=	BUTYLENE OXIDE
1,2-BUTYLENE OXIDE	=	BUTYLENE OXIDE
BUTYL ETHANOATE	=	N-BUTYL ACETATE
BUTYL ETHER	=	DI-N-BUTYL ETHER
N-BUTYLETHER	=	DI-N-BUTYL ETHER
BUTYLETHYLACETALDEHYDE	=	ETHYLHEXALDEHYDE
TERT-BUTYL HYDROPEROXIDE	=	TERT-BUTYL HYDROPEROXIDE
N-BUTYL MERCAPTAN	=	N-BUTYL MERCAPTAN
BUTYL METHACRYLATE	=	N-BUTYL METHACRYLATE
N-BUTYL METHACRYLATE	=	N-BUTYL METHACRYLATE
BUTYL 2-METHACRYLATE	=	N-BUTYL METHACRYLATE
N-BUTYL METHYL KETONE	=	METHYL N-BUTYL KETONE
BUTYL 2-METHYL-2-PROPENOATE	=	N-BUTYL METHACRYLATE
P-TERT-BUTYLPHENOL	=	P-TERT-BUTYLPHENOL
BUTYL PHTHALATE	=	DIBUTYL PHTHALATE
BUTYL 2-PROPENOATE	=	N-BUTYL ACRYLATE
BUTYL TITANATE	=	TETRABUTYL TITANATE
BUTYL TITANATE MONOMER	=	TETRABUTYL TITANATE
BUTYL 2,4,5-TRICHLOROPHENOXYACETATE	=	2,4,5-T(ESTERS)
BUTYLTRICHLOROSILANE	=	BUTYLTRICHLOROSILANE
N-BUTYLTRICHLOROSILANE	=	BUTYLTRICHLOROSILANE
1,4-BUTYNEDIOL	=	1,4-BUTYNEDIOL
2-BUTYNE-1,4-DIOL	=	1,4-BUTYNEDIOL
BUTYRAL	=	N-BUTYRALDEHYDE
BUTYRALDEHYDE	=	N-BUTYRALDEHYDE
ISO-BUTYRALDEHYDE	=	ISO-BUTYRALDEHYDE
N-BUTYRALDEHYDE	=	N-BUTYRALDEHYDE
BUTYRIC ACID	=	N-BUTYRIC ACID
N-BUTYRIC ACID	=	N-BUTYRIC ACID
BUTYRIC ACID, ETHYL ESTER	=	ETHYL BUTYRATE
BUTYRIC ALDEHYDE	=	N-BUTYRALDEHYDE
BUTYRIC ETHER	=	ETHYL BUTYRATE
CACODYLIC ACID	=	CACODYLIC ACID
CADMIUM ACETATE	=	CADMIUM ACETATE
CADMIUM ACETATE DIHYDRATE	=	CADMIUM ACETATE
CADMIUM BROMIDE	=	CADMIUM BROMIDE
CADMIUM BROMIDE TETRAHYDRATE	=	CADMIUM BROMIDE
CADMIUM CHLORIDE	=	CADMIUM CHLORIDE
CADMIUM FLUOBORATE	=	CADMIUM FLUOROBORATE
CADMIUM FLUOROBORATE	=	CADMIUM FLUOROBORATE
CADMIUM FUME	=	CADMIUM OXIDE
CADMIUM NITRATE	=	CADMIUM NITRATE
CADMIUM NITRATE TETRAHYDRATE	=	CADMIUM NITRATE
CADMIUM OXIDE	=	CADMIUM OXIDE
CADMIUM SULFATE	=	CADMIUM SULFATE
CADOX HDP	=	CYCLOHEXANONE PEROXIDE
CADOX PS	=	DI-(P-CHLOROBENZOYL) PEROXIDE
CADOX TEH	=	TERT-BUTYL HYDROPEROXIDE
CAKE ALUM	=	ALUMINUM SULFATE
CALCIUM	=	CALCIUM PHOSPHATE
CALCIUM ABIETATE	=	CALCIUM RESINATE
CALCIUM ALKYLAROMATIC SULFONATE	=	DODECYLBENZENESULFONIC ACID,CALCIUM SALT
CALCIUM ALKYLBENZENESULFONATE	=	DODECYLBENZENESULFONIC ACID,CALCIUM SALT

SYNONYM		COMPOUND NAME
CALCIUM ARSENATE	=	CALCIUM ARSENATE
CALCIUM BIPHOSPHATE	=	CALCIUM PHOSPHATE
CALCIUM CARBIDE	=	CALCIUM CARBIDE
CALCIUM CHLORATE	=	CALCIUM CHLORATE
CALCIUM CHLORIDE	=	CALCIUM CHLORIDE
CALCIUM CHLORIDE HYDRATES	=	CALCIUM CHLORIDE
CALCIUM CHLORIDE,ANHYDROUS	=	CALCIUM CHLORIDE
CALCIUM CHROMATE	=	CALCIUM CHROMATE
CALCIUM CHROMATE DIHYDRATE	=	CALCIUM CHROMATE
CALCIUM CHROMATE (VI)	=	CALCIUM CHROMATE
CALCIUM CYANIDE	=	CALCIUM CYANIDE
CALCIUM DIOXIDE	=	CALCIUM PEROXIDE
CALCIUM FLUORIDE	=	CALCIUM FLUORIDE
CALCIUM HYDROXIDE	=	CALCIUM HYDROXIDE
CALCIUM HYPOCHLORITE	=	CALCIUM HYPOCHLORITE
CALCIUM MONOHYDROGEN PHOSPHATE	=	CALCIUM PHOSPHATE
CALCIUM, METALLIC	=	CALCIUM, METALLIC
CALCIUM NITRATE	=	CALCIUM NITRATE
CALCIUM NITRATE TETRAHYDRATE	=	CALCIUM NITRATE
CALCIUM OXIDE	=	CALCIUM OXIDE
CALCIUM PEROXIDE	=	CALCIUM PEROXIDE
CALCIUM PHOSPHATE	=	CALCIUM PHOSPHATE
CALCIUM PHOSPHATE,MONOBASIC,MONOHYDRATE	=	CALCIUM PHOSPHATE
CALCIUM PHOSPHIDE	=	CALCIUM PHOSPHIDE
CALCIUM RESINATE	=	CALCIUM RESINATE
CALCIUM RESINATE,FUSED	=	CALCIUM RESINATE
CALCIUM ROSIN	=	CALCIUM RESINATE
CALCIUM SUPERPHOSPHATE	=	CALCIUM PHOSPHATE
CALOCHLOR	=	MERCURIC CHLORIDE
CALOMEL	=	MERCUROUS CHLORIDE
CAMPHENE	=	CAMPHENE
CAMPHOR OIL	=	CAMPHOR OIL
CANE SUGAR	=	SUCROSE
CAPRALDEHYDE	=	DECALDEHYDE
CAPRIC ALCOHOL	=	N-DECYL ALCOHOL
CAPRIC ALDEHYDE	=	DECALDEHYDE
CAPROALDEHYDE	=	N-HEXALDEHYDE
CAPROIC ALDEHYDE	=	N-HEXALDEHYDE
EPSILON-CAPROLACTAM	=	CAPROLACTAM, LIQUID
CAPROLACTAM, LIQUID	=	CAPROLACTAM, LIQUID
CAPRONALDEHYDE	=	N-HEXALDEHYDE
N-CAPROYLALDEHYDE	=	N-HEXALDEHYDE
CAPRYLENE	=	1-OCTENE
CAPTAN	=	CAPTAN
CARBAMIDE	=	UREA
CARBAMIDE PEROXIDE	=	UREA PEROXIDE
CARBARYL	=	CARBARYL
CARBIDE	=	CALCIUM CARBIDE
CARBINOL	=	METHYL ALCOHOL
CARBITOL	=	DIETHYLENE GLYCOL MONOETHYL ETHER
CARBOBENZOXY CHLORIDE	=	BENZYL CHLOROFORMATE
CARBOLIC ACID	=	PHENOL
CARBOLIC OIL	=	CARBOLIC OIL
CARBON BISULFIDE	=	CARBON BISULFIDE
CARBON DIOXIDE	=	CARBON DIOXIDE
CARBON DISULFIDE	=	CARBON BISULFIDE
CARBONIC ACID DIETHYL ESTER	=	DIETHYL CARBONATE
CARBONIC ACID GAS	=	CARBON DIOXIDE
CARBONIC ACID, MONOAMMONIUM SALT	=	AMMONIUM BICARBONATE
CARBONIC ANHYDRIDE	=	CARBON DIOXIDE
CARBON MONOXIDE	=	CARBON MONOXIDE
CARBON TETRACHLORIDE	=	CARBON TETRACHLORIDE
CARBONYL CHLORIDE	=	PHOSGENE
CARBONYLDIAMIDE	=	UREA

SYNONYM		COMPOUND NAME
CARBONYL DIAMINE PEROXIDE	=	UREA PEROXIDE
CARBOXYBENZENE	=	BENZOIC ACID
CARENE	=	CARENE
3-CARENE	=	CARENE
CARPETING MATERIAL	=	ARSENIC ACID
CARPETING MEDIUM	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
CARTHAMUS TINCTORIUS OIL	=	OILS EDIBLE: SAFFLOWER
CARWINATE 125M	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
CATECHIN	=	CATECHOL
CATECHOL	=	CATECHOL
CAUSTIC ARSENIC CHLORIDE	=	ARSENIC TRICHLORIDE
CAUSTIC OIL OF ARSENIC	=	ARSENIC TRICHLORIDE
CAUSTIC POTASH	=	POTASSIUM HYDROXIDE
CAUSTIC POTASH SOLUTION	=	CAUSTIC POTASH SOLUTION
CAUSTIC SODA	=	SODIUM HYDROXIDE
CAUSTIC SODA SOLUTION	=	CAUSTIC SODA SOLUTION
CD-68	=	CHLORDANE
CELLOSOLVE	=	ETHYLENE GLYCOL MONOETHYL ETHER
CELLOSOLVE ACETATE	=	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
CELLULOSE NITRATE SOLUTION	=	COLLODION
CETYL SODIUM SULFATE	=	HEXADECYL SULFATE, SODIUM SALT
CETYLTRIMETHYLAMMONIUM CHLORIDE SOLUTION	=	HEXADECYLTRIMETHYLAMMONIUM CHLORIDE
CHAMBER ACID	=	SULFURIC ACID
CHARCOAL	=	CHARCOAL
CHEM BAM	=	NABAM
CHINESE TANNIN	=	TANNIC ACID
CHINOLINE	=	QUINOLINE
CHLORACETIC ACID	=	MONOCHLOROACETIC ACID
CHLORACETYL CHLORIDE	=	CHLOROACETYL CHLORIDE
CHLORATE OF POTASH	=	POTASSIUM CHLORATE
CHLORATE OF POTASSIUM	=	POTASSIUM CHLORATE
CHLORATE OF SODA	=	SODIUM CHLORATE
CHLORDAN	=	CHLORDANE
CHLORDANE	=	CHLORDANE
2-CHLORETHANOL	=	ETHYLENE CHLOROHYDRIN
CHLOREX	=	DICHLOROETHYL ETHER
CHLORIDE OF AMYL	=	N-AMYL CHLORIDE
CHLORINATED BIPHENYL	=	POLYCHLORINATED BIPHENYL (PCB)
CHLORINE	=	CHLORINE
CHLORINE TRIFLUORIDE	=	CHLORINE TRIFLUORIDE
CHLOROACETIC ACID	=	MONOCHLOROACETIC ACID
CHLOROACETIC ACID, ETHYL ESTER	=	ETHYL CHLOROACETATE
CHLOROACETOPHENONE	=	CHLOROACETOPHENONE
ALPHA-CHLOROACETOPHENONE	=	CHLOROACETOPHENONE
OMEGA-CHLOROACETOPHENONE	=	CHLOROACETOPHENONE
CHLOROACETYL CHLORIDE	=	CHLOROACETYL CHLORIDE
5-CHLORO-2-AMINOTOLUENE	=	4-CHLORO-O-TOLUIDINE
4-CHLOROANILINE	=	P-CHLOROANILINE
P-CHLOROANILINE	=	P-CHLOROANILINE
CHLOROBENZENE	=	CHLOROBENZENE
P-CHLOROBENZOYL PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
DI-(4-CHLOROBENZOYL)PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
4-CHLOROBUTYRONITRILE	=	4-CHLOROBUTYRONITRILE
4-CHLOROBUTYRONITRILE (PRACTICAL,MIXTURE WITH 4-BROMOBUTYRONITRILE)	=	4-CHLOROBUTYRONITRILE
CHLOROCARBONIC ACID, METHYL ESTER	=	METHYL CHLOROFORMATE
CHLORODIFLUOROMETHANE	=	MONOCHLORODIFLUOROMETHANE
1-CHLORO-2,3-EPOXYPROPANE	=	EPICHLOROHYDRIN
CHLOROETHANE	=	ETHYL CHLORIDE
2-CHLOROETHANOL	=	ETHYLENE CHLOROHYDRIN
CHLOROETHENE	=	VINYL CHLORIDE

SYNONYM		COMPOUND NAME
2-CHLOROETHYL ALCOHOL	=	ETHYLENE CHLOROHYDRIN
2-CHLORO-4-ETHYLAMINO-6-ISOPROPYLAMINO-S-TRIAZINE	=	ATRAZINE
CHLOROETHYLENE	=	VINYL CHLORIDE
CHLOROFORM	=	CHLOROFORM
CHLOROFORMIC ACID, BENZYL ESTER	=	BENZYL CHLOROFORMATE
CHLOROFORMIC ACID, ETHYL ESTER	=	ETHYL CHLOROFORMATE
CHLOROFORMIC ACID, METHYL ESTER	=	METHYL CHLOROFORMATE
CHLOROFORMYL CHLORIDE	=	PHOSGENE
CHLOROHYDRINS (CRUDE)	=	CHLOROHYDRINS (CRUDE)
GAMMA-CHLOROISOBUTYLENE	=	METHALLYL CHLORIDE
CHLOROMETHANE	=	METHYL CHLORIDE
4-CHLORO-2-METHYLANILINE	=	4-CHLORO-O-TOLUIDINE
CHLOROMETHYL METHYL ETHER	=	CHLOROMETHYL METHYL ETHER
CHLOROMETHYLOXIRANE	=	EPICHLOROHYDRIN
O-(3-CHLORO-4-METHYL-2-OXO-(2H)-1-BENZOPYRAN-7-YL)PHOSPHOROTHIOATE	=	COUMAPHOS
4-CHLORO-O-TOLUIDINE	=	4-CHLORO-O-TOLUIDINE
CHLOROMETHYL PHENYL KETONE	=	CHLOROACETOPHENONE
3-CHLORO-2-METHYLPROPENE	=	METHALLYL CHLORIDE
1-CHLOROPENTANE	=	N-AMYL CHLORIDE
4-CHLOROPHENOL	=	P-CHLOROPHENOL
P-CHLOROPHENOL	=	P-CHLOROPHENOL
4-CHLOROPHENYLAMINE	=	P-CHLOROANILINE
DI-(P-CHLOROPHENYL)TRICHLOROMETHYLCARBINOL	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
CHLOROPICRIN, LIQUID	=	CHLOROPICRIN, LIQUID
3-CHLOROPROPENE	=	ALLYL CHLORIDE
3-CHLOROPROPYLEN	=	ALLYL CHLORIDE
GAMMA-CHLOROPROPYLENE OXIDE	=	EPICHLOROHYDRIN
3-CHLORO-1,2-PROPYLENE OXIDE	=	EPICHLOROHYDRIN
CHLOROSULFONIC ACID	=	CHLOROSULFONIC ACID
CHLOROTHENE	=	TRICHLOROETHANE
CHLOROTOLUENE, ALPHA	=	BENZYL CHLORIDE
ALPHA-CHLOROTOLUENE	=	BENZYL CHLORIDE
OMEGA-CHLOROTOLUENE	=	BENZYL CHLORIDE
CHLOROTRIFLUOROETHYLENE	=	TRIFLUOROCHLOROETHYLENE
CHLOROTRIMETHYLSILANE	=	TRIMETHYLCHLOROSILANE
CHLORSULFONIC ACID	=	CHLOROSULFONIC ACID
CHLORYLEN	=	TRICHLOROETHYLENE
CHP	=	CUMENE HYDROPEROXIDE
CHROMIC ACID	=	CHROMIC ANHYDRIDE
CHROMIC ANHYDRIDE	=	CHROMIC ANHYDRIDE
CHROMIC OXIDE	=	CHROMIC ANHYDRIDE
CHROMIUM (VI) DIOXYCHLORIDE	=	CHROMYL CHLORIDE
CHROMIUM OXYCHLORIDE	=	CHROMYL CHLORIDE
CHROMIUM TRIOXIDE	=	CHROMIC ANHYDRIDE
CHROMYL CHLORIDE	=	CHROMYL CHLORIDE
CIANURINA	=	MERCURIC CYANIDE
CITRIC ACID	=	CITRIC ACID
CITRIC ACID, DIAMMONIUM SALT	=	AMMONIUM CITRATE
CLARIFIED OIL	=	OIL: CLARIFIED
CLOROX	=	SODIUM HYPOCHLORITE
CC RAL	=	COUMAPHOS
COAL TAR OIL	=	OIL: COAL TAR
COBALT ACETATE	=	COBALT ACETATE
COBALT ACETATE TETRAHYDRATE	=	COBALT ACETATE
COBALT (II) ACETATE	=	COBALT ACETATE
COBALT CHLORIDE	=	COBALT CHLORIDE
COBALT (II) CHLORIDE	=	COBALT CHLORIDE
COBALTOUS ACETATE	=	COBALT ACETATE
COBALTOUS CHLORIDE	=	COBALT CHLORIDE
COBALTOUS CHLORIDE DIHYDRATE	=	COBALT CHLORIDE
COBALTOUS CHLORIDE HEXAHYDRATE	=	COBALT CHLORIDE
COBALTOUS NITRATE	=	COBALT NITRATE

SYNONYM		COMPOUND NAME
COBALTOUS NITRATE HEXAHYDRATE	=	COBALT NITRATE
COBALTOUS SULFATE HEPTAHYDRATE	=	COBALT SULFATE
COBALT NITRATE	=	COBALT NITRATE
COBALT (II) NITRATE	=	COBALT NITRATE
COBALT SULFATE	=	COBALT SULFATE
COBALT (II) SULFATE	=	COBALT SULFATE
COCONUT BUTTER	=	OILS EDIBLE: COCONUT
COCONUT OIL	=	OILS EDIBLE: COCONUT
CODOIL	=	OIL: RESIN
CODOIL	=	OIL: ROSIN
COLLODION	=	COLLODION
COLOGNE SPIRIT	=	ETHYL ALCOHOL
COLONIAL SPIRIT	=	METHYL ALCOHOL
COLUMBIAN SPIRIT	=	METHYL ALCOHOL
COMBUSTION IMPROVER C12	=	METHYLCYCLOPENTADIENYLMANGANESE TRICARBONYL
CONDENSED PHOSPHORIC ACID	=	POLYPHOSPHORIC ACID
COPPER ACETATE	=	COPPER ACETATE
COPPER ACETOARSENITE	=	COPPER ACETOARSENITE
COPPER ARSENITE	=	COPPER ARSENITE
COPPERAS	=	FERROUS SULFATE
COPPER BORO FLUORIDE SOLUTION	=	COPPER FLUOROBORATE
COPPER BROMIDE	=	COPPER BROMIDE
COPPER CHLORIDE	=	COPPER CHLORIDE
COPPER CYANIDE	=	COPPER CYANIDE
COPPER FLUOROBORATE	=	COPPER FLUOROBORATE
COPPER(II)FLUOBORATE SOLUTION	=	COPPER FLUOROBORATE
COPPER IODIDE	=	COPPER IODIDE
COPPER NAPHTHENATE	=	COPPER NAPHTHENATE
COPPER NITRATE	=	COPPER NITRATE
COPPER ORTHOARSENITE	=	COPPER ARSENITE
COPPER OXALATE	=	COPPER OXALATE
COPPER SULFATE	=	COPPER SULFATE
COPPER SULFATE PENTAHYDRATE	=	COPPER SULFATE
COPRA OIL	=	OILS EDIBLE: COCONUT
CORN SUGAR SOLUTION	=	DEXTROSE SOLUTION
CORN SYRUP	=	CORN SYRUP
CORN SYRUP SOLUTION	=	DEXTROSE SOLUTION
CORROSIVE MERCURY CHLORIDE	=	MERCURIC CHLORIDE
CORROSIVE SUBLIMATE	=	MERCURIC CHLORIDE
COTTONSEED OIL	=	OIL: COTTONSEED
COUMAPHOS	=	COUMAPHOS
CRANKCASE OIL	=	OIL: MOTOR
CRANKCASE OIL	=	OIL: LUBRICATING
CREOSOTE, COAL TAR	=	CREOSOTE, COAL TAR
CREOSOTE OIL	=	CREOSOTE, COAL TAR
CRESOL,EPOXYPROPYL ETHER	=	CRESYL GLYCIDYL ETHER
CRESOLS	=	CRESOLS
CRESYL GLYCIDYL ETHER	=	CRESYL GLYCIDYL ETHER
CRESYLIC ACID	=	XYLENOL
CRESYLIC ACIDS	=	CRESOLS
CROPLAS EH	=	ETHYL HEXYL TALLATE
CROTENALDEHYDE	=	CROTONALDEHYDE
CROTONALDEHYDE	=	CROTONALDEHYDE
CROTONIC ALDEHYDE	=	CROTONALDEHYDE
CROTONOEL	=	OILS MISCELLANEOUS: CROTON
CROTON TIGLIUM L. OIL	=	OILS MISCELLANEOUS: CROTON
CRUDE EPICHLOROHYDRIN	=	CHLOROHYDRINS (CRUDE)
CRUDE OIL	=	OIL: CRUDE
CRYSTALLIZED VERDIGRIS	=	COPPER ACETATE
CTF	=	CHLORINE TRIFLUORIDE
CUCUMBER DUST	=	CALCIUM ARSENATE
CUMENE	=	CUMENE
CUMENE HYDROPEROXIDE	=	CUMENE HYDROPEROXIDE
CUMOL	=	CUMENE

SYNONYM		COMPOUND NAME
CUMYL HYDROPEROXIDE	=	CUMENE HYDROPEROXIDE
CUPRIC ACETATE MONOHYDRATE	=	COPPER ACETATE
CUPRIC ARSENITE	=	COPPER ARSENITE
CUPRIC BROMIDE, ANHYDROUS	=	COPPER BROMIDE
CUPRIC CHLORIDE DIHYDRATE	=	COPPER CHLORIDE
CUPRIC FLUOBORATE SOLUTION	=	COPPER FLUOROBORATE
CUPRIC GREEN	=	COPPER ARSENITE
CUPRICIN	=	COPPER CYANIDE
CUPRIC NITRATE TRIHYDRATE	=	COPPER NITRATE
CUPRIC OXALATE HEMIHYDRATE	=	COPPER OXALATE
CUPRIC SULFATE	=	COPPER SULFATE
CUPRIETHYLENEDIAMINE SOLUTION	=	CUPRIETHYLENEDIAMINE SOLUTION
CUPRIETHYLENEDIAMINE HYDROXIDE SOLUTION	=	CUPRIETHYLENEDIAMINE SOLUTION
CUPROUS CYANIDE	=	COPPER CYANIDE
CUPROUS IODIDE	=	COPPER IODIDE
CYANACETIC ACID	=	CYANOACETIC ACID
CYANIDE	=	POTASSIUM CYANIDE
CYANIDE OF CALCIUM	=	CALCIUM CYANIDE
CYANOACETIC ACID	=	CYANOACETIC ACID
CYANOBENZENE	=	BENZONITRILE
2-CYANOETHANOL	=	ETHYLENE CYANOHYDRIN
CYANOETHYLENE	=	ACRYLONITRILE
CYANOGAS A-DUST	=	CALCIUM CYANIDE
CYANOGAS G-FUMIGANT	=	CALCIUM CYANIDE
CYANOGEN	=	CYANOGEN
CYANOGEN BROMIDE	=	CYANOGEN BROMIDE
CYANOGEN CHLORIDE	=	CYANOGEN CHLORIDE
CYANOMETHANE	=	ACETONITRILE
CYCLOHEXANE	=	CYCLOHEXANE
CYCLOHEXANOL	=	CYCLOHEXANOL
CYCLOHEXANONE	=	CYCLOHEXANONE
CYCLOHEXANONE PEROXIDE	=	CYCLOHEXANONE PEROXIDE
CYCLOHEXENYLTRICHLOROSILANE	=	CYCLOHEXENYLTRICHLOROSILANE
CYCLOHEXYL ALCOHOL	=	CYCLOHEXANOL
CYCLOHEXYLAMINE	=	CYCLOHEXYLAMINE
CYCLOHEXYL KETONE	=	CYCLOHEXANONE
CYCLOPENTANE	=	CYCLOPENTANE
CYCLOPENTANE, METHYL	=	METHYLCYCLOPENTANE
CYCLOPROPANE	=	CYCLOPROPANE
P-CYMENE	=	P-CYMENE
CYMOL	=	P-CYMENE
CYSTOGEN	=	HEXAMETHYLENETETRAMINE
CYTHION INSECTICIDE	=	MALATHION
2,4-D	=	2,4-DICHLOROPHENOXYACETIC ACID
DALAPON	=	DALAPON
DBP	=	DIBUTYL PHTHALATE
DCEE	=	DICHLOROETHYL ETHER
DCP	=	CALCIUM PHOSPHATE
DDD	=	DDD
DDT	=	DDT
P,P -DDT	=	DDT
D.D. TURPENTINE	=	TURPENTINE
DEA	=	DIETHANOLAMINE
DEAD OIL	=	CREOSOTE, COAL TAR
DEC	=	DECAHYDRONAPHTHALENE
DECABORANE	=	DECABORANE
DECAHYDRONAPHTHALENE	=	DECAHYDRONAPHTHALENE
CIS-OR TRANS-DECAHYDRONAPHTHALENE	=	DECAHYDRONAPHTHALENE
DECALDEHYDE	=	DECALDEHYDE
DECALIN	=	DECAHYDRONAPHTHALENE
DECANAL	=	DECALDEHYDE
1-DECANOL	=	N-DECYL ALCOHOL

SYNONYM		COMPOUND NAME
1-DECENE	=	1-DECENE
ALPHA-DECENE	=	1-DECENE
N-DECYL ALCOHOL	=	N-DECYL ALCOHOL
N-DECYL ALDEHYDE	=	DECALDEHYDE
DECYLBENZENE	=	N-DECYLBENZENE
N-DECYLBENZENE	=	N-DECYLBENZENE
DEG	=	DIETHYLENE GLYCOL
DEHD	=	DIOCTYL PHTHALATE
DEHPA	=	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
DEHYDRITE	=	MAGNESIUM PERCHLORATE
DE KALIN	=	DECAHYDRONAPHTHALENE
DEMETON	=	DEMETON
DEN	=	DIETHYLAMINE
DENATURED ALCOHOL	=	ETHYL ALCOHOL
2,4-D ESTERS	=	2,4-D ESTERS
DETERGENT ALKYLATE #2	=	DODECYLBENZENE
DEXTROSE SOLUTION	=	DEXTROSE SOLUTION
DIACETIC ETHER	=	ETHYL ACETOACETATE
DIACETONE	=	DIACETONE ALCOHOL
DIACETONE ALCOHOL	=	DIACETONE ALCOHOL
DIACETYLMETHANE	=	ACETYLACETONE
DIACETYL PEROXIDE SOLUTION	=	ACETYL PEROXIDE SOLUTION
1,2-DIAMINOETHANE	=	ETHYLENEDIAMINE
2,2 -DIAMINODIETHYLAMINE	=	DIETHYLENETRIAMINE
1,6-DIAMINOHEXANE	=	HEXAMETHYLENEDIAMINE
1,11-DIAMINO-3,6,9-TRIAZAUNDECANE	=	TETRAETHYLENEPENTAMINE
DIAMMONIUM CITRATE	=	AMMONIUM CITRATE
DIAMMONIUM HYDROGEN PHOSPHATE	=	AMMONIUM PHOSPHATE
DIAMMONIUM ORTHOPHOSPHATE	=	AMMONIUM PHOSPHATE
DIAMMONIUM OXALATE	=	AMMONIUM OXALATE
DIAMYL PHTHALATE	=	DI-N-AMYL PHTHALATE
DI-N-AMYL PHTHALATE	=	DI-N-AMYL PHTHALATE
2,2-DI-(P-ANISYL)-1,1,1-TRICHLOROETHANE	=	METHOXYCHLOR
DIANTIMONY TROXIDE	=	ANTIMONY TRIOXIDE
DIAZINON	=	DIAZINON
DIBASIC CALCIUM PHOSPHATE	=	CALCIUM PHOSPHATE
DIBENZO(B,E)PYRIDINE	=	ACRIDINE
DIBENZOYL PEROXIDE	=	DIBENZOYL PEROXIDE
DIBK	=	DIISOBUTYL KETONE
1,2-DIBROMOETHANE	=	ETHYLENE DIBROMIDE
SYM-DIBROMOETHANE	=	ETHYLENE DIBROMIDE
DIBUTYLAMINE	=	DI-N-BUTYLAMINE
DI-N-BUTYLAMINE	=	DI-N-BUTYLAMINE
DIBUTYL ETHER	=	DI-N-BUTYL ETHER
N-DIBUTYL ETHER	=	DI-N-BUTYL ETHER
DI-N-BUTYL ETHER	=	DI-N-BUTYL ETHER
DI-N-BUTYL KETONE	=	DI-N-BUTYL KETONE
DIBUTYL OXIDE	=	DI-N-BUTYL ETHER
DIBUTYLPHENOL	=	DIBUTYLPHENOL
2,6-DI-TERT-BUTYLPHENOL	=	DIBUTYLPHENOL
DIBUTYL PHTHALATE	=	DIBUTYL PHTHALATE
DICALCIUM PHOSPHATE (ANHYDROUS OR DIHYDRATE)	=	CALCIUM PHOSPHATE
S-(1,2-DICARBETHOXYETHYL)-O,O-DIMETHYL DITHIOPHOSPHATE	=	MALATHION
DICARBOMETHOXYZINC	=	ZINC ACETATE
DICHLORICIDE	=	P-DICHLOROBENZENE
1,2-DICHLOROBENZENE	=	O-DICHLOROBENZENE
O-DICHLOROBENZENE	=	O-DICHLOROBENZENE
P-DICHLOROBENZENE	=	P-DICHLOROBENZENE
DI-(P-CHLOROBENZOYL) PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
DI-(4-CHLOROBENZOYL) PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
P,P -DICHLOROBENZOYL PEROXIDE	=	DI-(P-CHLOROBENZOYL) PEROXIDE
1,1-DICHLORO-2,2-BIS(P-CHLOROPHENYL)ETHANE	=	DDD

SYNONYM		COMPOUND NAME
DICHLOROBUTENE	=	DICHLOROBUTENE
1,4-DICHLORO-2-BUTENE	=	DICHLOROBUTENE
CIS-1,4-DICHLORO-2-BUTENE	=	DICHLOROBUTENE
TRANS-1,4-DICHLORO-2-BUTENE	=	DICHLOROBUTENE
1,4-DICHLORO-2-BUTYLENE	=	DICHLOROBUTENE
DICHLORODIETHYL ETHER	=	DICHLOROETHYL ETHER
DICHLORODIFLUOROMETHANE	=	DICHLORODIFLUOROMETHANE
DICHLORODIPHENYLDICHLOROETHANE	=	DDD
DICHLORODIPHENYLSILANE	=	DIPHENYLDICHLOROSILANE
DICHLORODIPHENYLSILICANE	=	DIPHENYLDICHLOROSILANE
DICHLORODIPHENYLTRICHLOROETHANE	=	DDT
1,2-DICHLOROETHANE	=	ETHYLENE DICHLORIDE
DI-(2-CHLOROETHYL)ETHER	=	DICHLOROETHYL ETHER
DI-(2-CHLOROETHYL) ETHER	=	DICHLOROETHYL ETHER
DICHLOROETHYL ETHER	=	DICHLOROETHYL ETHER
1,1-DICHLOROETHYLENE	=	VINYLIDENECHLORIDE, INHIBITED
1,2-DICHLOROETHYLENE	=	1,2-DICHLOROETHYLENE
SYM-DICHLOROETHYLENE	=	1,2-DICHLOROETHYLENE
UNSYM-DICHLOROETHYLENE	=	VINYLIDENECHLORIDE, INHIBITED
CIS-OR TRANS-1,2-DICHLOROETHYLENE	=	1,2-DICHLOROETHYLENE
2,2 -DICHLOROETHYL ETHER	=	DICHLOROETHYL ETHER
BETA, BETA - DICHLOROETHYL ETHER	=	DICHLOROETHYL ETHER
DICHLOROMETHANE	=	DICHLOROMETHANE
2,4-DICHLOROPHENOL	=	2,4-DICHLOROPHENOL
2,4-DICHLOROPHENOXYACETIC ACID	=	2,4-DICHLOROPHENOXYACETIC ACID
2,4-DICHLOROPHENOXYACETIC ACID, BUTOXYETHYL ESTER	=	2,4-D ESTERS
2,4-DICHLOROPHENOXYACETIC ACID, BUTYL ESTER	=	2,4-D ESTERS
2,4-DICHLOROPHENOXYACETIC ACID,ISOPROPYL ESTER	=	2,4-D ESTERS
DICHLOROPHENYLPHOSPHINE	=	BENZENE PHOSPHORUS DICHLORIDE
DI-(P-CHLOROPHENYL) TRICHLOROMETHYLCARBINOL	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
1,2-DICHLOROPROPANE	=	DICHLOROPROPANE
DICHLOROPROPANE	=	DICHLOROPROPANE
2,2-DICHLOROPROPANOIC ACID	=	DALAPON
ALPHA, ALPHA -DICHLOROPROPIONIC ACID	=	DALAPON
1,3-DICHLOROPROPENE	=	DICHLOROPROPENE
DICHLOROPROPENE	=	DICHLOROPROPENE
2,2-DICHLOROPROPIONIC ACID	=	DALAPON
4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
DICOFOL	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
DICY	=	DICYCLOPENTADIENE
DICYAN	=	CYANOGEN
1,4-DICYANOBUTANE	=	ADIPONITRILE
DICYANOGEN	=	CYANOGEN
DICYCLOHEXANONE DIPEROXIDE	=	CYCLOHEXANONE PEROXIDE
DICYCLOPENTADIENE	=	DICYCLOPENTADIENE
DIELDRIN	=	DIELDRIN
DIESEL IGNITION IMPROVER	=	N-AMYL NITRATE
DIESEL OIL, LIGHT	=	FUEL OIL: 1-D
DIESEL OIL, MEDIUM	=	FUEL OIL: 2-D
DIETHANOLAMINE	=	DIETHANOLAMINE
DIETHANOLAMINE, LAURYL SULFATE SOLUTION--LAURYL SULFATE,DIETHANOLAMINE SALT SOLUTION	=	DODECYL SULFATE, DIETHANOLAMINE SALT
DIETHANOLAMINE LAURYL SULFATE SOLUTION LAURYL SULFATE, DIETHANOLAMINE SALT	=	DODECYL SULFATE, DIETHANOLAMINE SALT

SYNONYM		COMPOUND NAME
1,2-DIETHOXYETHANE	=	ETHYLENE GLYCOL DIETHYL ETHER
DIETHYLAMINE	=	DIETHYLAMINE
DIETHYLBENZENE	=	DIETHYLBENZENE
DIETHYL CARBONATE	=	DIETHYL CARBONATE
DIETHYL CELLOSOLVE	=	ETHYLENE GLYCOL DIETHYL ETHER
O,O-DIETHYL-O-(3-CHLORO-4-METHYL-2-OXO-(2H)-1-BENZOPYRAN-7-YL)PHOSPHOROTHIOATE	=	COUMAPHOS
DIETHYLENEDIAMINE	=	PIPERAZINE
DIETHYLENE GLYCOL	=	DIETHYLENE GLYCOL
DIETHYLENE GLYCOL DIMETHYL ETHER	=	DIETHYLENE GLYCOL DIMETHYL ETHER
DIETHYLENE GLYCOL ETHYL ETHER	=	DIETHYLENE GLYCOL MONOETHYL ETHER
DIETHYLENE GLYCOL METHYL ETHER	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
DIETHYLENE GLYCOL MONOBUTYL ETHER	=	DIETHYLENE GLYCOL MONOBUTYL ETHER
DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE	=	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
DIETHYLENE GLYCOL MONOETHYL ETHER	=	DIETHYLENE GLYCOL MONOETHYL ETHER
DIETHYLENE GLYCOL MONOMETHYL ETHER	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
DIETHYLENEIMIDE OXIDE	=	MORPHOLINE
DIETHYLENE IMIDOXIDE	=	MORPHOLINE
DI(ETHYLENE OXIDE)	=	1,4-DIOXANE
DIETHYLENE OXIMIDE	=	MORPHOLINE
DIETHYLENETRIAMINE	=	DIETHYLENETRIAMINE
DIETHYL ETHER	=	ETHYL ETHER
DI-(2-ETHYLHEXYL) ACID PHOSPHATE	=	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
DI(2-ETHYLHEXYL)ADIPATE	=	DIOCTYL ADIPATE
DI-(2-ETHYLHEXYL) PHOSPHATE	=	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
DI-(2-ETHYLHEXYL) PHOSPHORIC ACID	=	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
DI(2-ETHYLHEXYL)PHTHALATE	=	DIOCTYL PHTHALATE
DI-(2-ETHYLHEXYL)SULFOSUCCINATE, SODIUM SALT	=	DIOCTYL SODIUM SULFOSUCCINATE
O,O-DIETHYL O-(2-ISOPROPYL-6-METHYL-4-PYRIMIDINYL) PHOSPHOROTHICATE	=	DIAZINON
O,O-DIETHYL-O-(2-ISOPROPYL-6-METHYL-4-PYRIMIDINYL)PHOSPHOROTHIOATE	=	DIAZINON
O,O-DIETHYL O-2-ISOPROPYL-4-METHYL-6-PYRIMIDYL THIO-PHOSPHATE	=	DIAZINON
O,O-DIETHYL-O-(2-ISOPROPYL-6-METHYL-4-PYRIMIDINYL)THIOPHOSPHATE	=	DIAZINON
DIETHYL 2-ISOPROPYL-4-METHYL-6-PYRIMIDYL THIONOPHOSPHATE	=	DIAZINON
O,O-DIETHYL O-(P-NITROPHENYL) PHOSPHOROTHIOATE	=	PARATHION, LIQUID
O,O-DIETHYL O-(P-NITROPHENYL) THIOPHOSPHATE	=	PARATHION, LIQUID
O,O-DIETHYL-S(AND S-)(I-(ETHYLTHIO)ETHYL)PHOSPHOROTHIOATES	=	DEMETON
DIETHYL OXIDE	=	ETHYL ETHER
DIETHYL PHTHALATE	=	DIETHYL PHTHALATE
DIETHYLZINC	=	DIETHYLZINC
1,1-DIFLUOROETHANE	=	1,1-DIFLUOROETHANE
DIFLUOROPHOSPHORUS ACID	=	DIFLUOROPHOSPHORIC ACID, ANHYDROUS
DIFLUOROPHOSPHORIC ACID, ANHYDROUS	=	DIFLUOROPHOSPHORIC ACID, ANHYDROUS
DIFORMYL	=	GLYOXAL, 40% SOLUTION
DIGLYCOL	=	DIETHYLENE GLYCOL
DIGLYCOL MONOBUTYL ETHER	=	DIETHYLENE GLYCOL MONOBUTYL ETHER
DIGLYCOL MONOBUTYL ETHER ACETATE	=	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
DIGLYME	=	DIETHYLENE GLYCOL DIMETHYL ETHER
DIHEPTYL PHTHALATE	=	DIHEPTYL PHTHALATE
DIHYDRATE	=	CADMIUM ACETATE
2,5-DIHYDROPEROXY-2,5-DIMETHYLHEXANE	=	DIMETHYLHEXANE DIHYDROPEROXIDE, WET
1,2-DIHYDRO-3,6-PYRIDAZINEDIONE	=	MALEIC HYDRAZIDE
1,2-DIHYDROXYBENZENE	=	CATECHOL
1,3-DIHYDROXYBENZENE	=	RESORCINOL

SYNONYM		COMPOUND NAME
M-DIHYDROXYBENZENE	=	RESORCINOL
P-DIHYDROXYBENZENE	=	HYDROQUINONE
DIHYDROXYBENZOL	=	RESORCINOL
1,4-DIHYDROXYBUTANE	=	1,4-BUTANEDIOL
1,4-DIHYDROXY-2-BUTENE	=	1,4-BUTENEDIOL
1,4-DIHYDROXY-2-BUTYNE	=	1,4-BUTYNEDIOL
2,2 -DIHYDROXYDIETHYL AMINE	=	DIETHANOLAMINE
BETA,BETA - DIHYDROXYDIETHYL ETHER	=	DIETHYLENE GLYCOL
P,P -DIHYDROXYDIPHENYLDIMETHYLMETHANE	=	BISPHENOL A
2,2 -DIHYDROXYDIPROPYLAMINE	=	DIISOPROPANOLAMINE
1,2-DIHYDROXYETHANE	=	ETHYLENE GLYCOL
DI-BETA-HYDROXYETHOXYETHANE	=	TRIETHYLENE GLYCOL
DI(2-HYDROXYETHYL)AMINE	=	DIETHANOLAMINE
DIHYDROXYETHYL ETHER	=	DIETHYLENE GLYCOL
1,2-DIHYDROXYPROPANE	=	PROPYLENE GYLCOL
DIISOBUTYLENE	=	DIISOBUTYLENE
DIISOBUTYLCARBINOL	=	DIISOBUTYLCARBINOL
DIISOBUTYL KETONE	=	DIISOBUTYL KETONE
I,J-DIISOCYANATOTOLUENE	=	TOLUENE 2,4-DIISOCYANATE (TDI)
DIISODECYL PHTHALATE	=	DIISODECYL PHTHALATE
DIISOPROPANOLAMINE	=	DIISOPROPANOLAMINE
DIISOPROPYL ETHER	=	ISOPROPYL ETHER
DIISOPROPYL OXIDE	=	ISOPROPYL ETHER
DIISOPROPYL PERCARBONATE	=	ISOPROPYL PERCARBONATE
DIISOPROPYL PEROXYDICARBONATE	=	ISOPROPYL PERCARBONATE
SYM-DIISOPROPYLACETONE	=	DIISOBUTYL KETONE
DIISOPROPYLAMINE	=	DIISOPROPYLAMINE
DIISOPROPYLBENZENE HYDROPEROXIDE	=	DIISOPROPYLBENZENE HYDROPEROXIDE
DILAUROYL PEROXIDE	=	LAUROYL PEROXIDE
DIMAZINE	=	1,1-DIMETHYLHYDRAZINE
5,8-DIMETHANONAPHTHALENE	=	ENDRIN
1,2-DIMETHOXYETHANE	=	ETHYLENE GLYCOL DIMETHYL ETHER
DIMETHOXYMETHANE	=	METHYL FORMAL
10,11-DIMETHOXYSTRYCHNINE	=	BRUCINE
DIMETHYLACETAMIDE	=	DIMETHYLACETAMIDE
N,N-DIMETHYLACETAMIDE	=	DIMETHYLACETAMIDE
N,N-DIMETHYLACETAMIDE ACETIC ACID, DIMETHYLAMIDE	=	DIMETHYLACETAMIDE
DIMETHYLACETIC ACID	=	ISOBUTYRIC ACID
DIMETHYLAMINE	=	DIMETHYLAMINE
DIMETHYLARSINIC ACID	=	CACODYLIC ACID
1,3-DIMETHYLBENZENE	=	M-XYLENE
1,4-DIMETHYLBENZENE	=	P-XYLENE
1,2-DIMETHYLBENZENE	=	O-XYLENE
ALPHA, ALPHA- DIMETHYLBENZENE HYDROPEROXIDE	=	CUMENE HYDROPEROXIDE
DIMETHYLBENZYL HYDROPEROXIDE	=	CUMENE HYDROPEROXIDE
DIMETHYLBENZYLOCTADECYLAMMONIUM CHLORIDE	=	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE
2,2-DIMETHYLBUTANE	=	NEOHEXANE
DIMETHYLCARBINOL	=	ISOPROPYL ALCOHOL
DIMETHYL CELLOSOLVE	=	ETHYLENE GLYCOL DIMETHYL ETHER
DIMETHYLDICHLOROSILANE	=	DIMETHYLDICHLOROSILANE
DIMETHYL ETHER	=	DIMETHYL ETHER
1,1-DIMETHYLETHYLAMINE	=	TERT-BUTYLAMINE
DIMETHYLFORMAL	=	METHYL FORMAL
DIMETHYLFORMAMIDE	=	DIMETHYLFORMAMIDE
N,N-DIMETHYLFORMAMIDE	=	DIMETHYLFORMAMIDE
2,6-DIMETHYL-4-HEPTANONE	=	DIISOBUTYL KETONE
2,6-DIMETHYL-4-HEPTANOL	=	DIISOBUTYLCARBINOL
DIMETHYLHEXANALS	=	ISOOCTALDEHYDE
DIMETHYLHEXANE DIHYDROPEROXIDE, WET	=	DIMETHYLHEXANE DIHYDROPEROXIDE, WET
2,5-DIMETHYLHEXANE-2,5-DIHYDROPEROXIDE	=	DIMETHYLHEXANE DIHYDROPEROXIDE, WET

SYNONYM		COMPOUND NAME
DIMETHYL-1-HEXANOLS	=	ISOOCTYL ALCOHOL
1,1-DIMETHYLHYDRAZINE	=	1,1-DIMETHYLHYDRAZINE
UNSYM-DIMETHYLHYDRAZINE	=	1,1-DIMETHYLHYDRAZINE
DIMETHYL KETONE	=	ACETONE
DIMETHYLMETHANE	=	PROPANE
2,2-DIMETHYL-3-METHYLENENORBORNANE	=	CAMPHENE
3,3-DIMETHYL-2-METHYLENENORCAMPHANE	=	CAMPHENE
DIMETHYLOCTADECYLBENZYLAMMONIUM CHLORIDE	=	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE
O,O-DIMETHYL-O-(P-NITROPHENYL)PHOSPHOROTHIOATE	=	METHYL PARATHION
O,O-DIMETHYL-O-(P-NITROPHENYL)THIOPHOSPHATE	=	METHYL PARATHION
O, O-DIMETHYL S-\\4-OXO-1,2,3-BENZOTRIAZINE-3\4H'-YL'METHYL' PHOSPHORODITHIOATE	=	AZINPHOSMETHYL
2,6-DIMETHYLPHENOL	=	XYLENOL
DIMETHYL POLYSILOXANE	=	DIMETHYL POLYSILOXANE
DIMETHYL SILICONE FLUIDS	=	DIMETHYL POLYSILOXANE
DIMETHYLSILICONE OIL	=	DIMETHYL POLYSILOXANE
DIMETHYL SULFATE	=	DIMETHYL SULFATE
DIMETHYL SULFIDE	=	DIMETHYL SULFIDE
DIMETHYL SULFOXIDE	=	DIMETHYL SULFOXIDE
DIMETHYL TEREPHTHALATE	=	DIMETHYL TEREPHTHALATE
DIMETHYLZINC	=	DIMETHYLZINC
2,4-DINITRANILINE	=	2,4-DINITROANILINE
2,4-DINITROANILINE	=	2,4-DINITROANILINE
1,3-DINITROBENZENE	=	M-DINITROBENZENE
M-DINITROBENZENE	=	M-DINITROBENZENE
META-DINITROBENZENE	=	M-DINITROBENZENE
DINITROBENZOL	=	M-DINITROBENZENE
1,3-DINITROBENZOL	=	M-DINITROBENZENE
DINITROCRESOLS	=	DINITROCRESOLS
3,5-DINITRO-O-CRESOL	=	DINITROCRESOLS
4,6-DINITRO-O-CRESOL	=	DINITROCRESOLS
2,6-DINITRO-P-CRESOL	=	DINITROCRESOLS
2,6-DINITRO-N,N-DIPROPYL-4-TRIFLUOROMETHYLANILINE	=	TRIFLURALIN
2,6-DINITRO-N,N-DIPROPYL-ALPHA,ALPHA,ALPHA-TRIFLUORO-P-TOLUIDINE	=	TRIFLURALIN
DINITROGEN MONOXIDE	=	NITROUS OXIDE
DINITROGEN TETROXIDE	=	NITROGEN TETROXIDE
ALPHA-DINITROPHENOL	=	2,4-DINITROPHENOL
2,4-DINITROPHENOL	=	2,4-DINITROPHENOL
2,4-DINITROTOLUENE	=	2,4-DINITROTOLUENE
2,4-DINITROTOLUOL	=	2,4-DINITROTOLUENE
DIOCTYL ADIPATE	=	DIOCTYL ADIPATE
DIOCTYL PHTHALATE	=	DIOCTYL PHTHALATE
DIOCTYL SODIUM SULFOSUCCINATE	=	DIOCTYL SODIUM SULFOSUCCINATE
DIOFORM	=	1,2-DICHLOROETHYLENE
DIOXAN	=	1,4-DIOXANE
1,4-DIOXANE	=	1,4-DIOXANE
P-DIOXANE	=	1,4-DIOXANE
DIOXONIUM PERCHLORATE SOLUTION	=	PERCHLORIC ACID
1,3-DIOXOPHTHALAN	=	PHTHALIC ANHYDRIDE
DIPENTENE	=	DIPENTENE
DIPENTYL PHTHALATE	=	DI-N-AMYL PHTHALATE
DIPHENYLAMINE	=	DIPHENYLAMINE
DIPHENYLDICHLOROSILANE	=	DIPHENYLDICHLOROSILANE
DIPHENYL ETHER	=	DIPHENYL ETHER
DIPHENYL KETONE	=	BENZOPHENONE
DIPHENYLMETHANEDIISOCYANATE (MDI)	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
DIPHENYLMETHANE-4,4 -DIISOCYANATE	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
DIPHENYL METHANONE	=	BENZOPHENONE

SYNONYM		COMPOUND NAME
DIPHENYL OXIDE	=	DIPHENYL ETHER
DIPHENYLSILICON DICHLORIDE	=	DIPHENYLDICHLOROSILANE
DI-N-PROPYLAMINE	=	DI-N-PROPYLAMINE
N,N-DIPROPYL-2,6-DINITRO-4-TRIFLUORO-METHYLANILINE	=	TRIFLURALIN
DIPROPYLENE GLYCOL	=	DIPROPYLENE GLYCOL
DISODIUM ARSENATE HEPTAHYDRATE	=	SODIUM ARSENATE
DISODIUM ETHYLENEBIS (DITHIOCARBAMATE)	=	NABAM
DISODIUM METHANEARSONATE	=	METHANEARSONIC ACID, SODIUM SALTS
DISODIUM METHYL ARSONATE	=	METHANEARSONIC ACID, SODIUM SALTS
DISODIUM NITRILOTRIACETATE	=	NITRILOTRIACETIC ACID AND SALTS
DISTILLATE:FLASHED FEED STOCKS	=	DISTILLATE:FLASHED FEED STOCKS
DISTILLATE:STRAIGHT RUN	=	DISTILLATE:STRAIGHT RUN
DISULFATOZIRCONIC ACID	=	ZIRCONIUM SULFATE
DITHANE	=	NABAM
DITHIOPYROPHOSPHORIC ACID,O,O,O,O-TETRAETHYL ESTER	=	TETRAETHYL DITHIOPYROPHOSPHATE
DIVINYL	=	BUTADIENE, INHIBITED
DMDT	=	METHOXYCHLOR
DMF	=	DIMETHYLFORMAMIDE
DMS	=	DIMETHYL SULFIDE
DMSO	=	DIMETHYL SULFOXIDE
DNT	=	2,4-DINITROTOLUENE
DOA	=	DIOCTYL ADIPATE
1-DODECANETHIOL	=	LAURYL MERCAPTAN
DODECANOL	=	LINEAR ALCOHOLS (12-15 CARBONS)
DODECANOL	=	DODECANOL
DODECANOYL PEROXIDE	=	LAUROYL PEROXIDE
DODECENE	=	DODECENE
1-DODECENE	=	1-DODECENE
DODECENE (NON-LINEAR)	=	PROPYLENE TETRAMER
DODECENE (NON-LINEAR)	=	DODECENE
DODECYL ALCOHOL	=	DODECANOL
DODECYLBENZENE	=	DODECYLBENZENE
N-DODECYLBENZENE	=	DODECYLBENZENE
DODECYLBENZENESULFONIC ACID	=	ALKYLBENZENESULFONIC ACIDS
DODECYLBENZENE (LINEAR)	=	DODECYLBENZENE
DODECYLBENZENESULFONIC ACID,CALCIUM SALT	=	DODECYLBENZENESULFONIC ACID,CALCIUM SALT
DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT	=	DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT
DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT	=	DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT
ALPHA-DODECYLENE	=	1-DODECENE
DODECYLETHYLENE	=	1-TETRADECENE
DODECYL MERCAPTAN	=	LAURYL MERCAPTAN
DODECYL SULFATE, AMMONIUM SALT	=	AMMONIUM LAURYL SULFATE
DODECYL SULFATE, DIETHANOLAMINE SALT	=	DODECYL SULFATE, DIETHANOLAMINE SALT
DODECYL SULFATE, MAGNESIUM SALT	=	DODECYL SULFATE, MAGNESIUM SALT
DODECYL SULFATE, SODIUM SALT	=	DODECYL SULFATE, SODIUM SALT
DODECYL SULFATE, TRIETHANOLAMINE SALT	=	DODECYL SULFATE, TRIETHANOLAMINE SALT
DODECYLTRICHLOROSILANE	=	DODECYLTRICHLOROSILANE
DOP	=	DIOCTYL PHTHALATE
DORMANT OIL	=	OIL: SPRAY
DOWANOL DB	=	DIETHYLENE GLYCOL MONOBUTYL ETHER
DOWANOL DE	=	DIETHYLENE GLYCOL MONOETHYL ETHER
DOWANOL DM	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
DOWANOL EB	=	ETHYLENE GLYCOL MONOBUTYL ETHER
DOWANOL EE	=	ETHYLENE GLYCOL MONOETHYL ETHER
DOWANOL EM	=	ETHYLENE GLYCOL MONOMETHYL ETHER
DOWANOL PM	=	PROPYLENE GLYCOL METHYL ETHER
DOWANOL TE	=	ETHOXY TRIGLYCOL
DOWANOL 33B	=	PROPYLENE GLYCOL METHYL ETHER
DOWFUME 40, W-10, W-15, W-40	=	ETHYLENE DIBROMIDE
DOWICIDE 2	=	TRICHLOROPHENOL

SYNONYM		COMPOUND NAME
DOWICIDE 7	=	PENTACHLOROPHENOL
DOWTHERM	=	DOWTHERM
DOWTHERM E	=	C-DICHLOROBENZENE
DRACYCLIC ACID	=	BENZOIC ACID
DRYCLEANERS NAPHTHA	=	NAPHTHA STODDARD SOLVENT
DRYING OIL EPOXIDES	=	EPOXIDIZED VEGETABLE OILS
DSMA	=	METHANEARSONIC ACID, SODIUM SALTS
DUST-LAYING OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
DUTCH LIQUID	=	ETHYLENE DICHLORIDE
DYTOL S-91	=	N-DECYL ALCOHOL
E 3314	=	HEPTACHLOR
EAA	=	ETHYL ACETOACETATE
EADC	=	ETHYLALUMINUM DICHLORIDE
EASC	=	ETHYLALUMINUM SESQUICHLORIDE
EB	=	ETHYLBENZENE
EBDC,SODIUM SALT	=	NABAM
EDC	=	ETHYLENE DICHLORIDE
EDIBLE TALLOW	=	TALLOW
EDTA	=	ETHYLENEDIAMINE TETRACETIC ACID
EKTASOLVE DB ACETATE	=	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
ELECTRICAL INSULATING OIL	=	OIL: TRANSFORMER
EMBAFUME	=	METHYL BROMIDE
ENANTHIC ALCOHOL	=	HEPTANOL
ENDRATE	=	ETHYLENEDIAMINE TETRACETIC ACID
ENDRIN	=	ENDRIN
EPICHLOROHYDRIN	=	EPICHLOROHYDRIN
EPOXIDIZED DRYING OILS	=	EPOXIDIZED VEGETABLE OILS
EPOXIDIZED OILS	=	EPOXIDIZED VEGETABLE OILS
EPOXIDIZED TALL OIL, OCTYL ESTER	=	OCTYL EPOXY TALLATE
EPOXIDIZED VEGETABLE OILS	=	EPOXIDIZED VEGETABLE OILS
1,2-EPOXYBUTANE	=	BUTYLENE OXIDE
1,2-EPOXYETHANE	=	ETHYLENE OXIDE
1,2-EPOXYPROPANE	=	PROPYLENE OXIDE
ERINITRIT	=	SODIUM NITRITE
ERIOCHALCITE (ANHYDROUS)	=	COPPER CHLORIDE
ESKIMON 11	=	TRICHLOROFLUOROMETHANE
ESKIMON 12	=	DICHLORODIFLUOROMETHANE
ESKIMON 22	=	MONOCHLORODIFLUOROMETHANE
ESSENCE OF MIRBANE	=	NITROBENZENE
ETHANAL	=	ACETALDEHYDE
ETHANE	=	ETHANE
ETHANECARBOXYLIC ACID	=	PROPIONIC ACID
ETHANEDIAL	=	GLYOXAL, 40% SOLUTION
1,2-ETHANEDIAMINE	=	ETHYLENEDIAMINE
ETHANEDINITRILE	=	CYANOGEN
ETHANEDIOIC ACID	=	OXALIC ACID
ETHANEDIOIC ACID,DISODIUM SALT	=	SODIUM OXALATE
1,2-ETHANEDIOL	=	ETHYLENE GLYCOL
ETHANENITRILE	=	ACETONITRILE
ETHANETHIOL	=	ETHYL MERCAPTAN
ETHANOIC ACID	=	ACETIC ACID
ETHANOIC ANHYDRIDE	=	ACETIC ANHYDRIDE
ETHANOL	=	ETHYL ALCOHOL
ETHANOLAMINE	=	MONOETHANOLAMINE
ETHENE	=	ETHYLENE
ETHER	=	ETHYL ETHER
ETHINE	=	ACETYLENE
ETHOXYDIHYDROPYRAN	=	ETHOXYDIHYDROPYRAN
2-ETHOXY-3,4-DIHYDRO-2H-PYRAN	=	ETHOXYDIHYDROPYRAN
ETHOXYETHANE	=	ETHYL ETHER
2-ETHOXYETHANOL	=	ETHYLENE GLYCOL MONOETHYL ETHER
2-ETHOXYETHANOL, ACETATE	=	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE

SYNONYM		COMPOUND NAME
2-(2-ETHOXYETHOXY)ETHANOL	=	DIETHYLENE GLYCOL MONOETHYL ETHER
2-ETHOXYETHYL ACETATE	=	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
ETHOXY DIGLYCOL	=	DIETHYLENE GLYCOL MONOETHYL ETHER
ETHOXYLATED DODECANOL	=	ETHOXYLATED DODECANOL
ETHOXYLATED DODECYL ALCOHOL	=	ETHOXYLATED DODECANOL
ETHOXYLATED LAURYL ALCOHOL	=	ETHOXYLATED DODECANOL
ETHOXYLATED MYRISTYL ALCOHOL	=	ETHOXYLATED TETRADECANOL
ETHOXYLATED NONYLPHENOL	=	ETHOXYLATED NONYLPHENOL
ETHOXYLATED PENTADECANOL	=	ETHOXYLATED PENTADECANOL
ETHOXYLATED PENTADECYL ALCOHOL	=	ETHOXYLATED PENTADECANOL
ETHOXYLATED TETRADECANOL	=	ETHOXYLATED TETRADECANOL
ETHOXYLATED TETRADECYL ALCOHOL	=	ETHOXYLATED TETRADECANOL
ETHOXYLATED TRIDECANOL	=	ETHOXYLATED TRIDECANOL
ETHOXYLATED TRIDECYL ALCOHOL	=	ETHOXYLATED TRIDECANOL
ETHOXYTRIETHYLENE GLYCOL	=	ETHOXY TRIGLYCOL
ETHOXY TRIGLYCOL	=	ETHOXY TRIGLYCOL
ETHYL ACETATE	=	ETHYL ACETATE
ETHYLACETIC ACID	=	N-BUTYRIC ACID
ETHYL ACETOACETATE	=	ETHYL ACETOACETATE
ETHYL ACRYLATE	=	ETHYL ACRYLATE
ETHYL ALCOHOL	=	ETHYL ALCOHOL
ETHYL ALDEHYDE	=	ACETALDEHYDE
ETHYLALUMINUM DICHLORIDE	=	ETHYLALUMINUM DICHLORIDE
ETHYLALUMINUM SESQUICHLORIDE	=	ETHYLALUMINUM SESQUICHLORIDE
ETHYLAMINE	=	ETHYLAMINE
ETHYLBENZENE	=	ETHYLBENZENE
ETHYL BUTANOATE	=	ETHYL BUTYRATE
ETHYL BUTANOL	=	ETHYL BUTANOL
2-ETHYL-1-BUTANOL	=	ETHYL BUTANOL
2-ETHYLBUTYL ALCOHOL	=	ETHYL BUTANOL
ETHYL BUTYRATE	=	ETHYL BUTYRATE
2-ETHYLCAPROALDEHYDE	=	ETHYLHEXALDEHYDE
ETHYLCARBINOL	=	N-PROPYL ALCOHOL
ETHYL CARBONATE	=	DIETHYL CARBONATE
ETHYL CHLORACETATE	=	ETHYL CHLOROACETATE
ETHYL CHLORIDE	=	ETHYL CHLORIDE
ETHYL CHLOROACETATE	=	ETHYL CHLOROACETATE
ETHYL CHLOROCARBONATE	=	ETHYL CHLOROFORMATE
ETHYL CHLOROETHANOATE	=	ETHYL CHLOROACETATE
ETHYL CHLOROFORMATE	=	ETHYL CHLOROFORMATE
ETHYL DICHLOROPHOSPHATE	=	ETHYL PHOSPHORODICHLORIDATE
ETHYLDICHLOROSILANE	=	ETHYLDICHLOROSILANE
ETHYLENE	=	ETHYLENE
ETHYLENE ACETATE	=	ETHYLENE GLYCOL DIACETATE
ETHYLENEBIS (DITHIOCARBAMIC ACID),DISODIUM SALT	=	NABAM
ETHYLENE BROMIDE	=	ETHYLENE DIBROMIDE
ETHYLENE CHLORHYDRIN	=	ETHYLENE CHLOROHYDRIN
ETHYLENE CHLORIDE	=	ETHYLENE DICHLORIDE
ETHYLENE CHLOROHYDRIN	=	ETHYLENE CHLOROHYDRIN
ETHYLENE CYANOHYDRIN	=	ETHYLENE CYANOHYDRIN
ETHYLENE DIACETATE	=	ETHYLENE GLYCOL DIACETATE
ETHYLENEDIAMINE	=	ETHYLENEDIAMINE
ETHYLENEDIAMINE TETRACETIC ACID	=	ETHYLENEDIAMINE TETRACETIC ACID
ETHYLENE DIBROMIDE	=	ETHYLENE DIBROMIDE
CIS-1,2-ETHYLENEDICARBOXYLIC ACID	=	MALEIC ACID
TRANS-1,2-ETHYLENEDICARBOXYLIC ACID	=	FUMARIC ACID
ETHYLENE DICHLORIDE	=	ETHYLENE DICHLORIDE
ETHYLENE DIGLYCOL	=	DIETHYLENE GLYCOL
ETHYLENE DIHYDRATE	=	ETHYLENE GLYCOL
(ETHYLENEDINITRILO)TETRAACETIC ACID	=	ETHYLENEDIAMINE TETRACETIC ACID
2,2 -ETHYLENEDIOXYDIETHANOL	=	TRIETHYLENE GLYCOL
ETHYLENE GLYCOL	=	ETHYLENE GLYCOL
ETHYLENE GLYCOL DIACETATE	=	ETHYLENE GLYCOL DIACETATE

SYNONYM		COMPOUND NAME
ETHYLENE GLYCOL DIETHYL ETHER	=	ETHYLENE GLYCOL DIETHYL ETHER
ETHYLENE GLYCOL DIHYDROXYDIETHYL ETHER	=	TRIETHYLENE GLYCOL
ETHYLENE GLYCOL DIMETHYL ETHER	=	ETHYLENE GLYCOL DIMETHYL ETHER
ETHYLENE GLYCOL ETHYL ETHER	=	ETHYLENE GLYCOL MONOETHYL ETHER
ETHYLENE GLYCOL MONOBUTYL ETHER	=	ETHYLENE GLYCOL MONOBUTYL ETHER
ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE	=	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
ETHYLENE GLYCOL MONOETHYL ETHER	=	ETHYLENE GLYCOL MONOETHYL ETHER
ETHYLENE GLYCOL MONOETHYL ETHER ACETATE	=	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
ETHYLENE GLYCOL MONOMETHYL ETHER	=	ETHYLENE GLYCOL MONOMETHYL ETHER
ETHYLENEIMINE	=	ETHYLENEIMINE
ETHYLENEBIS(IMINODIACETIC ACID)	=	ETHYLENEDIAMINE TETRACETIC ACID
ETHYLENE OXIDE	=	ETHYLENE OXIDE
ETHYL ETHANOATE	=	ETHYL ACETATE
ETHYL ETHER	=	ETHYL ETHER
ETHYL FORMATE	=	ETHYL FORMATE
ETHYL FORMIC ESTER	=	ETHYL FORMATE
ETHYLHEXALDEHYDE	=	ETHYLHEXALDEHYDE
2-ETHYLHEXALDEHYDE	=	ETHYLHEXALDEHYDE
2-ETHYLHEXANAL	=	ETHYLHEXALDEHYDE
2-ETHYL HEXANOL	=	2-ETHYL HEXANOL
2-ETHYL-1-HEXANOL	=	2-ETHYL HEXANOL
2-ETHYL-2-HEXENAL	=	2-ETHYL-3-PROPYLACROLEIN
2-ETHYLHEXYL ACRYLATE,INHIBITED	=	2-ETHYLHEXYL ACRYLATE,INHIBITED
2-ETHYLHEXYL ALCOHOL	=	2-ETHYL HEXANOL
2-ETHYLHEXYL 2-PROPENOATE	=	2-ETHYLHEXYL ACRYLATE,INHIBITED
ETHYL HEXYL TALLATE	=	ETHYL HEXYL TALLATE
2-ETHYLHEXYL TRICHLOROPHENOXYACETATE	=	2,4,5-T(ESTERS)
ETHYL 2-HYDROXYPROPANOATE	=	ETHYL LACTATE
ETHYL ALPHA-HYDROXY-PROPIONATE	=	ETHYL LACTATE
5-ETHYLIDENEBICYCLO(2.2.1)HEPT-2-ENE	=	ETHYLIDENENORBORNENE
ETHYLIDENE DIFLUORIDE	=	1,1-DIFLUOROETHANE
ETHYLIDENE FLUORIDE	=	1,1-DIFLUOROETHANE
ETHYLIDENENORBORNENE	=	ETHYLIDENENORBORNENE
ETHYLIDENENORBORNYLENE	=	ETHYLIDENENORBORNENE
ETHYLIDENENORCAMPHENE	=	ETHYLIDENENORBORNENE
ETHYL DL-LACTATE	=	ETHYL LACTATE
ETHYL LACTATE	=	ETHYL LACTATE
ETHYL MERCAPTAN	=	ETHYL MERCAPTAN
ETHYL METHACRYLATE	=	ETHYL METHACRYLATE
ETHYL 2-METHACRYLATE	=	ETHYL METHACRYLATE
ETHYL METHACRYLATE INHIBITED	=	ETHYL METHACRYLATE
ETHYL METHANOATE	=	ETHYL FORMATE
ETHYL METHYL KETONE	=	METHYL ETHYL KETONE
ETHYL ALPHAMETHYLMETHACRYLATE	=	ETHYL METHACRYLATE
ETHYL 2-METHYL-2-PROPENOATE	=	ETHYL METHACRYLATE
5-ETHYL-2-METHYLPYRIDINE	=	METHYLETHYLPYRIDINE
ETHYL NITRILE	=	ACETONITRILE
ETHYL NITRITE	=	ETHYL NITRITE
ETHYL ORTHOSILICATE	=	ETHYL SILICATE
ETHYL OXIDE	=	ETHYL ETHER
ETHYL 3-OXOBUTANOATE	=	ETHYL ACETOACETATE
ETHYL PARATHION	=	PARATHION, LIQUID
ETHYL PHENYLDICHLOROSILANE	=	ETHYL PHENYLDICHLOROSILANE
ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS	=	ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS
ETHYL PHOSPHORODICHLORIDO-THIONATE	=	ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS
ETHYL PHOSPHORODICHLORIDATE	=	ETHYL PHOSPHORODICHLORIDATE
ETHYL PHTHALATE	=	DIETHYL PHTHALATE
5-ETHYL-2-PICOLINE	=	METHYLETHYLPYRIDINE
ETHYL 2-PROPENOATE	=	ETHYL ACRYLATE
2-ETHYL-3-PROPYLACROLEIN	=	2-ETHYL-3-PROPYLACROLEIN
2-ETHYL-3-PROPYLACRYLALDEHYDE	=	2-ETHYL-3-PROPYLACROLEIN

SYNONYM		COMPOUND NAME
ETHYL PYROPHOSPHATE	=	TETRAETHYL PYROPHOSPHATE
ETHYL SILICATE	=	ETHYL SILICATE
ETHYL SILICATE CONDENSED	=	ETHYL SILICATE
ETHYL SILICATE 40	=	ETHYL SILICATE
ETHYL SILICON TRICHLORIDE	=	ETHYLTRICHLOROSILANE
ETHYL SILICONE TRICHLORIDE	=	ETHYLTRICHLOROSILANE
ETHYL SULFHYDRATE	=	ETHYL MERCAPTAN
ETHYL T..IONOPHOSPHONYL DICHLORIDE	=	ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS
ETHYLTRICHLOROSILANE	=	ETHYLTRICHLOROSILANE
ETHYL ZINC	=	DIETHYLZINC
ETHYNE	=	ACETYLENE
EUFIN	=	DIETHYL CARBONATE
EUNATROL	=	OLEIC ACID, SODIUM SALT
EXITELITE	=	ANTIMONY TRIOXIDE
F-11	=	TRICHLOROFLUOROMETHANE
F-12	=	DICHLORODIFLUOROMETHANE
F-22	=	MONOCHLORODIFLUOROMETHANE
FAST RED GG BASE	=	4-NITROANILINE
FAST RED TR BASE	=	4-CHLORO-O-TOLUIDINE
FAST RED ZG BASE	=	4-NITROANILINE
FERMENTATION ALCOHOL	=	ETHYL ALCOHOL
FERMENTATION AMYL ALCOHOL	=	ISOAMYL ALCOHOL
FERMENTATION BUTYL ALCOHOL	=	ISOBUTYL ALCOHOL
FERRIC AMMONIUM CITRATE	=	FERRIC AMMONIUM CITRATE
FERRIC AMMONIUM CITRATE, BROWN	=	FERRIC AMMONIUM CITRATE
FERRIC AMMONIUM CITRATE, GREEN	=	FERRIC AMMONIUM CITRATE
FERRIC AMMONIUM OXALATE	=	FERRIC AMMONIUM OXALATE
FERRIC CHLORIDE	=	FERRIC CHLORIDE
FERRIC CHLORIDE, ANHYDROUS	=	FERRIC CHLORIDE
FERRIC CHLORIDE, HEXAHYDRATE	=	FERRIC CHLORIDE
FERRIC GLYCEROPHOSPHATE	=	FERRIC GLYCEROPHOSPHATE
FERRIC NITRATE	=	FERRIC NITRATE
FERRIC NITRATE NONAHYDRATE	=	FERRIC NITRATE
FERRIC SULFATE	=	FERRIC SULFATE
FERROUS AMMONIUM SULFATE	=	FERROUS AMMONIUM SULFATE
FERROUS AMMONIUM SULFATE HEXAHYDRATE	=	FERROUS AMMONIUM SULFATE
FERROUS BOROFLUORIDE	=	FERROUS FLUOROBORATE
FERROUS CHLORIDE	=	FERROUS CHLORIDE
FERROUS CHLORIDE TETRAHYDRATE	=	FERROUS CHLORIDE
FERROUS FLUOROBORATE	=	FERROUS FLUOROBORATE
FERROUS OXALATE	=	FERROUS OXALATE
FERROUS OXALATE DIHYDRATE	=	FERROUS OXALATE
FERROUS SULFATE	=	FERROUS SULFATE
FERROX	=	FERROUS OXALATE
FERTILIZER ACID	=	SULFURIC ACID
FILMERINE	=	SODIUM NITRITE
FISH OIL	=	OIL: FISH
FLAXSEED OIL	=	OILS MISCELLANEOUS: LINSEED
FLOWERS OF ANTIMONY	=	ANTIMONY TRIOXIDE
FLUORINE	=	FLUORINE
FLUOROETHYLENE	=	VINYL FLUORIDE, INHIBITED
FLUOROSILICIC ACID	=	FLUOSILICIC ACID
FLUOROSULFONIC ACID	=	FLUOSULFONIC ACID
FLUOROSULFURIC ACID	=	FLUOSULFONIC ACID
FLUORSPAR	=	CALCIUM FLUORIDE
FLUOSILICIC ACID	=	FLUOSILICIC ACID
FLUOSPAR	=	CALCIUM FLUORIDE
FLUOSULFONIC ACID	=	FLUOSULFONIC ACID
FLUX	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
FLUXING OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
FLUX OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
FOLIAGE OIL	=	OIL: SPRAY
FORMALDEHYDE DIMETHYLACETAL	=	METHYL FORMAL
FORMALDEHYDE POLYMER	=	PARAFORMALDEHYDE

SYNONYM	COMPOUND NAME
FORMALDEHYDE SOLUTION	FORMALDEHYDE SOLUTION
FORMALIN	FORMALDEHYDE SOLUTION
FORMALITH	FORMALDEHYDE SOLUTION
FORMIC ACID	FORMIC ACID
FORMIC ACID, AMMONIUM SALT	AMMONIUM FORMATE
FORMIC ACID, ETHYL ESTER	ETHYL FORMATE
FORMIC ACID, METHYL ESTER	METHYL FORMATE
FORMIC ALDEHYDE	FORMALDEHYDE SOLUTION
FORMIC ETHER	ETHYL FORMATE
FORMIN	HEXAMETHYLENETETRAMINE
FORMYLIC ACID	FORMIC ACID
FREON 11	TRICHLOROFLUOROMETHANE
FREON 12	DICHLORODIFLUOROMETHANE
FREON 22	MONOCHLORODIFLUOROMETHANE
FRIGEN 11	TRICHLOROFLUOROMETHANE
FRIGEN 12	DICHLORODIFLUOROMETHANE
NO. 1 FUEL OIL	KEROSENE
NO.1 FUEL OIL	OIL: RANGE
FUEL OIL NO. 1	JET FUEL: JP-1(KEROSENE)
FUEL OIL 1-D	OIL: DIESEL
FUEL OIL: 1-D	FUEL OIL: 1-D
FUEL OIL NO. 2	FUEL OIL: 2
FUEL OIL: NO 1(KEROSENE)	FUEL OIL: NO 1(KEROSENE)
FUEL OIL: 2	FUEL OIL: 2
FUEL OIL 2-D	OIL: DIESEL
FUEL OIL: 2-D	FUEL OIL: 2-D
FUEL OIL: 4	FUEL OIL: 4
FUEL OIL NO. 4	FUEL OIL: 4
FUEL OIL NO. 5	FUEL OIL: 5
FUEL OIL: 5	FUEL OIL: 5
FUEL OIL NO. 6	FUEL OIL: 6
FUEL OIL: 6	FUEL OIL: 6
FUMARIC ACID	FUMARIC ACID
FUMIGRAIN	ACRYLONITRILE
FUMING LIQUID ARSENIC	ARSENIC TRICHLORIDE
FUMING SULFURIC ACID	OLEUM
FURAL	FURFURAL
2-FURALDEHYDE	FURFURAL
2-FURANCARBINOL	FURFURYL ALCOHOL
2,5-FURANEDIONE	MALEIC ANHYDRIDE
FURFURAL	FURFURAL
FURFURALCOHOL	FURFURYL ALCOHOL
FURFURALDEHYDE	FURFURAL
FURFUROLE	FURFURAL
FURFURYL ALCOHOL	FURFURYL ALCOHOL
2-FURYLCARBINOL	FURFURYL ALCOHOL
ALPHA-FURYLCARBINOL	FURFURYL ALCOHOL
FUSEL OIL	ISOAMYL ALCOHOL
FYDE	FORMALDEHYDE SOLUTION
GALLIC ACID	GALLIC ACID
GALLIC ACID MONOHYDRATE	GALLIC ACID
GALLOTANNIC ACID	TANNIC ACID
GALLOTANNIN	TANNIC ACID
GAMMEXANE	BENZENE HEXACHLORIDE
GAS OIL: CRACKED	GAS OIL: CRACKED
GASOLINE, AUTOMOTIVE (LESS THAN 4.23 G LEAD/GAL)	GASOLINE, AUTOMOTIVE (LESS THAN 4.23 G LEAD/GAL)
GASOLINE, AVIATION (LESS THAN 4.86 G LEAD/GAL)	GASOLINE, AVIATION (LESS THAN 4.86 G LEAD/GAL)
GASOLINE BLENDING STOCKS: ALKYLATES	GASOLINE BLENDING STOCKS: ALKYLATES
GASOLINE BLENDING STOCKS: REFORMATES	GASOLINE BLENDING STOCKS: REFORMATES
GASOLINE: CASINGHEAD	GASOLINE: CASINGHEAD
GASOLINE: POLYMER	GASOLINE: POLYMER
GASOLINE: STRAIGHT RUN	GASOLINE: STRAIGHT RUN
GELBIN YELLOW ULTRAMARINE	CALCIUM CHROMATE

SYNONYM		COMPOUND NAME
GENETRON 11	=	TRICHLOROFLUOROMETHANE
GENETRON 12	=	DICHLORODIFLUOROMETHANE
GENETRON 22	=	MONOCHLORODIFLUOROMETHANE
GERHARDITE	=	COPPER NITRATE
GEXANE	=	BENZENE HEXACHLORIDE
GLACIAL ACETIC ACID	=	ACETIC ACID
D-GLUCITOL	=	SORBITOL
GLUCOSE SOLUTION	=	DEXTROSE SOLUTION
GLUTARALDEHYDE SOLUTION	=	GLUTARALDEHYDE SOLUTION
GLYCERINE	=	GLYCERINE
GLYCERITE	=	TANNIC ACID
GLYCEROL	=	GLYCERINE
GLYCIDYL METHACRYLATE	=	GLYCIDYL METHACRYLATE
GLYCIDYL ALPHA-METHYL ACRYLATE	=	GLYCIDYL METHACRYLATE
GLYCOL	=	ETHYLENE GLYCOL
GLYCOL BUTYL ETHER	=	ETHYLENE GLYCOL MONOBUTYL ETHER
GLYCOL CHLOROHYDRIN	=	ETHYLENE CHLOROHYDRIN
GLYCOL CYANOHYDRIN	=	ETHYLENE CYANOHYDRIN
GLYCOL DIACETATE	=	ETHYLENE GLYCOL DIACETATE
GLYCOL DIBROMIDE	=	ETHYLENE DIBROMIDE
GLYCOL DICHLORIDE	=	ETHYLENE DICHLORIDE
GLYCOL ETHYL ETHER	=	ETHYLENE
GLYCOL MONOBUTYL ETHER ACETATE	=	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
GLYCOL MONOETHYL ETHER	=	ETHYLENE GLYCOL MONOETHYL ETHER
GLYCOL MONOMETHYL ETHER	=	ETHYLENE GLYCOL MONOMETHYL ETHER
GLYCOL MONOETHYL ETHER ACETATE	=	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
GLYOXAL, 40% SOLUTION	=	GLYOXAL, 40% SOLUTION
GRAIN ALCOHOL	=	ETHYL ALCOHOL
GRAPE SUGAR SOLUTION	=	DEXTROSE SOLUTION
GREEN OIL	=	ANTHRACENE
GREEN VITRIOL	=	FERROUS SULFATE
GREMALCENE	=	TRICHLOROETHYLENE
GUM TURPENTINE	=	TURPENTINE
GUSATHION INSECTICIDE	=	AZINPHOSMETHYL
GUTHION INSECTICIDE	=	AZINPHOSMETHYL
HALOGENATED WAXES	=	POLYCHLORINATED BIPHENYL (PCB)
HALON 122	=	DICHLORODIFLUOROMETHANE
HARTSHORN	=	AMMONIUM CARBONATE
HCH	=	BENZENE HEXACHLORIDE
HENDECANOIC ALCOHOL	=	UNDECANOL
1-HENDECANOL	=	UNDECANOL
N-HENDECYCLENIC ALCOHOL	=	UNDECANOL
HEOD	=	DIELDRIN
HEPTACHLOR	=	HEPTACHLOR
1,4,5,6,7,8,8A-HEPTACHLORODICYCLOPENTADIENE	=	HEPTACHLOR
1,4,5,6,7,8,8-HEPTACHLORO-3A,4,7,7A-TETRAHYDRO-4,7-METHANOINDENE	=	HEPTACHLOR
1-HEPTADECANECARBOXYLIC ACID	=	STEARIC ACID
CIS-8-HEPTADECYLENE-CARBOXYLIC ACID	=	OLEIC ACID
HEPTANE	=	HEPTANE
N-HEPTANE	=	HEPTANE
HEPTANOL	=	HEPTANOL
1-HEPTANOL	=	HEPTANOL
2-HEPTANONE	=	N-AMYL METHYL KETONE
1-HEPTENE	=	1-HEPTENE
HEPTYL ALCOHOL	=	HEPTANOL
HEPTYLCARBINOL	=	OCTANOL
HEPTYLENE	=	1-HEPTENE
N-HEPTYLETHYLENE	=	1-NONENE
HERCOFLEX 260	=	DIOCTYL PHTHALATE
HEXA	=	HEXAMETHYLENETETRAMINE

SYNONYM		COMPOUND NAME
1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE	=	BENZENE HEXACHLORIDE
HEXACHLOROCYCLOPENTADIENE	=	HEXACHLOROCYCLOPENTADIENE
ENDO, EXO-1,2,3,4,10,10-HEXACHLORO-6,7-EPOXY-1,4,4A,5,6,7,8,8A-OCTAHYDRO-1,4:5,8-DIMETHANONAPTHALENE	=	DIELDRIN
1,2,3,4,10,10-HEXACHLORO-6,7-EPOXY-1,4,4A,5,6,7,8,8A-OCTAHYDRO-ENDO,ENDO-1	=	ENDRIN
ENDO, EXO-1,2,3,4,10-HEXACHLORO-1,4,4A,5,8,8A-HEXAHYDRO-1,4:5,8-DIMETHANONAPHTHALENE	=	ALDRIN
HEXADECYL SULFATE, SODIUM SALT	=	HEXADECYL SULFATE, SODIUM SALT
HEXADECYLBENZENESULFONIC ACID	=	ALKYLBENZENESULFONIC ACIDS
HEXADECYLTRIMETHYLAMMONIUM CHLORIDE	=	HEXADECYLTRIMETHYLAMMONIUM CHLORIDE
HEXADRIN	=	ENDRIN
HEXAFLUOSILICIC ACID	=	FLUOSILICIC ACID
HEXAHYDRIC ALCOHOL	=	SORBITOL
HEXAHYDROANILINE	=	CYCLOHEXYLAMINE
HEXAHYDRO-2H-AZEPIN-2-ONE	=	CAPROLACTAM, LIQUID
HEXAHYDROAZEPINE	=	HEXAMETHYLENEIMINE
HEXAHYDROBENZENE	=	CYCLOHEXANE
HEXAHYDRO-1,4-DIAZINE	=	PIPERAZINE
HEXAHYDROPHENOL	=	CYCLOHEXANOL
HEXAHYDROPYRAZINE	=	PIPERAZINE
N-HEXALDEHYDE	=	N-HEXALDEHYDE
HEXALIN	=	CYCLOHEXANOL
HEXAMETHYLENE	=	CYCLOHEXANE
HEXAMETHYLENEAMINE	=	HEXAMETHYLENETETRAMINE
HEXAMETHYLENEDIAMINE	=	HEXAMETHYLENEDIAMINE
HEXAMETHYLENEIMINE	=	HEXAMETHYLENEIMINE
HEXAMETHYLENETETRAMINE	=	HEXAMETHYLENETETRAMINE
HEXAMINE	=	HEXAMETHYLENETETRAMINE
HEXANAL	=	N-HEXALDEHYDE
HEXANAPHTHENE	=	CYCLOHEXANE
HEXANE	=	HEXANE
1,6-HEXANEDIAMINE	=	HEXAMETHYLENEDIAMINE
HEXANEDIOIC ACID	=	ADIPIC ACID
1,2,3,4,5,6-HEXANEHEXOL	=	SORBITOL
HEXANOL	=	HEXANOL
1-HEXANOL	=	HEXANOL
2-HEXANONE	=	METHYL N-BUTYL KETONE
ALPHA-HEXENE	=	1-HEXENE
1-HEXENE	=	1-HEXENE
HEXONE	=	METHYL ISOBUTYL KETONE
HEXYL ACETATE	=	METHYL AMYL ACETATE
HEXYL ALCOHOL	=	HEXANOL
SEC-HEXYL ALCOHOL	=	ETHYL BUTANOL
HEXYLENE GLYCOL	=	HEXYLENE GLYCOL
HGI	=	BENZENE HEXACHLORIDE
HHDN	=	ALDRIN
HI-DRY	=	TETRAETHYLENE GLYCOL
HIGH-SPEED BEARING OIL	=	OIL: SPINDLE
HIGHER FATTY ALCOHOL	=	TALLOW FATTY ALCOHOL
HMDA	=	HEXAMETHYLENEDIAMINE
HOME HEATING OIL	=	FUEL OIL: 2
HOMOPIPERIDINE	=	HEXAMETHYLENEIMINE
HOUSEHOLD AMMONIA	=	AMMONIUM HYDROXIDE
HTH	=	CALCIUM HYPOCHLORITE
HTH DRY CHLORINE	=	CALCIUM HYPOCHLORITE
HYDRACRYLIC ACID,BETA-LACTONE	=	BETA-PROPIOLACTONE

SYNONYM		COMPOUND NAME
HYDRACRYLONITRILE	=	ETHYLENE CYANOHYDRIN
HYDRAZINE	=	HYDRAZINE
HYDRAZOIC ACID,SODIUM SALT	=	SODIUM AZIDE
HYDROBROMIC ACID, ANHYDROUS	=	HYDROGEN BROMIDE
HYDROCHLORIC ACID	=	HYDROCHLORIC ACID
HYDROCHLORIC ACID, ANHYDROUS	=	HYDROGEN CHLORIDE
HYDROCYANIC ACID	=	HYDROGEN CYANIDE
HYDROCYANIC ACID, SODIUM SALT	=	SODIUM CYANIDE
HYDROFLUORIC ACID	=	HYDROFLUORIC ACID
HYDROFLUORIC ACID, ANHYDROUS	=	HYDROGEN FLUORIDE
HYDROFLUOSILICIC ACID	=	FLUOSILICIC ACID
HYDROGEN BROMIDE	=	HYDROGEN BROMIDE
HYDROGEN BROMIDE, ANHYDROUS	=	HYDROGEN BROMIDE
HYDROGEN CHLORIDE	=	HYDROGEN CHLORIDE
HYDROGEN CYANIDE	=	HYDROGEN CYANIDE
HYDROGEN FLUORIDE	=	HYDROGEN FLUORIDE
HYDROGEN HEXAFLUOROSILICATE	=	FLUOSILICIC ACID
HYDROGEN PEROXIDE	=	HYDROGEN PEROXIDE
HYDROGEN PEROXIDE CARBAMIDE	=	UREA PEROXIDE
HYDROGEN SULFIDE	=	HYDROGEN SULFIDE
HYDROGEN, LIQUEFIED	=	HYDROGEN, LIQUEFIED
HYDROPEROXYCYCLOHEXYL HYDROXYCYCLOHEXYL PEROXIDE	=	CYCLOHEXANONE PEROXIDE
1-HYDROPEROXYCYCLOHEXYL 1-HYDROXYCYCLOHEXYL PEROXIDE	=	CYCLOHEXANONE PEROXIDE
HYDROQUINOL	=	HYDROQUINONE
HYDROQUINONE	=	HYDROQUINONE
HYDROXY ETHER	=	ETHYLENE GLYCOL MONOETHYL ETHER
HYDROXYBENZENE	=	PHENOL
P-HYDROXYBENZENSULFONIC ACID,ZINC SALT	=	ZINC PHENOLSULFONATE
O-HYDROXYBENZOIC ACID	=	SALICYLIC ACID
1-HYDROXYBUTANE	=	N-BUTYL ALCOHOL
2-HYDROXYBUTANE	=	SEC-BUTYL ALCOHOL
1-HYDROXY-2-CYANOETHANE	=	ETHYLENE CYANOHYDRIN
HYDROXYCYCLOHEXANE	=	CYCLOHEXANOL
HYDROXYDIMETHYLARSINE OXIDE	=	CACODYLIC ACID
1-HYDROXY-2,4-DINITROBENZENE	=	2,4-DINITROPHENOL
BETA-HYDROXYETHYL ACRYLATE	=	2-HYDROXYETHYL ACRYLATE, INHIBITED
2-HYDROXYETHYL ACRYLATE, INHIBITED	=	2-HYDROXYETHYL ACRYLATE, INHIBITED
2-HYDROXYETHYLAMINE	=	MONOETHANOLAMINE
N-HYDROXYETHYL-1,2-ETHANEDIAMINE	=	AMINOETHYLETHANOLAMINE
N-BETA HYDROXYETHYLETHYLENEDIAMINE	=	AMINOETHYLETHANOLAMINE
2-HYDROXYETHYL 2-PROPENOATE	=	2-HYDROXYETHYL ACRYLATE, INHIBITED
1-HYDROXYHEPTANE	=	HEPTANOL
1-HYDROXYHEXANE	=	HEXANOL
ALPHA-HYDROXYISOBUTYRONITRILE	=	ACETONE CYANOHYDRIN
HYDROXYLAMINE SULFATE	=	HYDROXYLAMINE SULFATE
2-HYDROXYMETHYLFURAN	=	FURFURYL ALCOHOL
TETRAKIS (HYDROXYMETHYL) METHANE	=	PENTAERYTHRITOL
4-HYDROXY-4-METHYL-2-PENTANONE	=	DIACETONE ALCOHOL
4-HYDROXYNITROBENZENE	=	4-NITROPHENOL
2-HYDROXYNITROBENZENE	=	2-NITROPHENOL
2,2-BIS(P-HYDROXYPHENYL)PROPANE, DIGLYCIDYL ETHER	=	BISPHENOL A DIGLYCIDYL ETHER
3-HYDROXYPROPANENITRILE	=	ETHYLENE CYANOHYDRIN
2-HYDROXY-1,2,3-PROPANETRICARBOXYLIC ACID	=	CITRIC ACID
2-HYDROXYPROPANOIC ACID	=	LACTIC ACID
ALPHA-HYDROXYPROPIONIC ACID	=	LACTIC ACID
HYDROXYPROPYL ACRYLATE	=	HYDROXYPROPYL ACRYLATE
2-HYDROXYPROPYLAMINE	=	MONOISOPROPANOLAMINE
HYDROXYPROPYL METHACRYLATE	=	HYDROXYPROPYL METHACRYLATE
6-HYDROXY-3-(2H)-PYRIDAZINONE	=	MALEIC HYDRAZIDE
HYDROXYTOLUENES	=	CRESOLS

SYNONYM		COMPOUND NAME
ALPHA-HYDROXYTOLUENE	=	BENZYL ALCOHOL
BETA-HYDROXYTRICARBALLYLIC ACID	=	CITRIC ACID
BETA-HYDROXYTRICARBOXYLIC ACID	=	CITRIC ACID
2-HYDROXY-M-XYLENE	=	XYLENOL
HYLENE M50	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
HYLENE T	=	TOLUENE 2,4-DIISOCYANATE (TDI)
HYTROL O	=	CYCLOHEXANONE
IBN	=	ISOBUTYRONITRILE
ILLUMINATING OIL	=	KEROSENE
2,2 -IMINODIETHANOL	=	DIETHANOLAMINE
1,1 -IMINODI-2-PROPANOL	=	DIISOPROPANOLAMINE
IMPERIAL GREEN	=	COPPER ACETOARSENITE
INEDIBLE TALLOW	=	TALLOW
INSULATING OIL	=	OIL: TRANSFORMER
IRON AMMONIUM SULFATE	=	FERROUS AMMONIUM SULFATE
IRON (III) CHLORIDE	=	FERRIC CHLORIDE
IRON DICHLORIDE	=	FERROUS CHLORIDE
IRON(OUS)SULFATE	=	FERROUS SULFATE
IRON PERCHLORIDE	=	FERRIC CHLORIDE
IRON PROTOCHLORIDE	=	FERROUS CHLORIDE
IRON PROTOXALATE	=	FERROUS OXALATE
IRON SESQUISULFATE	=	FERRIC SULFATE
IRON (III) SULFATE	=	FERRIC SULFATE
IRON TERSULFATE	=	FERRIC SULFATE
IRON TRICHLORIDE	=	FERRIC CHLORIDE
IRON VITRIOL	=	FERROUS SULFATE
ISEON 11	=	TRICHLOROFLUOROMETHANE
ISOAMYL ALCOHOL	=	ISOAMYL ALCOHOL
ISOBUTANE	=	ISOBUTANE
ISOBUTANOL	=	ISOBUTYL ALCOHOL
ISOBUTENE	=	ISOBUTYLENE
ISOBUTENYL METHYL KETONE	=	MESITYL OXIDE
ISOBUTYL ACETATE	=	ISOBUTYL ACETATE
ISOBUTYL ALCOHOL	=	ISOBUTYL ALCOHOL
ISOBUTYLALDEHYDE	=	ISO-BUTYRALDEHYDE
ISO-BUTYLAMINE	=	ISOBUTYLAMINE
ISOBUTYLAMINE	=	ISOBUTYLAMINE
ISOBUTYLCARBINOL	=	ISOAMYL ALCOHOL
ISOBUTYLENE	=	ISOBUTYLENE
ISOBUTYL METHYL CARBINOL	=	METHYL ISOBUTYL CARBINOL
ISOBUTYLMETHYL CARBINOL	=	METHYL AMYL ALCOHOL
ISOBUTYL METHYL KETONE	=	METHYL ISOBUTYL KETONE
ISOBUTYLMETHYLMETHANOL	=	METHYL AMYL ALCOHOL
ISOBUTYRALDEHYDE	=	ISO-BUTYRALDEHYDE
ISOBUTYRIC ACID	=	ISOBUTYRIC ACID
ISOBUTYRIC ALDEHYDE	=	ISO-BUTYRALDEHYDE
ISOBUTYRONITRILE	=	ISOBUTYRONITRILE
ISOCYANIC ACID, 4-METHYL-M-PHENYLENE ESTER	=	TOLUENE 2,4-DIISOCYANATE (TDI)
ISODECALDEHYDE	=	ISODECALDEHYDE
ISODECALDEHYDE, MIXED ISOMERS	=	ISODECALDEHYDE
ISO-DECYL ACRYLATE	=	ISODECYL ACRYLATE, INHIBITED
ISODECYL ACRYLATE, INHIBITED	=	ISODECYL ACRYLATE, INHIBITED
ISODECYL ALCOHOL	=	ISODECYL ALCOHOL
ISODIPRENE	=	CARENE
ISOHEXANE	=	ISOHEXANE
ISONITROPROPANE	=	2-NITROPROPANE
ISOOCTALDEHYDE	=	ISOOCTALDEHYDE
ISOOCTYL ALCOHOL	=	ISOOCTYL ALCOHOL
ISOOCTYL ALDEHYDE	=	ISOOCTALDEHYDE
ISOOCTYL TRICHLOROPHENOXYACETATE	=	2,4,5-T(ESTERS)
ISOPENTANE	=	ISOPENTANE
ISOPENTYL ALCOHOL	=	ISOAMYL ALCOHOL
ISOPENTYL NITRITE	=	ISO-AMYL NITRITE
ISOPHORONE	=	ISOPHORONE

SYNONYM		COMPOUND NAME
ISOPHTHALIC ACID	=	ISOPHTHALIC ACID
ISOPRENE	=	ISOPRENE
ISOPROPANOL	=	ISOPROPYL ALCOHOL
ISOPROPANOLAMINE	=	MONOISOPROPANOLAMINE
ISOPROPENYLBENZENE	=	ALPHA-METHYLSTYRENE
ISOPROPENYL METHYL KETONE	=	METHYL ISOPROPENYL KETONE, INHIBITED
2-ISOPROPOXYPROPANE	=	ISOPROPYL ETHER
ISOPROPYL ACETATE	=	ISOPROPYL ACETATE
ISOPROPYLACETONE	=	METHYL ISOBUTYL KETONE
ISOPROPYL ALCOHOL	=	ISOPROPYL ALCOHOL
ISO-PROPYLAMINE	=	ISOPROPYLAMINE
ISOPROPYLAMINE	=	ISOPROPYLAMINE
ISOPROPYLAMINE DODECYLBENZENESULFONATE	=	DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT
ISOPROPYLBENZENE	=	CUMENE
ISOPROPYLBENZENE HYDROPEROXIDE	=	CUMENE HYDROPEROXIDE
ISOPROPYLCARBINOL	=	ISOBUTYL ALCOHOL
ISOPROPYLCUMYL HYDROPEROXIDE	=	DIISOPROPYLBENZENE HYDROPEROXIDE
ISOPROPYL CYANIDE	=	ISOBUTYRONITRILE
ISOPROPYL 2,4-DICHLOROPHENOXY ACETATE	=	2,4-D ESTERS
ISOPROPYL ETHER	=	ISOPROPYL ETHER
ISOPROPYLFORMIC ACID	=	ISOBUTYRIC ACID
ISOPROPYLIDENEACETONE	=	MESITYL OXIDE
4,4 -ISOPROPYLIDENEDIPHENOL	=	BISPHENOL A
4,4 -ISOPROPYLIDENEDIPHENOLEPICHLOROHYDRIN RESIN	=	BISPHENOL A DIGLYCIDYL ETHER
ISOPROPYL MERCAPTAN	=	ISOPROPYL MERCAPTAN
ISOPROPYL PERCARBONATE	=	ISOPROPYL PERCARBONATE
ISOPROPYL PEROXYDICARBONATE	=	ISOPROPYL PERCARBONATE
P-ISOPROPYLTOLUENE	=	P-CYMENE
ISOPROPYLTOLUOL	=	P-CYMENE
ISOTRIDECANOL	=	TRIDECANOL
ISOTRIDECYL ALCOHOL	=	TRIDECANOL
ISOTRON 11	=	TRICHLOROFLUOROMETHANE
ISOTRON 12	=	DICHLORODIFLUOROMETHANE
ISOTRON 22	=	MONOCHLORODIFLUOROMETHANE
ISOVALERAL	=	ISOVALERALDEHYDE
ISOVALERALDEHYDE	=	ISOVALERALDEHYDE
ISOVALERIC ALDEHYDE	=	ISOVALERALDEHYDE
ISOVALERONE	=	DIISOBUTYL KETONE
JP-1	=	OIL: RANGE
JP-1	=	FUEL OIL: NO 1(KEROSENE)
JP-1	=	KEROSENE
JET FUEL: JP-1(KEROSENE)	=	JET FUEL: JP-1(KEROSENE)
JET FUEL: JP-3	=	JET FUEL: JP-3
JET FUEL: JP-4	=	JET FUEL: JP-4
JET FUEL: JP-5(KEROSENE, HEAVY)	=	JET FUEL: JP-5(KEROSENE, HEAVY)
JOCUTIN	=	BENZENE HEXACHLORIDE
KEL F MONOMER	=	TRIFLUOROCHLOROETHYLENE
KELTHANE	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
KELTHANETHANOL	=	4,4 -DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
KEROSENE	=	OIL: RANGE
KEROSENE	=	JET FUEL: JP-1(KEROSENE)
KEROSENE	=	FUEL OIL: NO 1(KEROSENE)
KEROSENE	=	KEROSENE
KEROSENE, HEAVY	=	JET FUEL: JP-5(KEROSENE, HEAVY)
KEROSENE, HEAVY	=	OIL: SPRAY
KEROSINE	=	KEROSENE
KEROSINE	=	OIL: RANGE
KEROSINE	=	FUEL OIL: NO 1(KEROSENE)
KEROSINE	=	JET FUEL: JP-1(KEROSENE)
2-KETOHEPTANE	=	N-AMYL METHYL KETONE

SYNONYM	COMPOUND NAME
2-KETOHEXAMETHYLENIMINE	CAPROLACTAM, LIQUID
KETTLE-RENDERED LARD	OILS EDIBLE, LARD
KILLAX	TETRAETHYL PYROPHOSPHATE
KINGS GOLD	ARSENIC TRISULFIDE
KINGS GREEN	COPPER ACETOARSENITE
KINGS YELLOW	ARSENIC TRISULFIDE
KNELL	BENZENE HEXACHLORIDE
LACTIC ACID	LACTIC ACID
DL-LACTIC ACID, AMMONIUM SALT	AMMONIUM LACTATE
LACTIC ACID, ETHYL ESTER	ETHYL LACTATE
LAH	LITHIUM ALUMINUM HYDRIDE
LATEX, LIQUID SYNTHETIC	LATEX, LIQUID SYNTHETIC
LAUGHING GAS	NITROUS OXIDE
LAUROYL PEROXIDE	LAUROYL PEROXIDE
LAURYL ALCOHOL	DODECANOL
LAURYL AMMONIUM SULFATE	AMMONIUM LAURYL SULFATE
LAURYL BENZENE	DODECYLBENZENE
LAURYL MAGNESIUM SULFATE	DODECYL SULFATE, MAGNESIUM SALT
LAURYL MERCAPTAN	LAURYL MERCAPTAN
LAURYL SODIUM SULFATE	DODECYL SULFATE, SODIUM SALT
LAURYL SULFATE, MAGNESIUM SALT	DODECYL SULFATE, MAGNESIUM SALT
LAURYL SULFATE, SODIUM SALT	DODECYL SULFATE, SODIUM SALT
LAURYL SULFATE, TRIETHANOLAMINE SALT	DODECYL SULFATE, TRIETHANOLAMINE SALT
LEAD (IV) ACETATE	LEAD TETRAACETATE
LEAD ACETATE	LEAD ACETATE
LEAD ACETATE TRIHYDRATE	LEAD ACETATE
LEAD ARSENATE	LEAD ARSENATE
LEAD ARSENATE, ACID	LEAD ARSENATE
LEAD DIFLUORIDE	LEAD FLUORIDE
LEAD FLUOBORATE	LEAD FLUOROBORATE
LEAD FLUORIDE	LEAD FLUORIDE
LEAD FLUOROBORATE	LEAD FLUOROBORATE
LEAD FLUOROBORATE SOLUTION	LEAD FLUOROBORATE
LEAD IODIDE	LEAD IODIDE
LEAD MONOXIDE	LITHARGE
LEAD NITRATE	LEAD NITRATE
LEAD OXIDE, YELLOW	LITH[illegible]E
LEAD PROTOXIDE	LITHARGE
LEAD SULFOCYANATE	LEAD THIOCYANATE
LEAD TETRAACETATE	LEAD TETRAACETATE
LEAD TETRAETHYL	TETRAETHYL LEAD
LEAD TETRAMETHYL	TETRAMETHYL LEAD
LEAD THIOCYANATE	LEAD THIOCYANATE
LEAF LARD	OILS EDIBLE, LARD
LEUCOL	QUINOLINE
LICHENIC ACID	FUMARIC ACID
LIGHT NAPHTHA	NAPHTHA SOLVENT
LIGHT NAPHTHA	NAPTHA VM + P (75 PER CENT NAPTHA)
LIGHT OIL	OIL: COAL TAR
LIMED WOOD ROSIN	CALCIUM RESINATE
LIMONENE	DIPENTENE
LINDANE	BENZENE HEXACHLORIDE
LINEAR ALCOHOLS (12-15 CARBONS)	LINEAR ALCOHOLS (12-15 CARBONS)
LIQUEFIED NATURAL GAS (LNG)	LIQUEFIED NATURAL GAS (LNG)
LIQUEFIED PETROLEUM GAS (LPG)	LIQUEFIED PETROLEUM GAS (LPG)
LIQUID AMMONIA	AMMONIA ANHYDROUS
LIQUID ASPHALT	ASPHALT BLENDING STOCK:ROOFERS FLUX
LIQUID ASPHALT	OIL: ROAD
LIQUID BLEACH	SODIUM HYPOCHLORITE
LIQUID GUM CAMPHOR	CAMPHOR OIL
LIQUID HYDROGEN	HYDROGEN, LIQUEFIED
LIQUID IMPURE CAMPHOR	CAMPHOR OIL
LIQUID NITROGEN	NITROGEN, LIQUEFIED
LIQUID NITROGEN DIOXIDE	NITROGEN TETROXIDE
LIQUID OXYGEN	OXYGEN, LIQUEFIED

SYNONYM		COMPOUND NAME
LIQUID PETROLATUM	=	OIL: MINERAL
LIQUIFIED PHENOL	=	CARBOLIC OIL
LITHARGE	=	LITHARGE
LITHIUM ALUMINUM HYDRIDE	=	LITHIUM ALUMINUM HYDRIDE
LITHIUM HYDRIDE	=	LITHIUM HYDRIDE
LITHIUM, METALLIC	=	LITHIUM, METALLIC
LNG	=	LIQUEFIED NATURAL GAS (LNG)
LONG-TIME BURNING OIL	=	BENZENE HEXACHLORIDE
LONG-TIME BURNING OIL	=	OIL: MINERAL SEAL
LOROL-22	=	N-DECYL ALCOHOL
LOX	=	OXYGEN, LIQUEFIED
LPG	=	LIQUEFIED PETROLEUM GAS (LPG)
LUBRICATING OIL	=	OIL: MOTOR
LUCIDOL-70	=	DIBENZOYL PEROXIDE
LUMBRICAL	=	PIPERAZINE
LUNAR CAUSTIC	=	SILVER NITRATE
LUPERCO JCB-50-T	=	CYCLOHEXANONE PEROXIDE
LYE	=	CAUSTIC SODA SOLUTION
LYE	=	CAUSTIC POTASH SOLUTION
MAAC	=	METHYL AMYL ACETATE
MACQUERS SALT	=	POTASSIUM ARSENATE
M-B-C FUMIGANT	=	METHYL BROMIDE
M-DNB	=	M-DINITROBENZENE
MAGNESIUM	=	MAGNESIUM
MAGNESIUM DODECYL SULFATE	=	DODECYL SULFATE, MAGNESIUM SALT
MAGNESIUM LAURYL SULFATE	=	DODECYL SULFATE, MAGNESIUM SALT
MAGNESIUM PERCHLORATE	=	MAGNESIUM PERCHLORATE
MAGNESIUM PERCHLORATE, ANHYDROUS	=	MAGNESIUM PERCHLORATE
MAGNESIUM PERCHLORATE HEXAHYDRATE	=	MAGNESIUM PERCHLORATE
MALATHION	=	MALATHION
MALAZIDE	=	MALEIC HYDRAZIDE
MALEIC ACID	=	MALEIC ACID
MALEIC ACID HYDRAZIDE	=	MALEIC HYDRAZIDE
MALEIC ANHYDRIDE	=	MALEIC ANHYDRIDE
MALEIC HYDRAZIDE	=	MALEIC HYDRAZIDE
MALEINIC ACID	=	MALEIC ACID
MALENIC ACID	=	MALEIC ACID
MALONIC MONONITRILE	=	CYANOACETIC ACID
MAOH	=	METHYL ISOBUTYL CARBINOL
MAOH	=	METHYL AMYL ALCOHOL
MAPP GAS	=	METHYLACETYLENE - PROPADIENE MIXTURE
MARLATE 50	=	METHOXYCHLOR
MARSH GAS	=	METHANE
MARSHITE	=	COPPER IODIDE
MASSICOT	=	LITHARGE
MCB	=	CHLOROBENZENE
MCP	=	CALCIUM PHOSPHATE
MDI	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
MEADOW GREEN	=	COPPER ACETOARSENITE
ME CB	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
MEK	=	METHYL ETHYL KETONE
MENDRIN	=	ENDRIN
MEP	=	METHYLETHYLPYRIDINE
MERCAPTOETHANE	=	ETHYL MERCAPTAN
MERCAPTOMETHANE	=	METHYL MERCAPTAN
MERCAPTOSUCCINIC ACID, S-ESTER WITH O,O-DIMETHYL DITHIOPHOSPHATE	=	MALATHION
MERCURIALIN	=	METHYLAMINE
MERCURIC ACETATE	=	MERCURIC ACETATE
MERCURIC AMMONIUM CHLORIDE	=	MERCURIC AMMONIUM CHLORIDE
MERCURIC CHLORIDE	=	MERCURIC CHLORIDE
MERCURIC CHLORIDE,AMMONIATED	=	MERCURIC AMMONIUM CHLORIDE
MERCURIC CYANIDE	=	MERCURIC CYANIDE
MERCURIC IODIDE	=	MERCURIC IODIDE

SYNONYM		COMPOUND NAME
MERCURIC IODIDE, RED	=	MERCURIC IODIDE
MERCURIC NITRATE	=	MERCURIC NITRATE
MERCURIC NITRATE MONOHYDRATE	=	MERCURIC NITRATE
MERCURIC OXIDE	=	MERCURIC OXIDE
MERCURIC OXIDE, RED (IRED PRECIPITATE()	=	MERCURIC OXIDE
MERCURIC OXIDE, YELLOW ((YELLOW PRECIPITATE()	=	MERCURIC OXIDE
MERCURIC SULFIDE	=	MERCURIC SULFIDE
MERCURIC SULFIDE, BLACK (ETHIOPS MINERAL)	=	MERCURIC SULFIDE
MERCURIC SULFIDE, RED (VERMILLION, ARTIFICIAL CINNABAR, CHINESE RED)	=	MERCURIC SULFIDE
MERCUROUS CHLORIDE	=	MERCUROUS CHLORIDE
MERCUROUS NITRATE	=	MERCUROUS NITRATE
MERCUROUS NITRATE MONOHYDRATE	=	MERCUROUS NITRATE
MERCURY	=	MERCURY
MERCURY AMMONIUM CHLORIDE	=	MERCURIC AMMONIUM CHLORIDE
MERCURY BICHLORIDE	=	MERCURIC CHLORIDE
MERCURY BINIODIDE	=	MERCURIC IODIDE
MERCURY (II) CHLORIDE	=	MERCURIC CHLORIDE
MERCURY (II) CHLORIDE AMMONOBASIC	=	MERCURIC AMMONIUM CHLORIDE
MERCURY CYANIDE	=	MERCURIC CYANIDE
MERCURY (II) CYANIDE	=	MERCURIC CYANIDE
MERCURY MONOCHLORIDE	=	MERCUROUS CHLORIDE
MERCURY (II) NITRATE	=	MERCURIC NITRATE
MERCURY OXIDE	=	MERCURIC OXIDE
MERCURY PERCHLORIDE	=	MERCURIC CHLORIDE
MERCURY PERNITRATE	=	MERCURIC NITRATE
MERCURY PROTOCHLORIDE	=	MERCUROUS CHLORIDE
MERCURY PROTONITRATE	=	MERCUROUS NITRATE
MERCURY SUBCHLORIDE	=	MERCUROUS CHLORIDE
MESITYL OXIDE	=	MESITYL OXIDE
METALLIC RESINATE	=	CALCIUM RESINATE
METHACRYLATE MONOMER	=	METHYL METHACRYLATE
METHACRYLIC ACID, BUTYL ESTER	=	N-BUTYL METHACRYLATE
METHACRYLIC ACID,2,3-EPOXYPROPYL ESTER	=	GLYCIDYL METHACRYLATE
METHACRYLIC ACID, ETHYL ESTER	=	ETHYL METHACRYLATE
METHACRYLIC ACID, METHYL ESTER	=	METHYL METHACRYLATE
BETA-METHALLYL CHLORIDE	=	METHALLYL CHLORIDE
METHALLYL CHLORIDE	=	METHALLYL CHLORIDE
METHANAL	=	FORMALDEHYDE SOLUTION
METHANE	=	METHANE
METHANEARSONIC ACID, SODIUM SALTS	=	METHANEARSONIC ACID, SODIUM SALTS
2-METHOXYETHANOL	=	ETHYLENE GLYCOL MONOMETHYL ETHER
2-(2-METHOXYETHOXY)ETHANOL	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
METHOXYETHYLENE	=	VINYL METHYL ETHER, INHIBITED
1-METHOXY-2-PROPANOL	=	PROPYLENE GLYCOL METHYL ETHER
METHYLACETALDEHYDE	=	PROPIONALDEHYDE
METHYL ACETATE	=	METHYL ACETATE
METHYLACETIC ACID	=	PROPIONIC ACID
METHYLACETIC ANHYDRIDE	=	PROPIONIC ANHYDRIDE
METHANETHIOL	=	METHYL MERCAPTAN
METHANETHIOMETHANE	=	DIMETHYL SULFIDE
METHANOIC ACID	=	FORMIC ACID
METHANOL	=	METHYL ALCOHOL
METHENEAMINE	=	HEXAMETHYLENETETRAMINE
METHOXYCHLOR	=	METHOXYCHLOR
METHOXY-DDT	=	METHOXYCHLOR
METHOXYDIGLYCOL	=	DIETHYLENE GLYCOL MONOETHYL ETHER
METHYLACETYLENE-ALLENE MIXTURE	=	METHYLACETYLENE - PROPADIENE MIXTURE
METHYLACETYLENE - PROPADIENE MIXTURE	=	METHYLACETYLENE - PROPADIENE MIXTURE
BETA-METHYLACROLEIN	=	CROTONALDEHYDE
METHYL ACRYLATE	=	METHYL ACRYLATE

SYNONYM		COMPOUND NAME
METHYLAL	=	METHYL FORMAL
METHYL ALCOHOL	=	METHYL ALCOHOL
BETA-METHYLALLYL CHLORIDE	=	METHALLYL CHLORIDE
METHYLAMINE	=	METHYLAMINE
N-METHYLAMINOBENZENE	=	N-METHYLANILINE
METHYL AMYL ACETATE	=	METHYL AMYL ACETATE
METHYL AMYL ALCOHOL	=	METHYL AMYL ALCOHOL
METHYLAMYL ALCOHOL	=	METHYL ISOBUTYL CARBINOL
METHYL AMYL KETONE	=	N-AMYL METHYL KETONE
O-METHYLANILINE	=	O-TOLUIDINE
2-METHYLANILINE	=	O-TOLUIDINE
N-METHYLANILINE	=	N-METHYLANILINE
METHYLANILINE (MONO)	=	N-METHYLANILINE
2-METHYLAZIRIDINE	=	PROPYLENEIMINE, INHIBITED
METHYLBENZENE	=	TOLUENE
METHYLBENZENESULFONIC ACID	=	P-TOLUENESULFONIC ACID
METHYLBENZOL	=	TOLUENE
BETA-METHYLBIVINYL	=	ISOPRENE
METHYL BROMIDE	=	METHYL BROMIDE
2-METHYL-1,3-BUTADIENE	=	ISOPRENE
3-METHYLBUTANAL	=	ISOVALERALDEHYDE
2-METHYLBUTANE	=	ISOPENTANE
3-METHYL-1-BUTANOL	=	ISOAMYL ALCOHOL
2-METHYL-1-BUTENE-3-ONE	=	METHYL ISOPROPENYL KETONE, INHIBITED
METHYL N-BUTYL KETONE	=	METHYL N-BUTYL KETONE
3-METHYLBUTYL NITRITE	=	ISO-AMYL NITRITE
3-METHYLBUTYRALDEHYDE	=	ISOVALERALDEHYDE
METHYL CARBITOL	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
METHYL CELLOSOLVE	=	ETHYLENE GLYCOL MONOMETHYL ETHER
METHYL CHLORIDE	=	METHYL CHLORIDE
METHYL CHLOROCARBONATE	=	METHYL CHLOROFORMATE
METHYL CHLOROFORM	=	TRICHLOROETHANE
METHYL CHLOROFORMATE	=	METHYL CHLOROFORMATE
METHYL CHLOROMETHYL ETHER, ANHYDROUS	=	CHLOROMETHYL METHYL ETHER
METHYL CYANIDE	=	ACETONITRILE
METHYLCYCLOPENTADIENYL MANGANESE TRICARBONYL	=	METHYLCYCLOPENTADIENYLMANGANESE TRICARBONYL
METHYLCYCLOPENTANE	=	METHYLCYCLOPENTANE
METHYLDICHLOROSILANE	=	METHYLDICHLOROSILANE
1-METHYL-2,4-DINITROBENZENE	=	2,4-DINITROTOLUENE
METHYLENE CHLORIDE	=	DICHLOROMETHANE
METHYLENE DICHLORIDE	=	DICHLOROMETHANE
METHYLENE DIMETHYL ETHER	=	METHYL FORMAL
METHYLENEBIS(4-PHENYL ISOCYANATE)	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
METHYL ETHER	=	DIMETHYL ETHER
METHYL ETHER WOOD ETHER	=	DIMETHYL ETHER
METHYLETHYLCARBINOL	=	SEC-BUTYL ALCOHOL
METHYLETHYLENE	=	PROPYLENE
METHYLETHYLENE GLYCOL	=	PROPYLENE GYLCOL
2-METHYLETHYLENIMINE	=	PROPYLENEIMINE, INHIBITED
METHYL ETHYL KETONE	=	METHYL ETHYL KETONE
METHYLETHYLPYRIDINE	=	METHYLETHYLPYRIDINE
METHYL FORMAL	=	METHYL FORMAL
METHYL FORMATE	=	METHYL FORMATE
6-METHYL-1-HEPTANAL	=	ISOOCTALDEHYDE
6-METHYL-1-HEPTANOL	=	ISOOCTYL ALCOHOL
METHYLHYDRAZINE	=	METHYLHYDRAZINE
METHYL ISOBUTENYL KETONE	=	MESITYL OXIDE
METHYLISOBUTYL CARBINOL	=	METHYL AMYL ALCOHOL
METHYL ISOBUTYL CARBINOL	=	METHYL ISOBUTYL CARBINOL
METHYLISOBUTYLCARBINYL ACETATE	=	METHYL AMYL ACETATE
METHYL ISOBUTYL KETONE	=	METHYL ISOBUTYL KETONE
METHYL ISOPROPENYL KETONE, INHIBITED	=	METHYL ISOPROPENYL KETONE, INHIBITED
1-METHYL-4-ISOPROPYL-BENZENE	=	P-CYMENE

SYNONYM		COMPOUND NAME
2-METHYLLACTONITRILE	=	ACETONE CYANOHYDRIN
METHYL MERCAPTAN	=	METHYL MERCAPTAN
METHYL METHACRYLATE	=	METHYL METHACRYLATE
METHYL ALPHA-METHACRYLATE	=	METHYL METHACRYLATE
METHYLMETHANE	=	ETHANE
METHYL 2-METHYL-2-PROPENOATE	=	METHYL METHACRYLATE
METHYL OXIRANE	=	PROPYLENE OXIDE
METHYL PARATHION	=	METHYL PARATHION
2-METHYLPENTANE	=	ISOHEXANE
2-METHYL-2,4-PENTANEDIOL	=	HEXYLENE GLYCOL
4-METHYL-2-PENTANOL	=	METHYL AMYL ALCOHOL
4-METHYL-2-PENTANOL	=	METHYL ISOBUTYL CARBINOL
4-METHYL-2-PENTANOL, ACETATE	=	METHYL AMYL ACETATE
4-METHYL-2-PENTANONE	=	METHYL ISOBUTYL KETONE
4-METHYL-3-PENTENE-2-ONE	=	MESITYL OXIDE
4-METHYL-2-PENTYL ACETATE	=	METHYL AMYL ACETATE
1-METHYL-1-PHENYLETHYLENE	=	ALPHA-METHYLSTYRENE
METHYL PENTYL KETONE	=	N-AMYL METHYL KETONE
METHYLPHENOLS	=	CRESOLS
METHYLPHENYLAMINE	=	N-METHYLANILINE
METHYL PHENYL KETONE	=	ACETOPHENONE
METHYL PHOSPHONOTHIOIC DICHLORIDE(ANHYD)	=	METHYL PHOSPHONOTHIOIC DICHLORIDE(ANHYD)
2-METHYLPROPANAL	=	ISO-BUTYRALDEHYDE
2-METHYLPROPANE	=	ISOBUTANE
2-METHYLPROPANENITRILE	=	ISOBUTYRONITRILE
2-METHYLPROPANOIC ACID	=	ISOBUTYRIC ACID
2-METHYL-1-PROPANOL	=	ISOBUTYL ALCOHOL
2-METHYL-2-PROPANOL	=	TERT-BUTYL ALCOHOL
2-METHYLPROPENE	=	ISOBUTYLENE
METHYL 2-PROPENOATE	=	METHYL ACRYLATE
ALPHA-METHYLPROPIONIC ACID	=	ISOBUTYRIC ACID
2-METHYLPROPIONITRILE	=	ISOBUTYRONITRILE
2-METHYL-1-PROPYL ACETATE	=	ISOBUTYL ACETATE
METHYL PROPYL BENZENE	=	P-CYMENE
BETA-METHYLPROPYL ETHANOATE	=	ISOBUTYL ACETATE
1-METHYL-2-(3-PYRIDYL)PYRROLIDINE	=	NICOTINE
1-METHYL-2-(3-PYRIDYL) PYRROLIDINE,3-(1-METHYL-2-PYRROLIDYL) PYRIDINE	=	NICOTINE
N-METHYLPYRROLIDINONE	=	1-METHYLPYRROLIDONE
1-METHYLPYRROLIDONE	=	1-METHYLPYRROLIDONE
N-METHYL-PYRROLIDONE	=	1-METHYLPYRROLIDONE
1-METHYL-2-PYRROLIDINONE	=	1-METHYLPYRROLIDONE
N-METHYL-ALPHA-PYRROLIDONE	=	1-METHYLPYRROLIDONE
3-(2-METHYL-2-PYRROLIDYL)PYRIDINE	=	NICOTINE
METHYLSTYRENE	=	VINYLTOLUENE
ALPHA-METHYLSTYRENE	=	ALPHA-METHYLSTYRENE
METHYL SULFHYDRATE	=	METHYL MERCAPTAN
METHYL SULFIDE	=	DIMETHYL SULFIDE
4-(METHYLSULFONYL)-2,6-DINITRO-N,N-DIPROPYLANILINE	=	NITRALIN
METHYL SULFOXIDE	=	DIMETHYL SULFOXIDE
METHYL THIRAM	=	THIRAM
METHYLTRICHLOROSILANE	=	METHYLTRICHLOROSILANE
METHYL TUADS	=	THIRAM
METHYL VINYL ETHER	=	VINYL METHYL ETHER, INHIBITED
METHYL VINYL KETONE	=	METHYL VINYL KETONE
METHYL ZINC	=	DIMETHYLZINC
MH	=	MALEIC HYDRAZIDE
MIBC	=	METHYL AMYL ALCOHOL
MIBC	=	METHYL ISOBUTYL CARBINOL
MIBK	=	METHYL ISOBUTYL KETONE
MIC	=	METHYL AMYL ALCOHOL
MIC	=	METHYL ISOBUTYL CARBINOL

SYNONYM	COMPOUND NAME
MIDDLE OIL	CARBOLIC OIL
MIK	METHYL ISOBUTYL KETONE
MILD MERCURY CHLORIDE	MERCUROUS CHLORIDE
MILK ACID	LACTIC ACID
MINERAL CARBON	CHARCOAL
MINERAL CHARCOAL	CHARCOAL
MINERAL COLZA OIL	OIL: MINERAL SEAL
MINERAL OIL	OIL: MINERAL
MINERAL SEAL OIL	OIL: MINERAL SEAL
MINERAL SPIRITS	MINERAL SPIRITS
MITIS GREEN	COPPER ACETOARSENITE
MIXED PRIMARY AMYL NITRATES	N-AMYL NITRATE
MIXTURE OF BENZENE, TOLUENE, AND XYLENES	NAPHTHA COAL TAR
MIXTURE OF O- AND S-(2-(ETHYLTHIO)ETHYL)PHOSPHOROTHIOIC ACID, O,O-DIETHYL ESTER	DEMETON
MMH	METHYLHYDRAZINE
MOHRS SALT	FERROUS AMMONIUM SULFATE
MOLYBDENUM TRIOXIDE	MOLYBDIC TRIOXIDE
MOLYBDIC ACID, 85 PER CENT	AMMONIUM MOLYBDATE
MOLYBDIC ANHYDRIDE	MOLYBDIC TRIOXIDE
MOLYBDIC TRIOXIDE	MOLYBDIC TRIOXIDE
MONDUR TDS	TOLUENE 2,4-DIISOCYANATE (TDI)
MONOAMMONIUM ORTHOPHOSPHATE	AMMONIUM PHOSPHATE
MONOBROMOBENZENE	BROMOBENZENE
MONOBROMOMETHANE	METHYL BROMIDE
MONO-N-BUTYLAMINE	N-BUTYLAMINE
MONOCALCIUM PHOSPHATE,MONOHYDRATE	CALCIUM PHOSPHATE
MONOCHLORACETIC ACID, ETHYL ESTER	ETHYL CHLOROACETATE
MONOCHLORETHANE	ETHYL CHLORIDE
MONOCHLORETHANOIC ACID, ETHYL ESTER	ETHYL CHLOROACETATE
MONOCHLOROACETIC ACID	MONOCHLOROACETIC ACID
MONOCHLOROBENZENE	CHLOROBENZENE
MONOCHLORODIFLUOROMETHANE	MONOCHLORODIFLUOROMETHANE
MONOCHLOROMETHYL ETHER	CHLOROMETHYL METHYL ETHER
MONOETHANOLAMINE	MONOETHANOLAMINE
MONOETHYLAMINE	ETHYLAMINE
MONOETHYLENE GLYCOL	ETHYLENE GLYCOL
MONOFLUORO ETHYLENE	VINYL FLUORIDE, INHIBITED
MONOGLYME	ETHYLENE GLYCOL DIMETHYL ETHER
MONOHYDRATE	CALCIUM PHOSPHATE
MONOISOBUTYLAMINE	ISOBUTYLAMINE
MONOISOPROPANOLAMINE	MONOISOPROPANOLAMINE
MONOISOPROPYLAMINE	ISOPROPYLAMINE
MONOMETHYLAMINE, ANHYDROUS	METHYLAMINE
MONOMETHYLHYDRAZINE	METHYLHYDRAZINE
MONONITROGEN MONOXIDE	NITRIC OXIDE
MONO PE	PENTAERYTHRITOL
MONOSODIUM METHANEARSONATE	METHANEARSONIC ACID, SODIUM SALTS
MONOSODIUM METHYL ARSONATE	METHANEARSONIC ACID, SODIUM SALTS
MONOXIDE	CARBON MONOXIDE
MORPHOLINE	MORPHOLINE
MORTOPAL	TETRAETHYL PYROPHOSPHATE
MOSS GREEN	COPPER ACETOARSENITE
MOTOR FUEL ANTI-KNOCK COMPOUNDS CONTAINIG LEAD ALKYLS	MOTOR FUEL ANTI-KNOCK COMPOUNDS CONTAINIG LEAD ALKYLS
MOTOR OIL	OIL: LUBRICATING
MOTOR SPIRIT	GASOLINE, AUTOMOTIVE (LESS THAN 4.23 G LEAD/GAL)
MPT	METHYL PARATHION
MPTD	METHYL PHOSPHONOTHIOIC DICHLORIDE(ANHYD)
MSMA	METHANEARSONIC ACID, SODIUM SALTS

SYNONYM		COMPOUND NAME
MULTRATHANE M	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
MURIATIC ACID	=	HYDROCHLORIC ACID
MYRISTIC ALCOHOL	=	TETRADECANOL
MYRISTYL ALCOHOL	=	TETRADECANOL
NABAM	=	NABAM
NACCONATE 100	=	TOLUENE 2,4-DIISOCYANATE (TDI)
NACCONATE 300	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
NADONE	=	CYCLOHEXANONE
NAPHTHA	=	MINERAL SPIRITS
NAPHTHA COAL TAR	=	NAPHTHA COAL TAR
NAPHTHA SOLVENT	=	NAPHTHA SOLVENT
NAPHTHA STODDARD SOLVENT	=	NAPHTHA STODDARD SOLVENT
NAPTHA VM + P (75 PER CENT NAPTHA)	=	NAPTHA VM + P (75 PER CENT NAPTHA)
NAPHTHALANE	=	DECAHYDRONAPHTHALENE
NAPHTHALENE, MOLTEN	=	NAPHTHALENE, MOLTEN
NAPHTHALIN	=	NAPHTHALENE, MOLTEN
NAPHTHANE	=	DECAHYDRONAPHTHALENE
NAPTHENIC ACIDS	=	NAPTHENIC ACIDS
ALPHA-NAPHTHYLAMINE	=	1-NAPHTHYLAMINE
1-NAPHTHYLAMINE	=	1-NAPHTHYLAMINE
1-NAPHTHYL N-METHYLCARBAMATE	=	CARBARYL
NATURAL GASOLINE	=	GASOLINE: CASINGHEAD
NEATSFOOT OIL	=	OIL: NEATSFOOT
NECATORINA	=	CARBON TETRACHLORIDE
NEOHEXANE	=	NEOHEXANE
NEUTRAL AMMONIUM FLUORIDE	=	AMMONIUM FLUORIDE
NEUTRAL ANHYDROUS CALCIUM HYPOCHLORITE	=	CALCIUM HYPOCHLORITE
NEUTRAL LEAD ACETATE	=	LEAD ACETATE
NEUTRAL NICOTINE SULFATE	=	NICOTINE SULFATE
NEUTRAL POTASSIUM CHROMATE	=	POTASSIUM CHROMATE
NEUTRAL SODIUM CHROMATE,ANHYDROUS	=	SODIUM CHROMATE
NEUTRAL VERDIGRIS	=	COPPER ACETATE
NICKEL ACETATE	=	NICKEL ACETATE
NICKEL ACETATE TETRAHYDRATE	=	NICKEL ACETATE
NICKEL AMMONIUM SULFATE	=	NICKEL AMMONIUM SULFATE
NICKEL AMMONIUM SULFATE HEXAHYDRATE	=	NICKEL AMMONIUM SULFATE
NICKEL BROMIDE	=	NICKEL BROMIDE
NICKEL BROMIDE TRIHYDRATE	=	NICKEL BROMIDE
NICKEL CARBONYL	=	NICKEL CARBONYL
NICKEL CHLORIDE	=	NICKEL CHLORIDE
NICKEL CHLORIDE	=	NICKEL CHLORIDE
NICKEL CYANIDE	=	NICKEL CYANIDE
NICKEL (II) FLUOBORATE	=	NICKEL FLUOROBORATE
NICKEL FLUOROBORATE SOLUTION	=	NICKEL FLUOROBORATE
NICKEL FLUOROBORATE	=	NICKEL FLUOROBORATE
NICKEL FORMATE	=	NICKEL FORMATE
NICKEL FORMATE DIHYDRATE	=	NICKEL FORMATE
NICKEL NITRATE	=	NICKEL NITRATE
NICKEL NITRATE HEXAHYDRATE	=	NICKEL NITRATE
NICKEL SULFATE	=	NICKEL SULFATE
NICKEL TETRACARBONYL	=	NICKEL CARBONYL
NICKELOUS ACETATE	=	NICKEL ACETATE
NICKELOUS SULFATE	=	NICKEL SULFATE
NICOTINE	=	NICOTINE
NICOTINE SULFATE	=	NICOTINE SULFATE
NIFOS	=	TETRAETHYL PYROPHOSPHATE
NITRALIN	=	NITRALIN
NITRAM	=	AMMONIUM NITRATE
O-NITRANILINE	=	2-NITROANILINE
P-NITRANILINE	=	4-NITROANILINE
NITREX NITROGEN SOLUTIONS (NON-PRESSURE)	=	AMMONIUM NITRATE-UREA SOLUTION
NITRIC ACID	=	NITRIC ACID
NITRIC ACID, ALUMINUM SALT	=	ALUMINUM NITRATE

SYNONYM	COMPOUND NAME
NITRIC ACID, IRON (III) SALT	FERRIC NITRATE
NITRIC ACID, LEAD (II) SALT	LEAD NITRATE
NITRIC OXIDE	NITRIC OXIDE
NITRILOTRIACETIC ACID AND SALTS	NITRILOTRIACETIC ACID AND SALTS
2,2 ,2 -NITRILOTRIETHANOL	TRIETHANOLAMINE
O-NITROANILINE	2-NITROANILINE
4-NITROANILINE	4-NITROANILINE
P-NITROANILINE	4-NITROANILINE
2-NITROANILINE	2-NITROANILINE
NITROBENZENE	NITROBENZENE
NITROBENZOL	NITROBENZENE
NITROCARBOL	NITROMETHANE
NITROCELLULOSE GUM	COLLODION
NITROCELLULOSE SOLUTION	COLLODION
NITROCHLOROFORM	CHLOROPICRIN, LIQUID
NITROETHANE	NITROETHANE
NITROGEN DIOXIDE	NITROGEN TETROXIDE
NITROGEN, LIQUEFIED	NITROGEN, LIQUEFIED
NITROGEN MONOXIDE	NITRIC OXIDE
NITROGEN PEROXIDE	NITROGEN TETROXIDE
NITROGEN TETROXIDE	NITROGEN TETROXIDE
NITROMETHANE	NITROMETHANE
O-NITROPHENOL	2-NITROPHENOL
2-NITROPHENOL	2-NITROPHENOL
P-NITROPHENOL	4-NITROPHENOL
4-NITROPHENOL	4-NITROPHENOL
SEC-NITROPROPANE	2-NITROPROPANE
2-NITROPROPANE	2-NITROPROPANE
NITROSYL CHLORIDE	NITROSYL CHLORIDE
NITROTRICHLOROMETHANE	CHLOROPICRIN, LIQUID
NITROUS ETHER	ETHYL NITRITE
NITROUS OXIDE	NITROUS OXIDE
N-NONANE	NONANE
NONANE	NONANE
NONANOL	NONANOL
1-NONANOL	NONANOL
5-NONANONE	DI-N-BUTYL KETONE
NONENE	NONENE
1-NONENE	1-NONENE
NONENE (NON-LINEAR)	NONENE
NONYL ALCOHOL	NONANOL
NONYLCARBINOL	N-DECYL ALCOHOL
1-NONYLENE	1-NONENE
N-NONYLETHYLENE	1-UNDECENE
NONYLPHENOL	NONYLPHENOL
NORMAL AMYL ALCOHOL	N-AMYL ALCOHOL
NORMAL BUTYL ACETATE	N-BUTYL ACETATE
NORMAL BUTYL ACRYLATE	N-BUTYL ACRYLATE
NORMAL BUTYL ALCOHOL	N-BUTYL ALCOHOL
NORMAL BUTYRALDEHYDE	N-BUTYRALDEHYDE
NORMAL DECYL ALCOHOL	N-DECYL ALCOHOL
NORMAL LEAD ACETATE	LEAD ACETATE
NORMAL PROPYL ACETATE	N-PROPYL ACETATE
NORMAL PROPYL ALCOHOL	N-PROPYL ALCOHOL
NORVALAMINE	N-BUTYLAMINE
2-NP	2-NITROPROPANE
NTA	NITRILOTRIACETIC ACID AND SALTS
1,2,4,5,6,7,8,8-OCTACHLORO-2,3,3A,4,7,7A-HEXAHYDRO-4,7-METHANOINDENE	CHLORDANE
OCTACHLOROCAMPHENE	TOXAPHENE
OCTADECANOIC ACID	STEARIC ACID
CIS-9-OCTADECENOIC ACID	OLEIC ACID
OCTADECYLDIMETHYLBENZYLAMMONIUM CHLORIDE	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE

SYNONYM		COMPOUND NAME
CIS-OCTADECYLENIC ACID	=	OLEIC ACID
CIS-(DELTA 9)-OCTADECYLENIC ACID	=	OLEIC ACID
N-OCTADECYLIC ACID	=	STEARIC ACID
OCTANE	=	OCTANE
OCTA-KLOR	=	CHLORDANE
N-OCTANE	=	OCTANE
OCTANOL	=	OCTANOL
1-OCTANOL	=	OCTANOL
1-OCTENE	=	1-OCTENE
OCTOCHLOROCAMPHENE	=	TOXAPHENE
OCTOIL	=	DIOCTYL PHTHALATE
OCTYL ALCOHOL	=	OCTANOL
OCTYL ALDEHYDE	=	ETHYLHEXALDEHYDE
OCTYL CARBINOL	=	NONANOL
ALPHA-OCTYLENE	=	1-OCTENE
OCTYL EPOXY TALLATE	=	OCTYL EPOXY TALLATE
300 DEG OIL	=	OIL: MINERAL SEAL
OIL: ABSORPTION	=	OIL: ABSORPTION
OIL: CASTOR	=	OIL: CASTOR
OIL: CLARIFIED	=	OIL: CLARIFIED
OIL: COAL TAR	=	OIL: COAL TAR
OIL: COTTONSEED	=	OIL: COTTONSEED
OIL: CRUDE	=	OIL: CRUDE
OIL: DIESEL	=	OIL: DIESEL
OIL: FISH	=	OIL: FISH
OIL: LUBRICATING	=	OIL: LUBRICATING
OIL: MINERAL	=	OIL: MINERAL
OIL: MINERAL SEAL	=	OIL: MINERAL SEAL
OIL: MOTOR	=	OIL: MOTOR
OIL: NEATSFOOT	=	OIL: NEATSFOOT
OIL OF BITTER ALMOND	=	BENZALDEHYDE
OIL OF MERBANE	=	NITROBENZENE
OIL OF VITRIOL	=	SULFURIC ACID
OIL: OLIVE	=	OIL: OLIVE
OIL: PEANUT	=	OIL: PEANUT
OIL: PENETRATING	=	OIL: PENETRATING
OIL: RANGE	=	OIL: RANGE
OIL: RESIN	=	OIL: RESIN
OIL: ROAD	=	OIL: ROAD
OIL: ROSIN	=	OIL: ROSIN
OIL, TANNERS	=	OIL, TANNERS
OILS EDIBLE: COCONUT	=	OILS EDIBLE: COCONUT
OILS EDIBLE, LARD	=	OILS EDIBLE, LARD
OILS EDIBLE: PALM	=	OILS EDIBLE: PALM
OILS EDIBLE: SAFFLOWER	=	OILS EDIBLE: SAFFLOWER
OILS EDIBLE: TUCUM	=	OILS EDIBLE: TUCUM
OILS MISCELLANEOUS: CROTON	=	OILS MISCELLANEOUS: CROTON
OILS MISCELLANEOUS: LINSEED	=	OILS MISCELLANEOUS: LINSEED
OILS MISCELLANEOUS: TURBINE	=	OILS MISCELLANEOUS: TURBINE
OIL: SOYA BEAN	=	OIL: SOYA BEAN
OIL: SPERM	=	OIL: SPERM
OIL: SPINDLE	=	OIL: SPINDLE
OIL: SPRAY	=	OIL: SPRAY
OIL: TALL	=	OIL: TALL
OIL: TRANSFORMER	=	OIL: TRANSFORMER
OIL: VEGETABLE	=	OIL: VEGETABLE
OLEFIANT GAS	=	ETHYLENE
OLEIC ACID	=	OLEIC ACID
OLEIC ACID, AMMONIUM SALT	=	AMMONIUM OLEATE
OLEIC ACID, POTASSIUM SALT	=	OLEIC ACID, POTASSIUM SALT
OLEIC ACID, SODIUM SALT	=	OLEIC ACID, SODIUM SALT
OLEUM	=	OLEUM
OLIVE OIL	=	OIL: OLIVE

SYNONYM		COMPOUND NAME
OPAL	=	TRICHLOROPHENOL
ONA	=	2-NITROANILINE
ONP	=	2-NITROPHENOL
ORPIMENT	=	ARSENIC TRISULFIDE
ORTHOARSENIC ACID	=	ARSENIC ACID
ORTHOBORIC ACID	=	BORIC ACID
ORTHOCIDE	=	CAPTAN
ORTHODICHLOROBENZENE	=	O-DICHLOROBENZENE
ORTHO-DIHYDROXYBENZENE	=	CATECHOL
ORTHOPHOSPHORIC ACID	=	PHOSPHORIC ACID
ORTHOTITANIC ACID,TETRABUTYL ESTER	=	TETRABUTYL TITANATE
ORTHOXYLENE	=	O-XYLENE
OXAL	=	GLYOXAL, 40% SOLUTION
OXALDEHYDE	=	GLYOXAL, 40% SOLUTION
OXALIC ACID	=	OXALIC ACID
OXALIC ACID, DIAMMONIUM SALT	=	AMMONIUM OXALATE
OXALIC ACID DINITRILE	=	CYANOGEN
OXALIC ACID, FERROUS SALT	=	FERROUS OXALATE
OXALONITRILE	=	CYANOGEN
OXAMMONIUM SULFATE	=	HYDROXYLAMINE SULFATE
3-OXA-1,5-PENTANEDIOL	=	DIETHYLENE GLYCOL
2-OXETANONE	=	BETA-PROPIOLACTONE
OXIDES OF NITROGEN	=	NITROGEN TETROXIDE
OXIRANE	=	ETHYLENE OXIDE
ALPHA-OXODIPHENYLMETHANE	=	BENZOPHENONE
ALPHA-OXODITANE	=	BENZOPHENONE
2,2 OXYBISETHANOL	=	DIETHYLENE GLYCOL
OXYGEN, LIQUEFIED	=	OXYGEN, LIQUEFIED
OXYLITE	=	DIBENZOYL PEROXIDE
OXYPHENIC ACID	=	CATECHOL
OXYTOLUENES	=	CRESOLS
PAINT DRIER	=	COPPER NAPHTHENATE
PAINTERS NAPHTHA	=	NAPTHA VP + P (75 PER CENT NAPTHA)
PALM BUTTER	=	OILS EDIBLE: PALM
PALM FRUIT OIL	=	OILS EDIBLE: PALM
PALM SEED OIL	=	OILS EDIBLE: TUCUM
PAN	=	PHTHALIC ANHYDRIDE
PAPI	=	POLYMETHYLENE POLYPHENYL ISOCYANATE
PARADI	=	P-DICHLOROBENZENE
PARADICHLOROBENZENE	=	P-DICHLOROBENZENE
PARADOW	=	P-DICHLOROBENZENE
PARAFORMALDEHYDE	=	PARAFORMALDEHYDE
PARA HYDROGEN	=	HYDROGEN, LIQUEFIED
PARA-MENTHA-1,8-DIENE	=	DIPENTENE
PARAMOTH	=	P-DICHLOROBENZENE
PARANAPHTHALENE	=	ANTHRACENE
PARATHION, LIQUID	=	PARATHION, LIQUID
PARATHION-METHYL	=	METHYL PARATHION
PARAXYLENE	=	P-XYLENE
PARIS GREEN	=	COPPER ACETOARSENITE
PARROT GREEN	=	COPPER ACETOARSENITE
PATENT ALUM	=	ALUMINUM SULFATE
PCB	=	POLYCHLORINATED BIPHENYL (PCB)
PE	=	PENTAERYTHRITOL
PEANUT OIL	=	OIL: PEANUT
PEARL WHITE	=	BISMUTH OXYCHLORIDE
PELARGONIC ALCOHOL	=	NONANOL
PENETRATING OIL	=	OIL: PENETRATING
PENTA	=	PENTACHLOROPHENOL
PENTABORANE	=	PENTABORANE
(9)-PENTABORON NONAHYDRIDE	=	PENTABORANE
PENTACHLOROPHENOL	=	PENTACHLOROPHENOL
PENTADECANOL	=	PENTADECANOL
1-PENTADECANOL	=	PENTADECANOL
PENTADECANOL	=	LINEAR ALCOHOLS (12-15 CARBONS)

SYNONYM		COMPOUND NAME
PENTADECYL ALCOHOL	=	PENTADECANOL
PENTADECYLBENZENESULFONIC ACID	=	ALKYLBENZENESULFONIC ACIDS
PENTAERYTHRITE	=	PENTAERYTHRITOL
PENTAERYTHRITOL	=	PENTAERYTHRITOL
PENTAMETHYLENE	=	CYCLOPENTANE
PENTANAL	=	VALERALDEHYDE
PENTANE	=	PENTANE
1,5-PENTANEDIAL SOLUTION	=	GLUTARALDEHYDE SOLUTION
2,4-PENTANEDIONE	=	ACETYLACETONE
1-PENTANETHIOL	=	N-AMYL MERCAPTAN
1-PENTANOL	=	N-AMYL ALCOHOL
PENTEK	=	PENTAERYTHRITOL
1-PENTENE	=	1-PENTENE
PENTYL ACETATES	=	AMYL ACETATE
PENTYL ALCOHOL	=	N-AMYL ALCOHOL
SEC-PENTYL CARBINOL	=	ETHYL BUTANOL
1-PENTYL CHLORIDE	=	N-AMYL CHLORIDE
PENTYL METHYL KETONE	=	N-AMYL METHYL KETONE
PENTYLSILICON TRICHLORIDE	=	N-AMYLTRICHLOROSILANE
PERACETIC ACID	=	PERACETIC ACID
PERCARBAMIDE	=	UREA PEROXIDE
PERCHLORIC ACID	=	PERCHLORIC ACID
PERCHLORIC ACID SOLUTION	=	PERCHLORIC ACID
PERCHLOROCYCLOPENTADIENE	=	HEXACHLOROCYCLOPENTADIENE
PERCHLOROETHYLENE	=	TETRACHLOROETHYLENE
PERCHLOROMETHANE	=	CARBON TETRACHLORIDE
PERCHLOROMETHYL MERCAPTAN	=	PERCHLOROMETHYL MERCAPTAN
PERCLENE	=	TETRACHLOROETHYLENE
PERHYDROL-UREA	=	UREA PEROXIDE
PERHYDRONAPHTHALENE	=	DECAHYDRONAPHTHALENE
PERK	=	TETRACHLOROETHYLENE
PEROXIDE	=	HYDROGEN PEROXIDE
PEROXYACETIC ACID	=	PERACETIC ACID
PEROXYDICARBONIC ACID, DIISOPROPYL ESTER	=	ISOPROPYL PERCARBONATE
PEROXY-DICARBONIC ACID, BIS(1-METHYLETHYL)ESTER	=	ISOPROPYL PERCARBONATE
PEROXY-DICARBONIC ACID, BIS (1-METHYLETHYL) ESTER	=	ISOPROPYL PERCARBONATE
PEROXYDISULFURIC ACID, DIAMMONIUM SALT	=	AMMONIUM PERSULFATE
PETROHOL	=	ISOPROPYL ALCOHOL
PETROL	=	GASOLINE, AUTOMOTIVE (LESS THAN 4.23 G LEAD/GAL)
PETROLATUM	=	PETROLATUM
PETROLATUM JELLY	=	PETROLATUM
PETROLEUM	=	OIL: CRUDE
PETROLEUM ASPHALT	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
PETROLEUM ASPHALT	=	OIL: ROAD
PETROLEUM ASPHALT	=	ASPHALT
PETROLEUM DISTILLATE	=	DISTILLATE:FLASHED FEED STOCKS
PETROLEUM DISTILLATE	=	DISTILLATE:STRAIGHT RUN
PETROLEUM INSULATING OIL	=	OIL: TRANSFORMER
PETROLEUM JELLY	=	PETROLATUM
PETROLEUM NAPHTHA	=	PETROLEUM NAPHTHA
PETROLEUM PITCH	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
PETROLEUM RESIDUE	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
PETROLEUM SOLVENT	=	NAPHTHA SOLVENT
PETROLEUM SOLVENT	=	NAPHTHA STODDARD SOLVENT
PETROLEUM SOLVENT	=	NAPTHA VP + P (75 PER CENT NAPTHA)
PETROLEUM SOLVENT	=	PETROLEUM NAPHTHA
PETROLEUM SPIRITS	=	MINERAL SPIRITS

SYNONYM	COMPOUND NAME
PETROLEUM TAILINGS	ASPHALT BLENDING STOCK:ROOFERS FLUX
PETROLEUM WAX	WAXES: PARAFFIN
PHELLANDRENE	DIPENTENE
PHENACHLOR	TRICHLOROPHENOL
PHENACYL CHLORIDE	CHLOROACETOPHENONE
PHENETHYLENE	STYRENE
PHENIC ACID	PHENOL
PHENOL	PHENOL
PHENOXYBENZENE	DIPHENYL ETHER
PHENYLAMINE	ANILINE
N-PHENYLANILINE	DIPHENYLAMINE
PHENYLARSENIC DICHLORIDE	PHENYLDICHLOROARSINE, LIQUID
PHENYL BROMIDE	BROMOBENZENE
PHENYLCARBINOL	BENZYL ALCOHOL
PHENYL CHLORIDE	CHLOROBENZENE
PHENYL CHLOROMETHYL KETONE	CHLOROACETOPHENONE
PHENYLCYANIDE	BENZONITRILE
1-PHENYLDECANE	N-DECYLBENZENE
PHENYLDICHLOROARSINE, LIQUID	PHENYLDICHLOROARSINE, LIQUID
1-PHENYLDODECANE	DODECYLBENZENE
PHENYLETHANE	ETHYLBENZENE
PHENYLETHYLENE	STYRENE
PHENYL ETHER	DIPHENYL ETHER
PHENYLHYDRAZINE HYDROCHLORIDE	PHENYLHYDRAZINE HYDROCHLORIDE
PHENYLHYDRAZINIUM CHLORIDE	PHENYLHYDRAZINE HYDROCHLORIDE
PHENYL HYDROXIDE	PHENOL
PHENYLMETHANOL	BENZYL ALCOHOL
PHENYLMETHYL ALCOHOL	BENZYL ALCOHOL
PHENYLMETHYL AMINE	BENZYLAMINE
PHENYLPHOSPHINE DICHLORIDE	BENZENE PHOSPHORUS DICHLORIDE
PHENYLPHOSPHINE THIODICHLORIDE	BENZENE PHOSPHORUS THIODICHLORIDE
PHENYLPHOSPHONOTHIOIC DICHLORIDE	BENZENE PHOSPHORUS THIODICHLORIDE
PHENYL PHOSPHONOUS DICHLORIDE	BENZENE PHOSPHORUS DICHLORIDE
PHENYLPROPYLENE	ALPHA-METHYLSTYRENE
1-PHENYLTETRADECANE	TETRADECYLBENZENE
1-PHENYLUNDECANE	N-UNDECYLBENZENE
PHOSGENE	PHOSGENE
PHOSPHORIC ACID	PHOSPHORIC ACID
PHOSPHORIC ACID TRIETHYLENEIMIDE	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
PHOSPHORIC SULFIDE	PHOSPHORUS PENTASULFIDE
PHOSPHORODICHLORIDIC ACID, ETHYL ESTER	ETHYL PHOSPHORODICHLORIDATE
PHOSPHOROTHIOIC ACID, O,O-DIETHYL ESTER	CEMETON
PHOSPHOROTHIOIC ACID,O,O-DIETHYL O-P-NITROPHENYL ESTER	PARATHION, LIQUID
PHOSPHORUS BROMIDE	PHOSPHORUS TRIBROMIDE
PHOSPHORUS OXYCHLORIDE	PHOSPHORUS OXYCHLORIDE
PHOSPHORUS PENTASULFIDE	PHOSPHORUS PENTASULFIDE
PHOSPHORUS PERSULFIDE	PHOSPHORUS PENTASULFIDE
PHOSPHORUS TRIBROMIDE	PHOSPHORUS TRIBROMIDE
PHOSPHORUS TRICHLORIDE	PHOSPHORUS TRICHLORIDE
PHOSPHORUS, RED	PHOSPHORUS, RED
PHOSPHORUS, WHITE	PHOSPHORUS, WHITE
PHOSPHORYL CHLORIDE	PHOSPHORUS OXYCHLORIDE
PHOSPHORYL CHLORIDE	PHOSPHORUS OXYCHLORIDE
PHOTOPHOR	CALCIUM PHOSPHIDE
PHTHALANDIONE	PHTHALIC ANHYDRIDE
M-PHTHALIC ACID	ISOPHTHALIC ACID
PHTHALIC ACID ANHYDRIDE	PHTHALIC ANHYDRIDE
PHTHALIC ACID, BENZYL BUTYL ESTER	BENZYL N-BUTYL PHTHALATE
PHTHALIC ACID, DIAMYL ESTER	DI-N-AMYL PHTHALATE
PHTHALIC ACID, DIBUTYL ESTER	DIBUTYL PHTHALATE
PHTHALIC ACID, DIETHYL ESTER	DIETHYL PHTHALATE
PHTHALIC ACID, DIHEPTYL ESTER	DI[illegible]PTYL PHTHALATE
PHTHALIC ACID, DIISODECYL ESTER	DIISODECYL PHTHALATE

SYNONYM		COMPOUND NAME
PHTHALIC ACID, DIPENTYL ESTER	=	DI-N-AMYL PHTHALATE
PHTHALIC ACID, BIS(2-ETHYLHEXYL)ESTER	=	DIOCTYL PHTHALATE
PHTHALIC ACID, BIS(8-METHYLNONYL)ESTER	=	DIISODECYL PHTHALATE
PHTHALIC ANHYDRIDE	=	PHTHALIC ANHYDRIDE
PHYTAR 160	=	SODIUM CACODYLATE
PHYTAR 560	=	SODIUM CACODYLATE
PICFUME	=	CHLOROPICRIN, LIQUID
PIMELIC KETONE	=	CYCLOHEXANONE
PIPERAZIDINE	=	PIPERAZINE
PIPERAZINE	=	PIPERAZINE
PITTSBURG PX-138	=	DIOCTYL PHTHALATE
PLANAVIN	=	NITRALIN
PLANT SPRAY OIL	=	OIL: SPRAY
PLASKON MONOMER	=	TRIFLUOROCHLOROETHYLENE
PLASTICIZER ODP	=	DIISODECYL PHTHALATE
PLASTIC LATEX	=	LATEX, LIQUID SYNTHETIC
PLUMBOUS ARSENATE	=	LEAD ARSENATE
PLUMBOUS FLUORIDE	=	LEAD FLUORIDE
PLUMBOUS OXIDE	=	LITHARGE
PLURACOL POLYOL	=	POLYPROPYLENE GLYCOL
PNA	=	4-NITROANILINE
PNP	=	4-NITROPHENOL
POLY (DIMETHYLSILOXANE)	=	DIMETHYL POLYSILOXANE
POLYBUTENE	=	POLYBUTENE
POLYCHLORINATED BIPHENYL (PCB)	=	POLYCHLORINATED BIPHENYL (PCB)
POLYCHLOROPOLYPHENYLS	=	POLYCHLORINATED BIPHENYL (PCB)
POLYFORMALDEHYDE	=	PARAFORMALDEHYDE
POLYISOBUTYLENE PLASTICS	=	POLYBUTENE
POLYISOBUTYLENE RESINS	=	POLYBUTENE
POLYISOBUTYLENE WAXES	=	POLYBUTENE
POLYMETHYLENE POLYPHENYL ISOCYANATE	=	POLYMETHYLENE POLYPHENYL ISOCYANATE
POLYOXPROPYLENE ETHER,PPG	=	POLYPROPYLENE GLYCOL
POLY(OXYETHYL)DODECYL ETHER	=	ETHOXYLATED DODECANOL
POLY(OXYETHYL)LAURYL ETHER	=	ETHOXYLATED DODECANOL
POLY(OXYETHYL)MYRISTYL ETHER	=	ETHOXYLATED TETRADECANOL
POLY(OXYETHYL)PENTADECYL ETHER	=	ETHOXYLATED PENTADECANOL
POLY(OXYETHYL)TETRADECYL ETHER	=	ETHOXYLATED TETRADECANOL
POLY(OXYETHYL)TRIDECYL ETHER	=	ETHOXYLATED TRIDECANOL
POLYOXYMETHYLENE	=	PARAFORMALDEHYDE
POLYOXYMETHYLENE GLYCOL	=	PARAFORMALDEHYDE
POLYOXYPROPYLENE GLYCOL	=	POLYPROPYLENE GLYCOL
POLYOXYPROPYLENE GLYCOL METHYL ETHER	=	POLYPROPYLENE GLYCOL METHYL ETHER
POLYPHOSPHORIC ACID	=	POLYPHOSPHORIC ACID
POLYPROPYLENE	=	POLYPROPYLENE
POLYPROPYLENE GLYCOL	=	POLYPROPYLENE GLYCOL
POLYPROPYLENE GLYCOL METHYL ETHER	=	POLYPROPYLENE GLYCOL METHYL ETHER
POLY(PROPYLENE GLYCOL)METHYL ETHER	=	POLYPROPYLENE GLYCOL METHYL ETHER
POLYPROPYLENE GLYCOLS P400 TO P4000	=	POLYPROPYLENE GLYCOL
POLY-SOLV	=	DIETHYLENE GLYCOL DIMETHYL ETHER
POLY-SOLV DB	=	DIETHYLENE GLYCOL MONOBUTYL ETHER
POLY-SOLV DE	=	DIETHYLENE GLYCOL MONOETHYL ETHER
POLY-SOLV DM	=	DIETHYLENE GLYCOL MONOMETHYL ETHER
POLY-SOLV EB	=	ETHYLENE GLYCOL MONOBUTYL ETHER
POLY-SOLV EE	=	ETHYLENE GLYCOL MONOETHYL ETHER
POLY-SOLV EE ACETATE	=	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
POLY-SOLV EM	=	ETHYLENE GLYCOL MONOMETHYL ETHER
POTASSIUM ACID ARSENATE	=	POTASSIUM ARSENATE
POTASSIUM ACID OXALATE	=	POTASSIUM BINOXALATE
POTASSIUM ANTIMONYL TARTRATE	=	ANTIMONY POTASSIUM TARTRATE
POTASSIUM ARSENATE	=	POTASSIUM ARSENATE
POTASSIUM BICHROMATE	=	POTASSIUM DICHROMATE
POTASSIUM BINOXALATE	=	POTASSIUM BINOXALATE
POTASSIUM CHLORATE	=	POTASSIUM CHLORATE

SYNONYM		COMPOUND NAME
POTASSIUM CHROMATE	=	POTASSIUM CHROMATE
POTASSIUM CHROMATE(VI)	=	POTASSIUM CHROMATE
POTASSIUM CYANIDE	=	POTASSIUM CYANIDE
POTASSIUM DICHLOROISOCYANURATE	=	POTASSIUM DICHLORO-S-TRIAZINETRIONE
POTASSIUM DICHLORO-S-TRIAZINETRIONE	=	POTASSIUM DICHLORO-S-TRIAZINETRIONE
POTASSIUM DICHROMATE	=	POTASSIUM DICHROMATE
POTASSIUM HYDROXIDE SOLUTION	=	CAUSTIC POTASH SOLUTION
POTASSIUM IODIDE	=	POTASSIUM IODIDE
POTASSIUM DIHYDROGEN ARSENATE	=	POTASSIUM ARSENATE
POTASSIUM HYDROXIDE	=	POTASSIUM HYDROXIDE
POTASSIUM, METALLIC	=	POTASSIUM, METALLIC
POTASSIUM OLEATE	=	OLEIC ACID, POTASSIUM SALT
POTASSIUM OXALATE	=	POTASSIUM OXALATE
POTASSIUM OXALATE MONOHYDRATE	=	POTASSIUM OXALATE
POTASSIUM PERMANGANATE	=	POTASSIUM PERMANGANATE
POTASSIUM PEROXIDE	=	POTASSIUM PEROXIDE
POTASSIUM SUPEROXIDE	=	POTASSIUM PEROXIDE
POTATOSPIRIT OIL	=	ISOAMYL ALCOHOL
POTERATE	=	POTASSIUM CHLORATE
PRESERVATIVE OIL	=	OIL: PENETRATING
PRIMARY CALCIUM PHOSPHATE	=	CALCIUM PHOSPHATE
PRIME STEAM LARD	=	OILS EDIBLE, LARD
PROPADIENE-METHYLACETYLENE MIXTURE	=	METHYLACETYLENE - PROPADIENE MIXTURE
PROPALDEHYDE	=	PROPIONALDEHYDE
PROPANAL	=	PROPIONALDEHYDE
PROPANE	=	PROPANE
PROPANE-BUTANE-(PROPYLENE)	=	LIQUEFIED PETROLEUM GAS (LPG)
PROPANE-2-CARBOXYLIC ACID	=	ISOBUTYRIC ACID
PROPANECARBOXYLIC ACID	=	N-BUTYRIC ACID
1,2-PROPANEDIOL	=	PROPYLENE GYLCOL
1,2-PROPANEDIOL 1-ACRYLATE	=	HYDROXYPROPYL ACRYLATE
1,2-PROPANEDIOL 1-METHACRYLATE	=	HYDROXYPROPYL METHACRYLATE
1-PROPANETHIOL	=	N-PROPYL MERCAPTAN
2-PROPANETHIOL	=	ISOPROPYL MERCAPTAN
PROPANE-1-THIOL	=	N-PROPYL MERCAPTAN
PROPANE-2-THIOL	=	ISOPROPYL MERCAPTAN
1,2,3-PROPANETRIOL	=	GLYCERINE
PROPANOIC ACID	=	PROPIONIC ACID
PROPANOIC ANHYDRIDE	=	PROPIONIC ANHYDRIDE
1-PROPANOL	=	N-PROPYL ALCOHOL
2-PROPANOL	=	ISOPROPYL ALCOHOL
PROPANOLIDE	=	BETA-PROPIOLACTONE
2-PROPANONE	=	ACETONE
2-PROPENAL	=	ACROLEIN
2-PROPEN-1-OL	=	ALLYL ALCOHOL
PROPENAMIDE 50 PER CENT	=	ACRYLAMIDE
PROPENE	=	PROPYLENE
PROPENE OXIDE	=	PROPYLENE OXIDE
PROPENE POLYMER	=	POLYPROPYLENE
PROPENOIC ACID	=	ACRYLIC ACID
BETA-PROPIOLACTONE	=	BETA-PROPIOLACTONE
PROPIONALDEHYDE	=	PROPIONALDEHYDE
PROPIONIC ACID	=	PROPIONIC ACID
PROPIONIC ALDEHYDE	=	PROPIONALDEHYDE
PROPIONIC ANHYDRIDE	=	PROPIONIC ANHYDRIDE
BETA-PROPIONOLACTONE	=	BETA-PROPIOLACTONE
PROPIONYL OXIDE	=	PROPIONIC ANHYDRIDE
N-PROPYL ACETATE	=	N-PROPYL ACETATE
2-PROPYL ACETATE	=	ISOPROPYL ACETATE
PROPYL ALCOHOL	=	N-PROPYL ALCOHOL
SEC-PROPYL ALCOHOL	=	ISOPROPYL ALCOHOL
N-PROPYL ALCOHOL	=	N-PROPYL ALCOHOL
PROPYL ALDEHYDE	=	PROPIONALDEHYDE
N-PROPYLCARBINOL	=	N-BUTYL ALCOHOL
PROPYLENE	=	PROPYLENE

SYNONYM		COMPOUND NAME
PROPYLENE BUTYLENE POLYMER	=	PROPYLENE BUTYLENE POLYMER
PROPYLENE DICHLORIDE	=	DICHLOROPROPANE
PROPYLENE GLYCOL METHYL ETHER	=	PROPYLENE GLYCOL METHYL ETHER
PROPYLENE GLYCOL MONO-ACRYLATE	=	HYDROXYPROPYL ACRYLATE
PROPYLENE GLYCOL MONOMETHACRYLATE	=	HYDROXYPROPYL METHACRYLATE
PROPYLENE GYLCOL	=	PROPYLENE GYLCOL
PROPYLENIMINE	=	PROPYLENEIMINE, INHIBITED
PROPYLENE OXIDE	=	PROPYLENE OXIDE
PROPYLENE TETRAMER	=	PROPYLENE TETRAMER
PROPYLENE TETRAMER	=	DODECENE
PROPYLENE TRIMER	=	NONENE
PROPYLENEIMINE, INHIBITED	=	PROPYLENEIMINE, INHIBITED
PROPYLETHYLENE	=	1-PENTENE
N-PROPYL MERCAPTAN	=	N-PROPYL MERCAPTAN
N-N-PROPYL-L-PROPANAMINE	=	DI-N-PROPYLAMINE
PRUSSIC ACID	=	HYDROGEN CYANIDE
PSEUDOHEXYL ALCOHOL	=	ETHYL BUTANOL
PYRAZINE HEXAHYDRIDE	=	PIPERAZINE
PYRIDINE	=	PYRIDINE
PYROCATECHIN	=	CATECHOL
PYROCATECHINIC ACID	=	CATECHOL
PYROCATECHOL	=	CATECHOL
PYROCATECHUIC ACID	=	CATECHOL
PYROFAX	=	LIQUEFIED PETROLEUM GAS (LPG)
PYROGALLIC ACID	=	PYROGALLIC ACID
PYROGALLOL	=	PYROGALLIC ACID
PYROGENTISIC ACID	=	HYDROQUINONE
PYROMUCIC ALDEHYDE	=	FURFURAL
PYROXYLIC SPIRIT	=	METHYL ALCOHOL
PYROXYLIN SOLUTION	=	COLLODION
QUAKERAL	=	FURFURAL
QUICKLIME	=	CALCIUM OXIDE
QUICKSILVER	=	MERCURY
QUINOL	=	HYDROQUINONE
QUINOLINE	=	QUINOLINE
RACEMIC LACTIC ACID	=	LACTIC ACID
RANGE OIL	=	FUEL OIL: NO 1(KEROSENE)
RANGE OIL	=	KEROSENE
RANGE OIL	=	JET FUEL: JP-1(KEROSENE)
RAW LINSEED OIL	=	OILS MISCELLANEOUS: LINSEED
RC PLASTICIZER DBP	=	DIBUTYL PHTHALATE
RC PLASTICIZER DOP	=	DIOCTYL PHTHALATE
REALGAR	=	ARSENIC DISULFIDE
RED ARSENIC GLASS	=	ARSENIC DISULFIDE
RED ARSENIC SULFIDE	=	ARSENIC DISULFIDE
RED OIL	=	OLEIC ACID
RED ORPIMENT	=	ARSENIC DISULFIDE
RED OXIDE OF NITROGEN	=	NITROGEN TETROXIDE
RED TR BASE	=	4-CHLORO-O-TOLUIDINE
REFRIGERANT 152A	=	1,1-DIFLUOROETHANE
REGULOX	=	MALEIC HYDRAZIDE
RESIDUAL ASPHALT	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
RESIDUAL FUEL OIL, NO.6	=	FUEL OIL: 6
RESIDUAL FUEL OIL, NO.4	=	FUEL OIL: 4
RESIDUAL FUEL OIL, NO.5	=	FUEL OIL: 5
RESIDUAL OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
RESIN OIL	=	OIL: ROSIN
RESORCIN	=	RESORCINOL
RESORCINOL	=	RESORCINOL
RETARDER W	=	SALICYLIC ACID
RETINOL	=	OIL: RESIN
RETINOL	=	OIL: ROSIN
RHODANATE	=	SODIUM THIOCYANATE

SYNONYM		COMPOUND NAME
ROAD BINDER	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
ROAD OIL	=	ASPHALT BLENDING STOCK:ROOFERS FLUX
ROSIN OIL	=	OIL: RESIN
ROSINOL	=	OIL: ROSIN
ROSINOL	=	OIL: RESIN
RUBBING ALCOHOL	=	ISOPROPYL ALCOHOL
RUBY ARSENIC	=	ARSENIC DISULFIDE
SACCHAROSE	=	SUCROSE
SACCHARUM	=	SUCROSE
SAFFLOWER SEED OIL	=	OILS EDIBLE: SAFFLOWER
SAL ACETOSELLA	=	POTASSIUM BINOXALATE
SAL AMMONIAC	=	AMMONIUM CHLORIDE
SALICYLIC ACID	=	SALICYLIC ACID
SALMIAC	=	AMMONIUM CHLORIDE
SALT OF SATURN	=	LEAD ACETATE
SALT OF SORREL	=	POTASSIUM BINOXALATE
SALUFER	=	SODIUM SILICOFLUORIDE
SAL VOLATILE	=	AMMONIUM CARBONATE
SAND ACID	=	FLUOSILICIC ACID
SANTACHLOR	=	P-DICHLOROBENZENE
SANTOPHEN 20	=	PENTACHLOROPHENOL
SARALEX	=	DIAZINON
SCHEELES GREEN	=	COPPER ARSENITE
SEAL-COATING MATERIAL	=	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
SECONDARY AMMONIUM PHOSPHATE	=	AMMONIUM PHOSPHATE
SECONDARY BUTYL ACETATE	=	SEC-BUTYL ACETATE
SECONDARY BUTYL ALCOHOL	=	SEC-BUTYL ALCOHOL
SECONDARY CALCIUM PHOSPHATE	=	CALCIUM PHOSPHATE
SELENIC ANHYDRIDE	=	SELENIUM TRIOXIDE
SELENIOUS ANHYDRIDE	=	SELENIUM DIOXIDE
SELENIUM DIOXIDE	=	SELENIUM DIOXIDE
SELENIUM OXIDE	=	SELENIUM DIOXIDE
SELENIUM TRIOXIDE	=	SELENIUM TRIOXIDE
SENARMONTITE	=	ANTIMONY TRIOXIDE
SENTRY	=	CALCIUM HYPOCHLORITE
SEVIN	=	CARBARYL
SEXTONE	=	CYCLOHEXANONE
SHELL CHARCOAL	=	CHARCOAL
SIGNAL OIL	=	OIL: MINERAL SEAL
SILIBOND	=	ETHYL SILICATE
SILICOCHLOROFORM	=	TRICHLOROSILANE
SILICOFLUORIC ACID	=	FLUOSILICIC ACID
SILICON CHLORIDE	=	SILICON TETRACHLORIDE
SILICONE FLUIDS	=	DIMETHYL POLYSILOXANE
SILICON TETRACHLORIDE	=	SILICON TETRACHLORIDE
SILVER ACETATE	=	SILVER ACETATE
SILVER CARBONATE	=	SILVER CARBONATE
SILVER FLUORIDE	=	SILVER FLUORIDE
SILVER IODATE	=	SILVER IODATE
SILVER MONOFLUORIDE	=	SILVER FLUORIDE
SILVER NITRATE	=	SILVER NITRATE
SILVER OXIDE	=	SILVER OXIDE
SILVER SULFATE	=	SILVER SULFATE
SILVISAR 510	=	CACODYLIC ACID
SLAKED LIME	=	CALCIUM HYDROXIDE
SLOW-CURING ASPHALT	=	OIL: ROAD
SODAMIDE	=	SODIUM AMIDE
SODIUM	=	SODIUM
SODIUM ACID SULFITE	=	SODIUM BISULFITE
SODIUM ALKYLBENZENESULFONATES	=	SODIUM ALKYLBENZENESULFONATES
SODIUM ALKYL SULFATES	=	SODIUM ALKYL SULFATES
SODIUM AMIDE	=	SODIUM AMIDE
SODIUM ARSENATE	=	SODIUM ARSENATE

SYNONYM		COMPOUND NAME
SODIUM ARSENATE, DIBASIC	=	SODIUM ARSENATE
SODIUM ARSENITE	=	SODIUM ARSENITE
SODIUM AZIDE	=	SODIUM AZIDE
SODIUM BIBORATE	=	SODIUM BORATE
SODIUM BISULFIDE	=	SODIUM HYDROSULFIDE SOLUTION
SODIUM BISULFITE	=	SODIUM BISULFITE
SODIUM BORATE	=	SODIUM BORATE
SODIUM BOROHYDRIDE	=	SODIUM BOROHYDRIDE
SODIUM CACODYLATE	=	SODIUM CACODYLATE
SODIUM CETYL SULFATE SOLUTION	=	HEXADECYL SULFATE, SODIUM SALT
SODIUM CHLORATE	=	SODIUM CHLORATE
SODIUM CHROMATE	=	SODIUM CHROMATE
SODIUM CHROMATE(VI)	=	SODIUM CHROMATE
SODIUM CYANIDE	=	SODIUM CYANIDE
SODIUM DICHLOROISOCYANURATE	=	SODIUM DICHLORO-S-TRIAZINETRIONE
SODIUM DICHLORO-S-TRIAZINETRIONE	=	SODIUM DICHLORO-S-TRIAZINETRIONE
SODIUM DICHROMATE	=	SODIUM DICHROMATE
SODIUM DIMETHYLARSONATE	=	SODIUM CACODYLATE
SODIUM DIOCTYL SULFOSUCCINATE	=	DIOCTYL SODIUM SULFOSUCCINATE
SODIUM DODECYL SULFATE	=	DODECYL SULFATE, SODIUM SALT
SODIUM FERROCYANIDE	=	SODIUM FERROCYANIDE
SODIUM FLUORIDE	=	SODIUM FLUORIDE
SODIUM FLUOSILICATE	=	SODIUM SILICOFLUORIDE
SODIUM HEXAFLUOROSILICATE	=	SODIUM SILICOFLUORIDE
SODIUM HYDRIDE	=	SODIUM HYDRIDE
SODIUM HYDROGEN ALKYL SULFATE	=	SODIUM ALKYL SULFATES
SODIUM HYDROGEN SULFIDE	=	SODIUM HYDROSULFIDE SOLUTION
SODIUM HYDROSULFIDE SOLUTION	=	SODIUM HYDROSULFIDE SOLUTION
SODIUM HYDROXIDE	=	SODIUM HYDROXIDE
SODIUM HYDROXIDE SOLUTION	=	CAUSTIC SODA SOLUTION
SODIUM HYPOCHLORITE	=	SODIUM HYPOCHLORITE
SODIUM LAURYL SULFATE	=	DODECYL SULFATE, SODIUM SALT
SODIUM METAARSENITE	=	SODIUM ARSENITE
SODIUM METABISULFITE	=	SODIUM BISULFITE
SODIUM METHOXIDE	=	SODIUM METHYLATE
SODIUM METHYLATE	=	SODIUM METHYLATE
SODIUM NITRITE	=	SODIUM NITRITE
SODIUM OLEATE	=	OLEIC ACID, SODIUM SALT
SODIUM ORTHOARSENITE	=	SODIUM ARSENITE
SODIUM OXALATE	=	SODIUM OXALATE
SODIUM PHOSPHATE	=	SODIUM PHOSPHATE
SODIUM PYROBORATE	=	SODIUM BORATE
SODIUM PYROSULFITE	=	SODIUM BISULFITE
SODIUM RHODANIDE	=	SODIUM THIOCYANATE
SODIUM SILICATE	=	SODIUM SILICATE
SODIUM SILICOFLUORIDE	=	SODIUM SILICOFLUORIDE
SODIUM SULFHYDRATE	=	SODIUM HYDROSULFIDE SOLUTION
SODIUM SULFIDE	=	SODIUM SULFIDE
SODIUM SULFITE	=	SODIUM SULFITE
SODIUM SULFOCYANATE	=	SODIUM THIOCYANATE
SODIUM TETRABORATE,ANHYDROUS	=	SODIUM BORATE
SODIUM THIOCYANATE	=	SODIUM THIOCYANATE
SOLAR NITROGEN SOLUTIONS	=	AMMONIUM NITRATE-UREA SOLUTION
SOLUBLE GLASS	=	SODIUM SILICATE
SORBIT	=	SORBITOL
SORBITOL	=	SORBITOL
SORBO	=	SORBITOL
SORBOL	=	SORBITOL
SOYBEAN OIL	=	OIL: SOYA BEAN
SPECTRACIDE	=	DIAZINON
SPERM OIL	=	OIL: SPERM
SPINDLE OIL	=	OIL: SPINDLE
SPIRIT	=	ETHYL ALCOHOL
SPIRIT OF ETHER NITRITE	=	ETHYL NITRITE
SPIRITS OF TURPENTINE	=	TURPENTINE

SYNONYM		COMPOUND NAME
SPIRITS OF WINE	=	ETHYL ALCOHOL
SPOTTING NAPHTHA	=	NAPHTHA STODDARD SOLVENT
SPRAY OIL	=	OIL: SPRAY
STEAM TURBINE LUBE OIL	=	OILS MISCELLANEOUS: TURBINE
STEAM TURBINE OIL	=	OILS MISCELLANEOUS: TURBINE
STEARIC ACID	=	STEARIC ACID
STEARIC ACID, AMMONIUM SALT	=	AMMONIUM STEARATE
STEAROPHANIC ACID	=	STEARIC ACID
STEARYL ALCOHOL,CRUDE	=	TALLOW FATTY ALCOHOL
STEINBUHL YELLOW	=	CALCIUM CHROMATE
STREUNEX	=	BENZENE
STYRENE	=	STYRENE
STYROL	=	STYRENE
STYROLENE	=	STYRENE
SUCROSE	=	SUCROSE
SUGAR	=	SUCROSE
SUGAR OF LEAD	=	LEAD ACETATE
SULFAMIC ACID, MONOAMMONIUM SALT	=	AMMONIUM SULFAMATE
SULFATED NEATSFOOT OIL, SODIUM SALT	=	OIL, TANNERS
SULFATE OF COPPER	=	COPPER SULFATE
SULFATE TURPENTINE	=	TURPENTINE
SULFOLANE	=	SULFOLANE
SULFOLANE-W	=	SULFOLANE
SULFONATED ALKYLBENZENE, SODIUM SALT	=	SODIUM ALKYLBENZENESULFONATES
SULFUR DIOXIDE	=	SULFUR DIOXIDE
SULFURETTED HYDROGEN	=	HYDROGEN SULFIDE
SULFURIC ACID	=	SULFURIC ACID
SULFURIC ACID, SPENT	=	SULFURIC ACID, SPENT
SULFURIC ETHER	=	ETHYL ETHER
SULFUR(LIQUID)	=	SULFUR(LIQUID)
SULFUR MONOCHLORIDE	=	SULFUR MONOCHLORIDE
SULFURYL CHLORIDE	=	SULFURYL CHLORIDE
SULPHUR (LIQUID)	=	SULFUR(LIQUID)
SULPHURETTED HYDROGEN	=	HYDROGEN SULFIDE
SUPEROXOL	=	HYDROGEN PEROXIDE
SWEDISH GREEN	=	COPPER ARSENITE
SWEET SPIRIT OF NITRE	=	ETHYL NITRITE
SYNTHETIC RUBBER LATEX	=	LATEX, LIQUID SYNTHETIC
SYSTOX AND ISOSYSTOX MIXTURE	=	DEMETON
2,4,5-T	=	2,4,5-TRICHLOROPHENOXYACETIC ACID
TALL OIL	=	OIL: TALL
TALLOW	=	TALLOW
TALLOW FATTY ALCOHOL	=	TALLOW FATTY ALCOHOL
TALLOW OIL	=	TALLOW
TANNERS OIL	=	OIL, TANNERS
TANNIC ACID	=	TANNIC ACID
TANNIN	=	TANNIC ACID
TAR ACIDS	=	CRESOLS
TAR CAMPHOR	=	NAPHTHALENE, MOLTEN
TARTAR EMETIC	=	ANTIMONY POTASSIUM TARTRATE
L-TARTARIC ACID, AMMONIUM SALT	=	AMMONIUM TARTRATE
TARTARIZED ANTIMONY	=	ANTIMONY POTASSIUM TARTRATE
TARTRATED ANTIMONY	=	ANTIMONY POTASSIUM TARTRATE
TBA	=	TERT-BUTYLAMINE
TCP	=	TRICRESYL PHOSPHATE
TCP	=	CALCIUM PHOSPHATE
TCE	=	DDD
TDI	=	TOLUENE 2,4-DIISOCYANATE (TDI)
TEA	=	TRIETHYLALUMINUM
TEAR GAS	=	CHLOROACETOPHENONE
TEFLON MONOMER	=	TETRAFLUOROETHYLENE, INHIBITED
TEG	=	TRIETHYLENE GLYCOL
TEL	=	TETRAETHYL LEAD
TELONE	=	DICHLOROPROPENE
TEN	=	TRIETHYLAMINE

SYNONYM		COMPOUND NAME
TEP	=	TETRAETHYL PYROPHOSPHATE
TEPP	=	TETRAETHYL PYROPHOSPHATE
TEREPHTHALIC ACID, DIMETHYL ESTER	=	DIMETHYL TEREPHTHALATE
TERGITOL 3-A-6 NONIONIC	=	ETHOXYLATED TRIDECANOL
TERGITOL NONIONIC 45-S-10	=	ETHOXYLATED PENTADECANOL
TERGITOL NONIONIC 45-S-10	=	ETHOXYLATED TETRADECANOL
TERGITOL NONIONIC TMN	=	ETHOXYLATED DODECANOL
TERPINENE	=	DIPENTENE
DELTA-1,8-TERPODIENE	=	DIPENTENE
TERTIARY BUTYL ALCOHOL	=	TERT-BUTYL ALCOHOL
TERTIARY BUTYL HYDROPEROXIDE	=	TERT-BUTYL HYDROPEROXIDE
2,4,5-T(ESTERS)	=	2,4,5-T(ESTERS)
TETA	=	TRIETHYLENETETRAMINE
TETRABUTYL TITANATE	=	TETRABUTYL TITANATE
1,1,2,2-TETRACHLOROETHANE	=	TETRACHLOROETHANE
TETRACHLOROETHANE	=	TETRACHLOROETHANE
TETRACHLOROETHYLENE	=	TETRACHLOROETHYLENE
TETRACHLOROMETHANE	=	CARBON TETRACHLORIDE
1-TETRADECANOL	=	TETRADECANOL
TETRADECANOL	=	TETRADECANOL
TETRADECANOL	=	LINEAR ALCOHOLS (12-15 CARBONS)
1-TETRADECENE	=	1-TETRADECENE
N-TETRADECYL ALCOHOL	=	TETRADECANOL
TETRADECYLBENZENE	=	TETRADECYLBENZENE
TETRADECYLBENZENESULFONIC ACID	=	ALKYLBENZENESULFONIC ACIDS
TETRAETHYL DITHIONOPYROPHOSPHATE	=	TETRAETHYL DITHIOPYROPHOSPHATE
TETRAETHYL DITHIOPYROPHOSPHATE	=	TETRAETHYL DITHIOPYROPHOSPHATE
TETRAETHYL LEAD	=	TETRAETHYL LEAD
TETRAETHYL ORTHOSILICATE	=	ETHYL SILICATE
TETRAETHYL PYROPHOSPHATE	=	TETRAETHYL PYROPHOSPHATE
O,O,O,O-TETRAETHYL PYROPHOSPHORODITHIONATE	=	TETRAETHYL DITHIOPYROPHOSPHATE
TETRAETHYLENE GLYCOL	=	TETRAETHYLENE GLYCOL
TETRAETHYLENEPENTAMINE	=	TETRAETHYLENEPENTAMINE
TETRAETHYL SILICATE	=	ETHYL SILICATE
TETRAFLUOROETHYLENE, INHIBITED	=	TETRAFLUOROETHYLENE, INHIBITED
TETRAHYDROFURAN	=	TETRAHYDROFURAN
3A,4,7,7A-TETRAHYDRO-4,7-METHANOINDENE	=	DICYCLOPENTADIENE
1,2,3,4-TETRAHYDRONAPHTHALENE	=	TETRAHYDRONAPHTHALENE
TETRAHYDRONAPHTHALENE	=	TETRAHYDRONAPHTHALENE
TETRAHYDRO-P-OXAZINE	=	MORPHOLINE
TETRAHYDRO-2H-1,4-OXAZINE	=	MORPHOLINE
TETRAHYDROTHIOPHENE-1,1-DIOXIDE	=	SULFOLANE
TETRAHYDROXYMETHYLMETHANE	=	PENTAERYTHRITOL
TETRALIN	=	TETRAHYDRONAPHTHALENE
TETRAMETHYLENEGLYCOL	=	1,4-BUTANEDIOL
TETRAMETHYLENE OXIDE	=	TETRAHYDROFURAN
TETRAMETHYLENE SULFONE	=	SULFOLANE
TETRAMETHYL LEAD	=	TETRAMETHYL LEAD
TETRAMETHYLOLMETHANE	=	PENTAERYTHRITOL
TETRAMETHYLTHIURAM DISULFIDE	=	THIRAM
TETRANAP	=	TETRAHYDRONAPHTHALENE
TETRAPROPYLENE	=	PROPYLENE TETRAMER
TETRAPROPYLENE	=	DODECENE
TETRINE ACID	=	ETHYLENEDIAMINE TETRACETIC ACID
TETRON	=	TETRAETHYL PYROPHOSPHATE
THANOL PPG	=	POLYPROPYLENE GLYCOL
THF	=	TETRAHYDROFURAN
2-THIAPROPANE	=	DIMETHYL SULFIDE
THIOBUTYL ALCOHOL	=	N-BUTYL MERCAPTAN
THIOCARBONYL CHLORIDE	=	THIOPHOSGENE
THIOCYANIC ACID, AMMONIUM SALT	=	AMMONIUM THIOCYANATE
THIOETHYL ALCOHOL	=	ETHYL MERCAPTAN
THIOMETHYL ALCOHOL	=	METHYL MERCAPTAN
THIOPHOSGENE	=	THIOPHOSGENE
THIOPHOSPHORIC ANHYDRIDE	=	PHOSPHORUS PENTASULFIDE

SYNONYM		COMPOUND NAME
THIRAM	=	THIRAM
THIURAM	=	THIRAM
THORIUM NITRATE	=	THORIUM NITRATE
THORIUM NITRATE TETRAHYDRATE	=	THORIUM NITRATE
THRETHYLENE	=	TRICHLOROETHYLENE
TIBA	=	TRIISOBUTYLALUMINUM
TIBAL	=	TRIISOBUTYLALUMINUM
TITANIUM BUTOXIDE	=	TETRABUTYL TITANATE
TITANIUM TETRABUTOXIDE	=	TETRABUTYL TITANATE
TITANIUM TETRACHLORIDE	=	TITANIUM TETRACHLORIDE
TOLUENE	=	TOLUENE
2,4-TOLUENE DIISOCYANATE	=	TOLUENE 2,4-DIISOCYANATE (TDI)
TOLUENE 2,4-DIISOCYANATE (TDI)	=	TOLUENE 2,4-DIISOCYANATE (TDI)
TOLUENE, MIXTURE WITH BENZENE AND XYLENES	=	NAPHTHA COAL TAR
P-TOLUENESULFONIC ACID	=	P-TOLUENESULFONIC ACID
O-TOLUIDINE	=	O-TOLUIDINE
TOLUOL	=	TOLUENE
M-TOLYLENE DIISOCYANATE	=	TOLUENE 2,4-DIISOCYANATE (TDI)
2,4-TOLYLENE DIISOCYANATE	=	TOLUENE 2,4-DIISOCYANATE (TDI)
TOLYL EPOXYPROPYL ETHER	=	CRESYL GLYCIDYL ETHER
TOLYL GLYCIDYL ETHER	=	CRESYL GLYCIDYL ETHER
TOSIC ACID	=	P-TOLUENESULFONIC ACID
TOXAPHENE	=	TOXAPHENE
TOXICHLOR	=	CHLORDANE
TOXILIC ACID	=	MALEIC ACID
TOXILIC ANHYDRIDE	=	MALEIC ANHYDRIDE
TRANSFORMER OIL	=	OIL: TRANSFORMER
TRANSMISSION OIL	=	OIL: MOTOR
TRANSMISSION OIL	=	OIL: LUBRICATING
TREFLAN	=	TRIFLURALIN
TRETHYLENE	=	TRICHLOROETHYLENE
TRI	=	TRICHLOROETHYLENE
TRI-6	=	BENZENE HEXACHLORIDE
TRICALCIUM ARSENATE	=	CALCIUM ARSENATE
TRICALCIUM ORTHOARSENATE	=	CALCIUM ARSENATE
TRICHLORAN	=	TRICHLOROETHYLENE
TRICHLOROAMYLSILANE	=	N-AMYLTRICHLOROSILANE
1,1,1-TRICHLORO-2,2-BIS(P-CHLOROPHENYL)ETHANE	=	DDT
1,1,1-TRICHLOROETHANE	=	TRICHLOROETHANE
TRICHLOROETHANE	=	TRICHLOROETHANE
TRICHLOROETHENE	=	TRICHLOROETHYLENE
TRICHLOROETHYLENE	=	TRICHLOROETHYLENE
TRICHLOROETHYLSILANE	=	ETHYLTRICHLOROSILANE
TRICHLOROETHYLSILICANE	=	ETHYLTRICHLOROSILANE
TRICHLOROFLUOROMETHANE	=	TRICHLOROFLUOROMETHANE
TRICHLOROIMINOISOCYANURIC ACID	=	TRICHLORO-S-TRIAZINETRIONE
TRICHLOROISOCYANURIC ACID	=	TRICHLORO-S-TRIAZINETRIONE
TRICHLOROMETHANE	=	CHLOROFORM
TRICHLOROMETHANE	=	CALCIUM FLUORIDE
TRICHLOROMETHANE SULPHURYL CHLORIDE	=	PERCHLOROMETHYL MERCAPTAN
TRICHLOROMETHANESULFENYL CHLORIDE	=	PERCHLOROMETHYL MERCAPTAN
TRICHLOROMETHYL SULPHOCHLORIDE	=	PERCHLOROMETHYL MERCAPTAN
TRICHLOROMETHYLSILANE	=	METHYLTRICHLOROSILANE
TRICHLOROMETHYLSULFUR CHLORIDE	=	PERCHLOROMETHYL MERCAPTAN
N-TRICHLOROMETHYLTHIO-CIS-CYCLOHEXENE-1,2-DICARBOXIMIDE	=	CAPTAN
N-((TRICHLOROMETHYL)THIO)-4-CYCLOHEXENE-1,2-DICARBOXIMIDE	=	CAPTAN
N-TRICHLOROMETHYLTHIO-CIS-(DELTA 4)CYCLOHEXENE-1,2-DICARBOXIMIDE	=	CAPTAN
TRICHLOROMONOSILANE	=	TRICHLOROSILANE
TRICHLORONITROMETHANE	=	CHLOROPICRIN, LIQUID
TRICHLOROOXO VANADIUM	=	VANADIUM OXYTRICHLORIDE

SYNONYM		COMPOUND NAME
TRICHLOROPENTYLSILANE	=	N-AMYLTRICHLOROSILANE
TRICHLOROPHENOL	=	TRICHLOROPHENOL
2,4,5-TRICHLOROPHENOL	=	TRICHLOROPHENOL
2,4,5-TRICHLOROPHENOXYACETIC ACID	=	2,4,5-TRICHLOROPHENOXYACETIC ACID
TRICHLOROSILANE	=	TRICHLOROSILANE
TRICHLORO-S-TRIAZINETRIONE	=	TRICHLORO-S-TRIAZINETRIONE
TRICHLOROTRIAZINETRIONE	=	TRICHLORO-S-TRIAZINETRIONE
TRICHLORO-S-TRIAZINE-2,4,6-(1H,3H,5H)-TRIONE	=	TRICHLORO-S-TRIAZINETRIONE
1,3,5-TRICHLORO-2,4,6-TRIOXO-1,3,5-TRIAZINE	=	TRICHLORO-S-TRIAZINETRIONE
TRICHLOROVINYL SILICANE	=	VINYLTRICHLOROSILANE
TRICHLOROVINYLSILANE	=	VINYLTRICHLOROSILANE
TRICLENE	=	TRICHLOROETHYLENE
TRI-CLENE	=	TRICHLOROETHYLENE
TRICRESYL PHOSPHATE	=	TRICRESYL PHOSPHATE
TRI-P-CRESYL PHOSPHATE	=	TRICRESYL PHOSPHATE
1-TRIDECANOL	=	TRIDECANOL
TRIDECANOL	=	TRIDECANOL
TRIDECANOL	=	LINEAR ALCOHOLS (12-15 CARBONS)
1-TRIDECENE	=	1-TRIDECENE
TRIDECYLBENZENESULFONIC ACID	=	ALKYLBENZENESULFONIC ACIDS
TRIELENE	=	TRICHLOROETHYLENE
TRIEN	=	TRIETHYLENETETRAMINE
TRIETHANOLAMINE	=	TRIETHANOLAMINE
TRIETHANOLAMINE DODECYLBENZENESULFONATE	=	DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT
TRIETHANOLAMINE LAURYL SULFATE	=	DODECYL SULFATE, TRIETHANOLAMINE SALT
TRIETHYLALUMINUM	=	TRIETHYLALUMINUM
TRIETHYLAMINE	=	TRIETHYLAMINE
TRIETHYLBENZENE	=	TRIETHYLBENZENE
SYM-TRIETHYLBENZENE	=	TRIETHYLBENZENE
1,3,5-TRIETHYLBENZENE	=	TRIETHYLBENZENE
TRIETHYLENE GLYCOL	=	TRIETHYLENE GLYCOL
TRIETHYLENE GLYCOL MONOETHYL ETHER	=	ETHOXY TRIGLYCOL
TRIETHYLENEPHOSPHORAMIDE	=	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
TRIETHYLENETETRAMINE	=	TRIETHYLENETETRAMINE
TRIETHYLOLAMINE	=	TRIETHANOLAMINE
ALPHA,ALPHA,ALPHA-TRIFLUORO-2,6-DINITRO-N,N-DIPROPYL-P-TOLUIDINE	=	TRIFLURALIN
TRIFLUOROCHLOROETHYLENE	=	TRIFLUOROCHLOROETHYLENE
TRIFLUOROMONOCHLOROETHYLENE	=	TRIFLUOROCHLOROETHYLENE
TRIFLUOROVINYL CHLORIDE	=	TRIFLUOROCHLOROETHYLENE
TRIFLURALIN	=	TRIFLURALIN
TRIGLYCINE	=	NITRILOTRIACETIC ACID AND SALTS
TRIGLYCOL	=	TRIETHYLENE GLYCOL
TRIGLYCOL MONOETHYL ETHER	=	ETHOXY TRIGLYCOL
1,2,3-TRIHYDROXYBENZENE	=	PYROGALLIC ACID
3,4,5-TRIHYDROXYBENZOIC ACID	=	GALLIC ACID
1,2,3-TRIHYDROXYPROPANE	=	GLYCERINE
TRIHYDROXYTRIETHYLAMINE	=	TRIETHANOLAMINE
TRIISOBUTYLALUMINUM	=	TRIISOBUTYLALUMINUM
TRILENE	=	TRICHLOROETHYLENE
TRILINE	=	TRICHLOROETHYLENE
TRIMAR	=	TRICHLOROETHYLENE
TRIMETHYLAMINE	=	TRIMETHYLAMINE
TRIMETHYLAMINOMETHANE	=	TERT-BUTYLAMINE
TRIMETHYLBENZYLAMMONIUM CHLORIDE	=	BENZYLTRIMETHYLAMMONIUM CHLORIDE
3,7,7-TRIMETHYLBICYCLO(0.1.4)HEPT-3-ENE	=	CARENE
TRIMETHYLCARBINOL	=	TERT-BUTYL ALCOHOL
TRIMETHYLCHLOROSILANE	=	TRIMETHYLCHLOROSILANE
3,5,5-TRIMETHYL-2-CYCLOHEXENE-1-ONE	=	ISOPHORONE
TRIMETHYLENE	=	CYCLOPROPANE
TRIMETHYLHEPTANALS	=	ISODECALDEHYDE
4,7,7-TRIMETHYL-3-NORCARENE	=	CARENE

SYNONYM		COMPOUND NAME
2,4,4-TRIMETHYL-1-PENTENE	=	DIISOBUTYLENE
TRIMETHYLSILYL CHLORIDE	=	TRIMETHYLCHLOROSILANE
3,6,9-TRIOXAUNDECAN-1,11-DIOL	=	TETRAETHYLENE GLYCOL
TRIPROPYLENE	=	NONENE
TRIPROPYLENE GLYCOL	=	TRIPROPYLENE GLYCOL
TRIS(AZIRIDINYL)PHOSPHINE OXIDE	=	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
TRIS (HYDROXYETHYL)AMINE	=	TRIETHANOLAMINE
TRISODIUM NITRILOTRIACETATE	=	NITRILOTRIACETIC ACID AND SALTS
TRI-P-TOLYL PHOSPHATE	=	TRICRESYL PHOSPHATE
P-TSA	=	P-TOLUENESULFONIC ACID
TURPENTINE	=	TURPENTINE
TURPS	=	TURPENTINE
TYRANTON	=	DI ETONE ALCOHOL
UCANE ALKYLATE 12	=	DO CYLBENZENE
UCAR BISPHENOL HP	=	BISPHENOL A
UCON 11	=	TRICHLOROFLUOROMETHANE
UCON 12	=	DICHLORODIFLUOROMETHANE
UCON 22	=	MONOCHLORODIFLUOROMETHANE
UDMH	=	1,1-DIMETHYLHYDRAZINE
UNDECANOL	=	UNDECANOL
1-UNDECANOL	=	UNDECANOL
1-UNDECENE	=	1-UNDECENE
UNDECYL ALCOHOL	=	UNDECANOL
N-UNDECYLBENZENE	=	N-UNDECYLBENZENE
UNDECYLBENZENESULFONIC ACID	=	ALKYLBENZENESULFONIC ACIDS
UNDECYLETHYLENE	=	1-TRIDECENE
UNDECYLIC ALCOHOL	=	UNDECANOL
UNSLAKED LIME	=	CALCIUM OXIDE
URANIUM ACETATE	=	URANYL ACETATE
URANIUM ACETATE DIHYDRATE	=	URANYL ACETATE
URANIUM NITRATE	=	URANYL NITRATE
URANIUM OXYACETATE DIHYDRATE	=	URANYL ACETATE
URANIUM SULFATE	=	URANYL SULFATE
URANIUM SULFATE TRIHYDRATE	=	URANYL SULFATE
URANYL ACETATE	=	URANYL ACETATE
URANYL ACETATE DIHYDRATE	=	URANYL ACETATE
URANYL NITRATE	=	URANYL NITRATE
URANYL SULFATE	=	URANYL SULFATE
URANYL SULFATE TRIHYDRATE	=	URANYL SULFATE
UREA	=	UREA
UREA HYDROGEN PEROXIDE	=	UREA PEROXIDE
UREA PEROXIDE	=	UREA PEROXIDE
URITONE	=	HEXAMETHYLENETETRAMINE
UROTROPIN	=	HEXAMETHYLENETETRAMINE
VALENTINITE	=	ANTIMONY TRIOXIDE
VALERAL	=	VALERALDEHYDE
VALERALDEHYDE	=	VALERALDEHYDE
VALERIC ALDEHYDE	=	VALERALDEHYDE
VAM	=	VINYL ACETATE
VANADIC ANHYDRIDE	=	VANADIUM PENTOXIDE
VANADIUM OXYSULFATE	=	VANADYL SULFATE
VANADIUM OXYTRICHLORIDE	=	VANADIUM OXYTRICHLORIDE
VANADIUM PENTAOXIDE	=	VANADIUM PENTOXIDE
VANADIUM PENTOXIDE	=	VANADIUM PENTOXIDE
VANADYL CHLORIDE	=	VANADIUM OXYTRICHLORIDE
VANADYL SULFATE	=	VANADYL SULFATE
VANADYL SULFATE DIHYDRATE	=	VANADYL SULFATE
VANADYL TRICHLORIDE	=	VANADIUM OXYTRICHLORIDE
VANICIDE	=	CAPTAN
VAPOTONE	=	TETRAETHYL PYROPHOSPHATE
VASELINE	=	PETROLATUM
VC	=	VINYL CHLORIDE
VCL	=	VINYL CHLORIDE
VCM	=	VINYL CHLORIDE
VEGETABLE CARBON	=	CHARCOAL

SYNONYM		COMPOUND NAME
VEGETABLE CHARCOAL	=	CHARCOAL
VEGETABLE OIL	=	OIL: VEGETABLE
VELSICOL	=	HEPTACHLOR
VELSICOL 1068	=	CHLORDANE
VENTOX	=	ACRYLONITRILE
VERSENE ACID	=	ETHYLENEDIAMINE TETRACETIC ACID
VIC-M-XYLENOL	=	XYLENOL
VIENNA GREEN	=	COPPER ACETOARSENITE
VILRATHANE 4300	=	DIPHENYLMETHANEDIISOCYANATE (MDI)
VINEGAR ACID	=	ACETIC ACID
VINYL ACETATE	=	VINYL ACETATE
VINYL A MONOMER	=	VINYL ACETATE
VINYLBENZENE	=	STYRENE
VINYLCARBINOL	=	ALLYL ALCOHOL
VINYL CHLORIDE	=	VINYL CHLORIDE
VINYL C MONOMER	=	VINYL CHLORIDE
VINYL CYANIDE	=	ACRYLONITRILE
VINYLETHYLENE	=	BUTADIENE, INHIBITED
VINYL FLUORIDE, INHIBITED	=	VINYL FLUORIDE, INHIBITED
VINYLIDENECHLORIDE, INHIBITED	=	VINYLIDENECHLORIDE, INHIBITED
VINYL METHYL ETHER, INHIBITED	=	VINYL METHYL ETHER, INHIBITED
VINYLSILICON TRICHLORIDE	=	VINYLTRICHLOROSILANE
VINYLTOLUENE	=	VINYLTOLUENE
VINYLTRICHLOROSILANE	=	VINYLTRICHLOROSILANE
VYAC	=	VINYL ACETATE
WATER DISPLACING OIL	=	OIL: PENETRATING
WATER GLASS	=	SODIUM SILICATE
WAXES: CARNAUBA	=	WAXES: CARNAUBA
WAXES: PARAFFIN	=	WAXES: PARAFFIN
WEISSPIESSGLANZ	=	ANTIMONY TRIOXIDE
WHITE ARSENIC	=	ARSENIC TRIOXIDE
WHITE OIL	=	OIL: MINERAL
WHITE VITRIOL	=	ZINC SULFATE
WITCIZER 300	=	DIBUTYL PHTHALATE
WITCIZER 312	=	DIOCTYL PHTHALATE
WOOD ALCOHOL	=	METHYL ALCOHOL
WOOD CHARCOAL	=	CHARCOAL
WOOD ETHER	=	DIMETHYL ETHER
WOOD NAPHTHA	=	METHYL ALCOHOL
WOOD SPIRIT	=	METHYL ALCOHOL
WOOD TURPENTINE	=	TURPENTINE
META-XYLENE	=	M-XYLENE
P-XYLENE	=	P-XYLENE
O-XYLENE	=	O-XYLENE
M-XYLENE	=	M-XYLENE
XYLENES, MIXTURE WITH BENZENE AND TOLUENE	=	NAPHTHA COAL TAR
XYLENOL	=	XYLENOL
2,6-XYLENOL	=	XYLENOL
XYLOL	=	M-XYLENE
YELLOW ARSENIC SULFIDE	=	ARSENIC TRISULFIDE
YELLOW PETROLATUM	=	PETROLATUM
YELLOW PHOSPHORUS	=	PHOSPHORUS, WHITE
ZINC ACETATE	=	ZINC ACETATE
ZINC ACETATE DIHYDRATE	=	ZINC ACETATE
ZINC AMMONIUM CHLORIDE	=	ZINC AMMONIUM CHLORIDE
ZINC ARSENATE	=	ZINC ARSENATE
ZINC BORATE	=	ZINC BORATE
ZINC BROMIDE	=	ZINC BROMIDE
ZINC O,O-DI-N-BUTYLPHOSPHORODITHIOATE	=	ZINC DIALKYLDITHIOPHOSPHATE
ZINC CHLORIDE	=	ZINC CHLORIDE
ZINC CHROMATE	=	ZINC CHROMATE
ZINC CHROMATE(VI)HYDROXIDE	=	ZINC CHROMATE
ZINC DIACETATE	=	ZINC ACETATE
ZINC DIALKYLDITHIOPHOSPHATE	=	ZINC DIALKYLDITHIOPHOSPHATE

SYNONYM		COMPOUND NAME
ZINC DIETHYL	=	DIETHYLZINC
ZINC DIHEXYLDITHIOPHOSPHATE	=	ZINC DIALKYLDITHIOPHOSPHATE
ZINC DIHEXYLPHOSPHORODITHIOATE	=	ZINC DIALKYLDITHIOPHOSPHATE
ZINC DIMETHYL	=	DIMETHYLZINC
ZINC ETHYL	=	DIETHYLZINC
ZINC FLUOBORATE SOLUTION	=	ZINC FLUOROBORATE
ZINC FLUOROBORATE	=	ZINC FLUOROBORATE
ZINC FLUOSILICATE	=	ZINC SILICOFLUORIDE
ZINC HEXAFLUOROSILICATE	=	ZINC SILICOFLUORIDE
ZINC METHYL	=	DIMETHYLZINC
ZINC NITRATE	=	ZINC NITRATE
ZINC NITRATE HEXAHYDRATE	=	ZINC NITRATE
ZINC P-PHENOLSULFONATE	=	ZINC PHENOLSULFONATE
ZINC PHENOLSULFONATE	=	ZINC PHENOLSULFONATE
ZINC PHENOLSULFONATE OCTAHYDRATE	=	ZINC PHENOLSULFONATE
ZINC PHOSPHIDE	=	ZINC PHOSPHIDE
ZINC SILICOFLUORIDE	=	ZINC SILICOFLUORIDE
ZINC SILICOFLUORIDE HEXAHYDRATE	=	ZINC SILICOFLUORIDE
ZINC SULFATE	=	ZINC SULFATE
ZINC SULFATE HEPTAHYDRATE	=	ZINC SULFATE
ZINC SULFOCARBOLATE	=	ZINC PHENOLSULFONATE
ZINC SULFOPHENATE	=	ZINC PHENOLSULFONATE
ZINC VITRIOL	=	ZINC SULFATE
ZINC YELLOW	=	ZINC CHROMATE
ZIRCONIUM ACETATE	=	ZIRCONIUM ACETATE
ZIRCONIUM ACETATE SOLUTION	=	ZIRCONIUM ACETATE
ZIRCONIUM NITRATE	=	ZIRCONIUM NITRATE
ZIRCONIUM NITRATE PENTAHYDRATE	=	ZIRCONIUM NITRATE
ZIRCONIUM OXIDE CHLORIDE	=	ZIRCONIUM OXYCHLORIDE
ZIRCONIUM OXYCHLORIDE	=	ZIRCONIUM OXYCHLORIDE
ZIRCONIUM OXYCHLORIDE HYDRATE	=	ZIRCONIUM OXYCHLORIDE
ZIRCONIUM SULFATE	=	ZIRCONIUM SULFATE
ZIRCONIUM SULFATE TETRAHYDRATE	=	ZIRCONIUM SULFATE
ZIRCONYL CHLORIDE	=	ZIRCONIUM OXYCHLORIDE

INDEX OF CODES

AAC	ACETIC ACID
AAD	ACETALDEHYDE
AAM	ACRYLAMIDE
AAN	n-AMYL ALCOHOL
AAT	AMMONIUM ACETATE
ABC	AMMONIUM BICARBONATE
ABF	AMMONIUM BIFLUORIDE
ABM	ACETYL BROMIDE
ABR	ALLYL BROMIDE
ABS	ALKYLBENZENESULFONIC ACIDS
ABZ	AMMONIUM BENZOATE
ACA	ACETIC ANHYDRIDE
ACB	AMMONIUM CARBONATE
ACC	ACETYL CHLORIDE
ACD	ACRIDINE
ACE	ACETYLENE
ACF	ALLYL CHLOROFORMATE
ACI	AMMONIUM CITRATE
ACL	ALUMINUM CHLORIDE
ACN	ACRYLONITRILE
ACP	ACETOPHENONE
ACR	ACRYLIC ACID
ACT	ACETONE
ACY	ACETONE CYANOHYDRIN
ADA	ADIPIC ACID
ADN	ADIPONITRILE
AEA	AMINOETHANOLAMINE
AFM	AMMONIUM FORMATE
AFR	AMMONIUM FLUORIDE
AGC	AMMONIUM GLUCONATE
AID	AMMONIUM IODIDE
ALA	ALLYL ALCOHOL
ALC	ALLYL CHLORIDE
ALD	ALDRIN
ALF	ALUMINUM FLUORIDE
ALM	ALUMINUM SULFATE
ALN	ALUMINUM NITRATE
ALS	AMMONIUM LAURYL SULFATE
ALT	AMMONIUM LACTATE
AMA	AMMONIA, ANHYDROUS
AMB	AMMONIUM MOLYBDATE
AMC	AMMONIUM CHLORIDE
AMD	AMMONIUM DICHROMATE
AMF	AMMONIUM SULFITE
AMH	AMMONIUM HYDROXIDE (<28% AQUEOUS AMMONIA)
AMK	n-AMYL METHYL KETONE
AML	AMYL ACETATE
AMM	n-AMYL MERCAPTAN
AMN	AMMONIUM NITRATE
AMP	AMMONIUM PERCHLORATE
AMR	AMMONIUM STEARATE
AMS	AMMONIUM SULFATE
AMT	AMMONIUM THIOCYANATE
AMY	n-AMYL CHLORIDE
ANI	iso-AMYL NITRITE
ANL	ANILINE
ANP	AMMONIUM NITRATE - PHOSPHATE MIXTURE
ANS	AMMONIUM NITRATE - SULFATE MIXTURE
ANT	n-AMYL NITRATE
ANU	AMMONIUM NITRATE--UREA SOLUTION
AOL	AMMONIUM OLEATE
AOX	AMMONIUM OXALATE
APB	AMMONIUM PENTABORATE
APC	ANTIMONY PENTACHLORIDE
APE	AMMONIUM PERSULFATE
APF	ANTIMONY PENTAFLUORIDE
APP	AMMONIUM PHOSPHATE
APS	ACETYL PEROXIDE SOLUTION
APT	ANTIMONY POTASSIUM TARTRATE

INDEX OF CODES (Continued)

ARD	ARSENIC DISULFIDE
ARF	ASPHALT BLENDING STOCKS: ROOFERS FLUX
ARL	ACROLEIN
ART	ARSENIC TRISULFIDE
ASA	ARSENIC ACID
ASC	ANISOYL CHLORIDE
ASF	AMMONIUM SULFIDE
ASL	AMMONIUM SILICOFLUORIDE
ASM	AMMONIUM SULFAMATE
ASP	ASPHALT
ASR	ASPHALT BLENDING STOCKS: STRAIGHT RUN RESIDUE
AST	ARSENIC TRICHLORIDE
ATA	ACETYLACETONE
ATC	ALLYLTRICHLOROSILANE
ATF	AMMONIUM THIOSULFATE
ATH	ANTHRACENE
ATM	ANTIMONY TRICHLORIDE
ATN	ACETONITRILE
ATO	ARSENIC TRIOXIDE
ATR	AMMONIUM TARTRATE
ATS	n-AMYLTRICHLOROSILANE
ATT	ANTIMONY TRIFLUORIDE
ATX	ANTIMONY TRIOXIDE
ATZ	ATRAZINE
AZM	AZINPHOSMETHYL
BAC	BORIC ACID
BAD	iso-BUTYRALDEHYDE
BAI	iso-BUTYL ACRYLATE
BAL	BENZYL ALCOHOL
BAM	n-BUTYLAMINE
BAN	n-BUTYL ALCOHOL
BAS	sec-BUTYL ALCOHOL
BAT	tert-BUTYL ALCOHOL
BBP	BENZYL n-BUTYL PHTHALATE
BBR	BENZYL BROMIDE
BBZ	BROMOBENZENE
BCF	BENZYL CHLOROFORMATE
BCL	BENZYL CHLORIDE
BCN	n-BUTYL ACETATE
BCP	BOILER COMPOUND, LIQUID
BCR	BARIUM CHLORATE
BCS	BUTYLTRICHLOROSILANE
BDE	BISPHENOL A DIGLYCIDYL ETHER
BDI	BUTADIENE, INHIBITED
BDO	1,4-BUTANEDIOL
BEC	BERYLLIUM CHLORIDE
BEF	BERYLLIUM FLUORIDE
BEM	BERYLLIUM, METALLIC
BEN	BERYLLIUM NITRATE
BEO	BERYLLIUM OXIDE
BES	BERYLLIUM SULFATE
BHC	BENZENE HEXACHLORIDE
BHP	tert-BUTYL HYDROPEROXIDE
BMA	BENZYLTRIMETHYLAMMONIUM CHLORIDE
BMN	n-BUTYL METHACRYLATE
BNT	BARIUM NITRATE
BNZ	BENZENE
BOC	BISMUTH OXYCHLORIDE
BPA	BISPHENOL A
BPC	BARIUM PERCHLORATE
BPD	BENZENE PHOSPHORUS DICHLORIDE
BPF	BROMINE PENTAFLUORIDE
BPM	BARIUM PERMANGANATE
BPO	BARIUM PEROXIDE
BPT	BENZENE PHOSPHORUS THIODICHLORIDE
BRA	n-BUTYRIC ACID
BRC	BARIUM CARBONATE
BRT	BORON TRICHLORIDE

INDEX OF CODES (Continued)

BRU	BRUCINE
BRX	BROMINE
BTA	sec-BUTYL ACETATE
BTB	BORON TRIBROMIDE
BTC	n-BUTYL ACRYLATE
BTD	1,4-BUTYNEDIOL
BTF	BROMINE TRIFLUORIDE
BTL	sec-BUTYLAMINE
BTM	n-BUTYL MERCAPTAN
BTN	BUTYLENE
BTO	BUTYLENE OXIDE
BTP	p-tert-BUTYLPHENOL
BTR	n-BUTYRALDEHYDE
BUA	tert-BUTYLAMINE
BUD	1,4-BUTENEDIOL
BUT	BUTANE
BZA	BENZOIC ACID
BZC	BENZOYL CHLORIDE
BZD	BENZALDEHYDE
BZM	BENZYLAMINE
BZN	BENZONITRILE
BZO	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE
BZP	BENZOPHENONE
CAA	COPPER ACETOARSENITE
CAC	CHLOROACETYL CHLORIDE
CAF	CALCIUM FLUORIDE
CAH	CALCIUM HYDROXIDE
CAL	CALCIUM PHOSPHATE
CAM	CALCIUM, METALLIC
CAO	CALCIUM OXIDE
CAP	p-CHLOROANILINE
CAR	CARENE
CAT	CADMIUM ACETATE
CBA	COBALT ACETATE
CBB	CARBON BISULFIDE
CBC	COBALT CHLORIDE
CBN	4-CHLOROBUTYRONITRILE
CBO	CARBOLIC OIL
CBR	CYANOGEN BROMIDE
CBS	COBALT SULFATE
CBT	CARBON TETRACHLORIDE
CBY	CARBARYL
CCA	CALCIUM ARSENATE
CCB	CALCIUM CARBIDE
CCC	CALCIUM CHLORATE
CCH	CYCLOHEXANONE
CCL	CYANOGEN CHLORIDE
CCN	CALCIUM CYANIDE
CCP	CALCIUM PEROXIDE
CCR	CALCIUM CHROMATE
CCT	CREOSOTE, COAL TAR
CCY	COPPER CYANIDE
CDA	CACODYLIC ACID
CDC	CADMIUM CHLORIDE
CDN	CHLORDANE
CDO	CARBON DIOXIDE
CES	CUPRIETHYLENEDIAMINE SOLUTION
CFB	CADMIUM FLUOROBORATE
CGE	CRESYL GLYCIDYL ETHER
CHA	CYCLOHEXYLAMINE
CHC	CHARCOAL
CHD	CHLOROHYDRINS (CRUDE)
CHN	CYCLOHEXANOL
CHP	CYCLOHEXANONE PEROXIDE
CHT	CYCLOHEXENYLTRICHLOROSILANE
CHX	CYCLOHEXANE
CHY	CALCIUM HYPOCHLORITE

INDEX OF CODES (Continued)

CID	COPPER IODIDE
CIT	CITRIC ACID
CLC	CALCIUM CHLORIDE
CLD	COLLODION
CLS	CAPROLACTAM, SOLUTION
CLX	CHLORINE
CMA	CHROMIC ANHYDRIDE
CMB	CADMIUM BROMIDE
CMC	CHROMYL CHLORIDE
CME	CHLOROMETHYL METHYL ETHER
CMH	CUMENE HYDROPEROXIDE
CMN	CADMIUM NITRATE
CMO	CARBON MONOXIDE
CMP	p-CYMENE
CMS	CADMIUM SULFATE
CNI	COPPER NITRATE
CNN	COPPER NAPHTHENATE
CNT	CALCIUM NITRATE
COL	COPPER OXALATE
CON	COBALT NITRATE
COP	COPPER ACETATE
COU	COUMAPHOS
COX	CADMIUM OXIDE
CPA	COPPER ARSENITE
CPB	COPPER BROMIDE
CPC	COPPER CHLORIDE
CPF	COPPER FLUOROBORATE
CPH	CAMPHENE
CPL	CHLOROPICRIN, LIQUID
CPN	p-CHLOROPHENOL
CPO	CAMPHOR OIL
CPP	CALCIUM PHOSPHIDE
CPR	CYCLOPROPANE
CPS	CAUSTIC POTASH SOLUTION
CPT	CAPTAN
CRA	CHLOROACETOPHENONE
CRB	CHLOROBENZENE
CRE	CALCIUM RESINATE
CRF	CHLOROFORM
CRS	CRESOLS
CSA	CHLOROSULFONIC ACID
CSF	COPPER SULFATE
CSS	CAUSTIC SODA SOLUTION
CSY	CORN SYRUP
CTA	CROTONALDEHYDE
CTC	CATECHOL
CTD	4-CHLORO-o-TOLUIDINE
CTF	CHLORINE TRIFLUORIDE
CUM	CUMENE
CYA	CYANOACETIC ACID
CYG	CYANOGEN
CYP	CYCLOPENTANE
DAA	DIACETONE ALCOHOL
DAC	DIMETHYLACETAMIDE
DAI	DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT
DAL	DECALDEHYDE
DAM	DIPHENYLAMINE
DAN	n-DECYL ALCOHOL
DAP	DI-n-AMYL PHTHALATE
DBA	DI-n-BUTYLAMINE
DBC	DIISOBUTYLCARBINOL
DBE	DI-n-BUTYL ETHER
DBK	DI-n-BUTYL KETONE
DBL	DIISOBUTYLENE
DBO	o-DICHLOROBENZENE
DBP	p-DICHLOROBENZENE
DBR	DECABORANE
DBS	DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT

INDEX OF CODES (Continued)

DBT	DIBUTYLPHENOL
DBZ	n-DECYLBENZENE
DCA	2,4-DICHLOROPHENOXYACETIC ACID
DCB	DICHLOROBUTENE
DCE	1-DECENE
DCF	DICHLORODIFLUOROMETHANE
DCM	DICHLOROMETHANE
DCP	2,4-DICHLOROPHENOL
DCS	DODECYLBENZENESULFONIC ACID, CALCIUM SALT
DDB	DODECYLBENZENE
DDC	1-DODECENE
DDD	D D D
DDN	DODECANOL
DDS	DODECYL SULFATE, SODIUM SALT
DDT	DDT
DDW	DIMETHYLHEXANE DIHYDROPEROXIDE, WET
DEA	DIETHANOLAMINE
DEB	DIETHYLBENZENE
DEC	DIETHYL CARBONATE
DED	DIELDRIN
DEE	DICHLOROETHYL ETHER
DEG	DIETHYLENE GLYCOL
DEL	1,2-DICHLOROETHYLENE
DEM	DIETHYLENEGLYCOL MONOBUTYL ETHER ACETATE
DEN	DIETHYLAMINE
DEP	DI-(2-ETHYLHEXYL)PHOSPHORIC ACID
DES	2,4-D ESTERS
DET	DIETHYLENETRIAMINE
DEZ	DIETHYLZINC
DFA	DIFLUOROPHOSPHORIC ACID, ANHYDROUS
DFE	1,1-DIFLUOROETHANE
DFF	DISTILLATES: FLASHED FEED STOCKS
DGD	DIETHYLENE GLYCOL DIMETHYL ETHER
DGE	DIETHYLENE GLYCOL MONOETHYL ETHER
DGM	DIETHYLENE GLYCOL MONOMETHYL ETHER
DHN	DECAHYDRONAPHTHALENE
DHP	DIHEPTYL PHTHALATE
DIA	DIISOPROPYLAMINE
DID	DIISODECYL PHTHALATE
DIH	DIISOPROPYLBENZENE HYDROPEROXIDE
DIK	DIISOBUTYL KETONE
DIM	DIMETHYL ETHER
DIP	DIISOPROPANOLAMINE
DLP	DALAPON
DMA	DIMETHYLAMINE
DMD	DIMETHYLDICHLOROSILANE
DME	DIETHYLENEGLYCOL MONOBUTYL ETHER
DMF	DIMETHYLFORMAMIDE
DMH	1,1-DIMETHYLHYDRAZINE
DMP	DIMETHYLPOLYSILOXANE
DMS	DIMETHYL SULFOXIDE
DMT	DIMETHYL TEREPHTHALATE
DMZ	DIMETHYLZINC
DNA	DI-n-PROPYLAMINE
DNB	m-DINITROBENZENE
DNC	DINITROCRESOLS
DNP	2,4-DINITROPHENOL
DNT	2,4-DINITROANILINE
DOA	DIOCTYL ADIPATE
DOD	DODECENE
DOP	DIOCTYL PHTHALATE
DOX	1,4-DIOXANE
DPA	DIBUTYL PHTHALATE
DPD	DIPHENYLDICHLOROSILANE
DPE	DIPHENYL ETHER
DPG	DIPROPYLENE GLYCOL
DPH	DIETHYL PHTHALATE
DPM	DIPHENYLMETHANE DIISOCYANATE

INDEX OF CODES (Continued)

DPN	DIPENTENE
DPO	DIBENZOYL PEROXIDE
DPP	DICHLOROPROPANE
DPR	DICHLOROPROPENE
DPT	DICYCLOPENTADIENE
DSD	DODECYL SULFATE, DIETHANOLAMINE SALT
DSF	DIMETHYL SULFATE
DSL	DIMETHYL SULFIDE
DSM	DODECYL SULFATE, MAGNESIUM SALT
DSR	DISTILLATES: STRAIGHT RUN
DSS	DIOCTYL SODIUM SULFOSUCCINATE
DST	DODECYL SULFATE, TRIETHANOLAMINE SALT
DTC	DODECYLTRICHLOROSILANE
DTH	DOWTHERM
DTM	4,4'-DICHLORO-alpha-TRICHLOROMETHYL-BENZHYDROL
DTN	DEMETON
DTS	DEXTROSE SOLUTION
DTT	2,4-DINITROTOLUENE
DZN	DIAZINON
DZP	DI-(p-CHLOROBENZOYL) PEROXIDE
EAA	ETHYL ACETOACETATE
EAC	ETHYL ACRYLATE
EAD	ETHYLALUMINUM DICHLORIDE
EAI	2-ETHYLHEXYL ACRYLATE, INHIBITED
EAL	ETHYL ALCOHOL
EAM	ETHYLAMINE
EAS	ETHYLALUMINUM SESQUICHLORIDE
EBR	ETHYL BUTYRATE
EBT	ETHYL BUTANOL
ECA	ETHYL CHLOROACETATE
ECF	ETHYL CHLOROFORMATE
ECH	ETHYLENE CHLOROHYDRIN
ECL	ETHYL CHLORIDE
ECS	ETHYLDICHLOROSILANE
EDA	ETHYLENEDIAMINE
EDB	ETHYLENE BIBROMIDE
EDC	ETHYLENE DICHLORIDE
EDR	ENDRIN
EDT	ETHYLENEDIAMINE TETRACETIC ACID
EEE	ETHYLENE GLYCOL DIETHYL ETHER
EET	ETHYL ETHER
EFM	ETHYL FORMATE
EGA	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
EGD	ETHYLENE GLYCOL DIMETHYL ETHER
EGE	ETHYLENE GLYCOL MONOETHYL ETHER
EGL	ETHYLENE GLYCOL
EGM	ETHYLENE GLYCOL MONOBUTYL ETHER
EGY	ETHYLENE GLYCOL DIACETATE
EHA	ETHYLHEXALDEHYDE
EHP	ETHOXYDIHYDROPYRAN
EHT	ETHYL HEXYL TALLATE
EHX	2-ETHYL HEXANOL
ELT	ETHYL LACTATE
EMA	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
EMC	ETHYL MERCAPTAN
EME	ETHYLENE GLYCOL MONOMETHYL ETHER
ENB	ETHYLIDENENORBORNENE
ENP	ETHOXYLATED NONYLPHENOL
EOD	ETHOXYLATED DODECANOL
EOP	ETHOXYLATED PENTADECANOL
EOT	ETHOXYLATED TETRADECANOL
EOX	ETHYLENE OXIDE
EPA	2-ETHYL-3-PROPYLACROLEIN
EPC	EPICHLOROHYDRIN
EPD	ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS
EPP	ETHYL PHOSPHORODICHLORIDATE
EPS	ETHYLPHENYLDICHLOROSILANE

INDEX OF CODES (Continued)

ESC	ETHYL SILICATE
ETA	ETHYL ACETATE
ETB	ETHYLBENZENE
ETC	ETHYLENE CYANOHYDRIN
ETD	ETHOXYLATED TRIDECANOL
ETG	ETHOXY TRIGLYCOL
ETH	ETHANE
ETI	ETHYLENEIMINE
ETL	ETHYLENE
ETM	ETHYL METHACRYLATE
ETN	ETHYL NITRITE
ETS	ETHYLTRICHLOROSILANE
EVO	EPOXIDIZED VEGETABLE OILS
FAC	FERRIC AMMONIUM CITRATE
FAL	FURFURYL ALCOHOL
FAO	FERRIC AMMONIUM OXALATE
FAS	FERROUS AMMONIUM SULFATE
FCL	FERRIC CHLORIDE
FCP	FERRIC GLYCEROPHOSPHATE
FEC	FERROUS CHLORIDE
FFA	FURFURAL
FFB	FERROUS FLUOROBORATE
FMA	FORMIC ACID
FMS	FORMALDEHYDE SOLUTION
FNT	FERRIC NITRATE
FOX	FERROUS OXALATE
FRS	FERROUS SULFATE
FSA	FLUOSULFONIC ACID
FSF	FERRIC SULFATE
FSL	FLUOSILICIC ACID
FUM	FUMARIC ACID
FXX	FLUORINE
GAK	GASOLINE BLENDING STOCKS: ALKYLATES
GAT	GASOLINES: AUTOMOTIVE (<4.23g LEAD/GAL.)
GAV	GASOLINES: AVIATION (<4.86g LEAD/GAL.)
GCM	GLYCIDYL METHACRYLATE
GCR	GLYCERINE
GCS	GASOLINES: CASINGHEAD
GLA	GALLIC ACID
GOC	GAS OIL: CRACKED
GOS	GLYOXAL, 40% SOLUTION
GPL	GASOLINES: POLYMER
GRF	GASOLINE BLENDING STOCKS: REFORMATES
GSR	GASOLINES: STRAIGHT RUN
GTA	GLUTARALDEHYDE SOLUTION
HAC	HEXADECYLTRIMETHYLAMMONIUM CHLORIDE
HAI	2-HYDROXYETHYL ACRYLATE, INHIBITED
HAL	n-HEXALDEHYDE
HAS	HYDROXYLAMINE SULFATE
HBR	HYDROGEN BROMIDE
HCC	HEXACHLOROCYLOPENTADIENE
HCL	HYDROCHLORIC ACID
HCN	HYDROGEN CYANIDE
HDC	HYDROGEN CHLORIDE
HDQ	HYDROQUINONE
HDS	HYDROGEN SULFIDE
HDZ	HYDRAZINE
HFA	HYDROFLUORIC ACID
HFX	HYDROGEN FLUORIDE
HMD	HEXAMETHYLENEDIAMINE
HMI	HEXAMETHYLENEIMINE
HMT	HEXAMETHYLENETETRAMINE
HPA	HYDROXYPROPYL ACRYLATE
HPM	HYDROXYPROPYL METHACRYLATE

INDEX OF CODES (Continued)

HPO	HYDROGEN PEROXIDE
HPT	HEPTANE
HSS	HEXADECYL SULFATE, SODIUM SALT
HTC	HEPTACHLOR
HTE	1-HEPTENE
HTN	HEPTANOL
HXA	HEXANE
HXE	1-HEXENE
HXG	HEXYLENE GLYCOL
HXN	HEXANOL
HXX	HYDROGEN, LIQUEFIED
IAA	ISOAMYL ALCOHOL
IAC	ISOPROPYL ACETATE
IAI	ISODECYL ACRYLATE, INHIBITED
IAL	ISOBUTYL ALCOHOL
IAM	ISOBUTYLAMINE
IBA	ISOBUTYL ACETATE
IBL	ISOBUTYLENE
IBN	ISOBUTYRONITRILE
IBR	ISOBUTYRIC ACID
IBT	ISOBUTANE
IDA	ISODECALDEHYDE
IHA	ISOHEXANE
IOA	ISOOCTYL ALCOHOL
IOC	ISOOCTALDEHYDE
IPA	ISOPROPYL ALCOHOL
IPC	ISOPROPYL PERCARBONATE
IPE	ISOPROPYL ETHER
IPH	ISOPHORONE
IPL	ISOPHTHALIC ACID
IPM	ISOPROPYL MERCAPTAN
IPP	ISOPROPYLAMINE
IPR	ISOPRENE
IPT	ISOPENTANE
ISA	ISODECYL ALCOHOL
IVA	ISOVALERALDEHYDE
JPF	JET FUELS: JP-4
JPO	JET FUELS: JP-1 (KEROSENE)
JPT	JET FUELS: JP-3
JPV	JET FUELS: JP-5 (KEROSENE, HEAVY)
KPS	KEROSENE
LAC	LEAD ACETATE
LAH	LITHIUM ALUMINUM HYDRIDE
LAL	LINEAR ALCOHOLS (12-15 CARBON)
LAR	LEAD ARSENATE
LFB	LEAD FLUOROBORATE
LFR	LEAD FLUORIDE
LHD	LITHIUM HYDRIDE
LID	LEAD IODIDE
LLS	LATEX, LIQUID SYNTHETIC
LNG	LIQUEFIED NATURAL GAS
LNT	LEAD NITRATE
LPG	LIQUEFIED PETROLEUM GAS
LPO	LAUROYL PEROXIDE
LRM	LAURYL MERCAPTAN
LTA	LACTIC ACID
LTC	LEAD THIOCYANATE
LTH	LITHARGE
LTM	LITHIUM, METALLIC
LTT	LEAD TETRAACETATE
MAA	METHYL AMYL ALCOHOL
MAC	METHYL AMYL ACETATE
MAL	METHYL ALCOHOL
MAM	METHYL ACRYLATE

INDEX OF CODES (Continued)

MAN	N-METHYLANILINE
MAP	METHYL ACETYLENE - PROPADIENE MIXTURE
MAT	MERCURIC ACETATE
MBK	METHYL n-BUTYL KETONE
MCA	MONOCHLOROACETIC ACID
MCC	MERCURIC AMMONIUM CHLORIDE
MCF	MONOCHLORODIFLUOROMETHANE
MCH	METHYL CHLOROFORMATE
MCL	METHALLYL CHLORIDE
MCN	MERCURIC CYANIDE
MCP	METHYLCYCLOPENTANE
MCR	MERCURY
MCS	METHYLDICHLOROSILANE
MCT	METHYLCYCLOPENTADIENYLMANGANESE TRICARBONYL
MEA	MONOETHANOLAMINE
MEK	METHYL ETHYL KETONE
MEP	METHYLETHYLPYRIDINE
MFA	MOTOR FUEL ANTI-KNOCK COMPOUNDS CONTAINING LEAD ALKYLS
MFM	METHYL FORMATE
MGX	MAGNESIUM
MHZ	METHYLHYDRAZINE
MIC	METHYL ISOBUTYL CARBINOL
MID	MERCURIC IODIDE
MIK	METHYL ISOBUTYL KETONE
MLA	MALEIC ANHYDRIDE
MLH	MALEIC HYDRAZIDE
MLI	MALEIC ACID
MLT	MALATHION
MMC	METHYL MERCAPTAN
MMM	METHYL METHACRYLATE
MNS	MINERAL SPIRITS
MNT	MERCURIC NITRATE
MOC	METHOXYCHLOR
MOX	MERCURIC OXIDE
MPA	MONOISOPROPANOLAMINE
MPC	MAGNESIUM PERCHLORATE
MPD	METHYL PHOSPHONOTHIOIC DICHLORIDE (ANHYD)
MPK	METHYL ISOPROPENYL KETONE, INHIBITED
MPL	MORPHOLINE
MPT	METHYL PARATHION
MPY	1-METHYLPYRROLIDONE
MRC	MERCURIC CHLORIDE
MRN	MERCUROUS NITRATE
MRR	MERCUROUS CHLORIDE
MSA	METHANEARSONIC ACID, SODIUM SALTS
MSF	MERCURIC SULFIDE
MSO	MESITYL OXIDE
MSR	alpha-METHYLSTYRENE
MTA	METHYLAMINE
MTB	METHYL BROMIDE
MTC	METHYL CHLORIDE
MTF	METHYL FORMAL
MTH	METHANE
MTO	MOLYBDIC TRIOXIDE
MTS	METHYLTRICHLOROSILANE
MTT	METHYL ACETATE
MVK	METHYL VINYL KETONE
NAA	NITRILOTRIACETIC ACID AND SALTS
NAB	NABAM
NAC	NITRIC ACID
NAL	4-NITROANILINE
NAN	NONANE
NAO	1-NAPHTHYLAMINE
NAS	NICKEL AMMONIUM SULFATE
NBR	NICKEL BROMIDE
NCL	NICKEL CHLORIDE

INDEX OF CODES (Continued)

NCN	NICKEL CYANIDE
NCS	NICOTINE SULFATE
NCT	NAPHTHA: COAL TAR
NFB	NICKEL FLUOROBORATE
NFM	NICKEL FORMATE
NHX	NEOHEXANE
NIC	NICOTINE
NKA	NICKEL ACETATE
NKC	NICKEL CARBONYL
NKS	NICKEL SULFATE
NMT	NITROMETHANE
NNE	1-NONENE
NNN	NONANOL
NNP	NONYLPHENOL
NNT	NICKEL NITRATE
NON	NONENE
NOX	NITROGEN TETROXIDE
NPH	4-NITROPHENOL
NPP	2-NITROPROPANE
NSS	NAPHTHA: STODDARD SOLVENT
NSV	NAPHTHA: SOLVENT
NTA	2-NITROANILINE
NTB	NITROBENZENE
NTC	NITROSYL CHLORIDE
NTE	NITROETHANE
NTI	NAPTHENIC ACIDS
NTL	NITRALIN
NTM	NAPHTHALENE, MOLTEN
NTO	NITROUS OXIDE
NTP	2-NITROPHENOL
NTX	NITRIC OXIDE
NVM	NAPHTHA: VM & P (75% NAPHTHA)
NXX	NITROGEN, LIQUEFIED
OAC	OLEIC ACID, SODIUM SALT
OAN	OCTANE
OAP	OLEIC ACID, POTASSIUM SALT
OAS	OILS, MISCELLANEOUS: ABSORPTION
OCA	OILS, EDIBLE: CASTOR
OCC	OILS, EDIBLE: COCONUT
OCF	OILS: CLARIFIED
OCR	OILS, MISCELLANEOUS: CROTON
OCS	OILS, EDIBLE: COTTONSEED
OCT	OILS, MISCELLANEOUS: COAL TAR
ODS	OILS: DIESEL
OET	OCTYL EPOXY TALLATE
OFR	OILS, FUEL: NO. 4
OFS	OILS, EDIBLE: FISH
OFV	OILS, FUEL: NO. 5
OIL	OILS: CRUDE
OLA	OLEIC ACID
OLB	OILS, MISCELLANEOUS: LUBRICATING
OLD	OILS, EDIBLE: LARD
OLM	OLEUM
OLS	OILS, MISCELLANEOUS: LINSEED
OMN	OILS, MISCELLANEOUS: MINERAL
OMS	OILS, MISCELLANEOUS: MINERAL SEAL
OMT	OILS, MISCELLANEOUS: MOTOR
ONF	OILS, MISCELLANEOUS: NEATSFOOT
OOD	OILS, FUEL: NO. 1-D
OOL	OILS, EDIBLE: OLIVE
OON	OILS, FUEL: NO. 1 (KEROSENE)
OPM	OILS, EDIBLE: PALM
OPN	OILS, EDIBLE: PEANUT
OPT	OILS, MISCELLANEOUS: PENETRATING
ORD	OILS, MISCELLANEOUS: ROAD
ORG	OILS, MISCELLANEOUS: RANGE

INDEX OF CODES (Continued)

ORN	OILS, MISCELLANEOUS: ROSIN
ORS	OILS, MISCELLANEOUS: RESIN
OSB	OILS, EDIBLE: SOYA BEAN
OSD	OILS, MISCELLANEOUS: SPINDLE
OSF	OILS, EDIBLE: SAFFLOWER
OSP	OILS, MISCELLANEOUS: SPERM
OSX	OILS, FUEL: NO. 6
OSY	OILS, MISCELLANEOUS: SPRAY
OTA	OCTANOL
OTB	OILS, MISCELLANEOUS: TURBINE
OTC	OILS, EDIBLE: TUCUM
OTD	OILS, FUEL: NO. 2-D
OTE	1-OCTENE
OTF	OILS, MISCELLANEOUS: TRANSFORMER
OTL	OILS, MISCELLANEOUS: TALL
OTN	OILS, MISCELLANEOUS: TANNER'S
OTW	OILS, FUEL: NO. 2
OVG	OILS, EDIBLE: VEGETABLE
OXA	OXALIC ACID
OXY	OXYGEN, LIQUEFIED
PAA	PERACETIC ACID
PAC	PHOSPHORIC ACID
PAD	PROPIONALDEHYDE
PAH	PROPIONIC ANHYDRIDE
PAL	n-PROPYL ALCOHOL
PAN	PHTHALIC ANHYDRIDE
PAS	POTASSIUM ARSENATE
PAT	n-PROPYL ACETATE
PBO	POTASSIUM BINOXALATE
PBP	PROPYLENE BUTYLENE POLYMER
PBR	PHOSPHORUS TRIBROMIDE
PCB	POLYCHLORINATED BIPHENYL
PCH	POTASSIUM CHROMATE
PCL	PERCHLORIC ACID
PCM	PERCHLOROMETHYL MERCAPTAN
PCP	PENTACHLOROPHENOL
PCR	POTASSIUM CHLORATE
PDC	PENTADECANOL
PDL	PHENYLDICHLOROARSINE, LIQUID
PDT	POTASSIUM DICHLORO-s-TRIAZINETRIONE
PET	PENTAERYTHRITOL
PFA	PARAFORMALDEHYDE
PGA	PYROGALLIC ACID
PGC	POLYPROPYLENE GLYCOL
PGM	POLYPROPYLENE GLYCOL METHYL ETHER
PHG	PHOSGENE
PHH	PHENYLHYDRAZINE HYDROCHLORIDE
PHN	PHENOL
PII	PROPYLENEIMINE, INHIBITED
PLB	POLYBUTENE
PLP	POLYPROPYLENE
PLT	beta-PROPIOLACTONE
PME	PROPYLENE GLYCOL METHYL ETHER
PMN	n-PROPYL MERCAPTAN
PNA	PROPIONIC ACID
POP	POTASSIUM PEROXIDE
POX	PROPYLENE OXIDE
PPA	POLYPHOSPHORIC ACID
PPG	PROPYLENE GLYCOL
PPI	POLYMETHYLENE POLYPHENYL ISOCYANATE
PPL	PROPYLENE
PPO	PHOSPHORUS OXYCHLORIDE
PPP	PHOSPHORUS PENTASULFIDE
PPR	PHOSPHORUS, RED
PPT	PHOSPHORUS TRICHLORIDE
PPW	PHOSPHORUS, WHITE
PPZ	PIPERAZINE
PRD	PYRIDINE
PRP	PROPANE

INDEX OF CODES (Continued)

PTA	PENTANE
PTB	PENTABORANE
PTC	POTASSIUM CYANIDE
PTD	POTASSIUM DICHROMATE
PTE	1-PENTENE
PTH	POTASSIUM HYDROXIDE
PTI	POTASSIUM IODIDE
PTL	PETROLATUM
PTM	POTASSIUM, METALLIC
PTN	PETROLEUM NAPHTHA
PTO	PARATHION, LIQUID
PTP	POTASSIUM PERMANGANATE
PTS	POTASSIUM OXALATE
PTT	PROPYLENE TETRAMER
QNL	QUINOLINE
RSC	RESORCINOL
SAB	SODIUM ALKYLBENZENESULFONATES
SAC	SULFURIC ACID, SPENT
SAM	SODIUM AMIDE
SAR	SODIUM ARSENITE
SAS	SODIUM ALKYL SULFATES
SAZ	SODIUM AZIDE
SBH	SODIUM BOROHYDRIDE
SBS	SODIUM BISULFITE
SBT	SORBITOL
SCD	SODIUM CACODYLATE
SCH	SODIUM CHROMATE
SCL	SULFURYL CHLORIDE
SCN	SODIUM CYANIDE
SCR	SODIUM DICHROMATE
SCY	SODIUM THIOCYANATE
SDA	SODIUM ARSENATE
SDB	SODIUM BORATE
SDC	SODIUM CHLORATE
SDF	SODIUM FLUORIDE
SDH	SODIUM HYDRIDE
SDS	SODIUM SULFIDE
SDT	SODIUM DICHLORO-S-TRIAZINETRIONE
SDU	SODIUM
SFA	SULFURIC ACID
SFC	SODIUM FERROCYANIDE
SFD	SULFUR DIOXIDE
SFL	SULFOLANE
SFM	SULFUR MONOCHLORIDE
SFR	SODIUM SILICOFLUORIDE
SHC	SODIUM HYPOCHLORITE
SHD	SODIUM HYDROXIDE
SHS	SODIUM HYDROSULFIDE SOLUTION
SLA	SALICYLIC ACID
SLD	SELENIUM DIOXIDE
SML	SODIUM METHYLATE
SNT	SODIUM NITRITE
SOX	SODIUM OXALATE
SPP	SODIUM PHOSPHATE
SRA	STEARIC ACID
SRS	SUCROSE
SSC	SODIUM SILICATE
SSF	SODIUM SULFITE
STC	SILICON TETRACHLORIDE
STO	SELENIUM TRIOXIDE
STY	STYRENE
SVA	SILVER ACETATE
SVC	SILVER CARBONATE
SVF	SILVER FLUORIDE
SVI	SILVER IODATE

INDEX OF CODES (Continued)

SVN	SILVER NITRATE
SVO	SILVER OXIDE
SVS	SILVER SULFATE
SXX	SULFUR (LIQUID)
TAL	TRIETHYLALUMINUM
TAP	p-TOLUENESULFONIC ACID
TBT	TETRABUTYL TITANATE
TCA	2,4,5-TRICHLOROPHENOXYACETIC ACID
TCE	TRICHLOROETHANE
TCF	TRICHLOROFLUOROMETHANE
TCL	TRICHLOROETHYLENE
TCP	TRICRESYL PHOSPHATE
TCS	TRICHLOROSILANE
TCT	TRICHLORO-s-TRIAZINETRIONE
TDB	TETRADECYLBENZENE
TDC	1-TRIDECENE
TDI	TOLUENE 2,4-DIISOCYANATE
TDN	TRIDECANOL
TEA	TRIETHANOLAMINE
TEB	TRIETHYLBENZENE
TEC	TETRACHLOROETHANE
TED	TETRAETHYL DITHIOPYROPHOSPHATE
TEG	TRIETHYLENE GLYCOL
TEL	TETRAETHYL LEAD
TEN	TRIETHYLAMINE
TEP	TETRAETHYL PYROPHOSPHATE
TES	2,4,5-T (ESTERS)
TET	TRIETHYLENETETRAMINE
TFA	TALLOW FATTY ALCOHOL
TFC	TRIFLUOROCHLOROETHYLENE
TFE	TETRAFLUOROETHYLENE, INHIBITED
TFR	TRIFLURALIN
TGC	TRIPROPYLENE GLYCOL
THF	TETRAHYDROFURAN
THN	TETRAHYDRONAPHTHALENE
THR	THIRAM
TIA	TRIISOBUTYLALUMINUM
TLI	o-TOLUIDINE
TLO	TALLOW
TMA	TRIMETHYLAMINE
TMC	TRIMETHYLCHLOROSILANE
TML	TETRAMETHYL LEAD
TNA	TANNIC ACID
TOL	TOLUENE
TPG	THIOPHOSGENE
TPH	TRICHLOROPHENOL
TPO	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
TPT	TURPENTINE
TRN	THORIUM NITRATE
TTD	1-TETRADECENE
TTE	TETRACHLOROETHYLENE
TTG	TETRAETHYLENE GLYCOL
TTN	TETRADECANOL
TTP	TETRAETHYLENEPENTAMINE
TTT	TITANIUM TETRACHLORIDE
TXP	TOXAPHENE
UAN	URANYL NITRATE
UDB	n-UNDECYLBENZENE
UDC	1-UNDECENE
UND	UNDECANOL
UPO	UREA PEROXIDE
URA	URANYL ACETATE
URE	UREA
URS	URANYL SULFATE
VAL	VALERALDEHYDE
VAM	VINYL ACETATE

INDEX OF CODES (Continued)

VCI	VINYLIDENECHLORIDE, INHIBITED
VCM	VINYL CHLORIDE
VFI	VINYL FLUORIDE, INHIBITED
VME	VINYL METHYL ETHER, INHIBITED
VNT	VINYLTOLUENE
VOT	VANADIUM OXYTRICHLORIDE
VOX	VANADIUM PENTOXIDE
VSF	VANADYL SULFATE
VTS	VINYLTRICHLOROSILANE
WCA	WAXES: CARNAUBA
WPF	WAXES: PARAFFIN
XLM	m-XYLENE
XLO	o-XYLENE
XLP	p-XYLENE
XYL	XYLENOL
ZAC	ZINC AMMONIUM CHLORIDE
ZAR	ZINC ARSENATE
ZBO	ZINC BORATE
ZBR	ZINC BROMIDE
ZCA	ZIRCONIUM ACETATE
ZCL	ZINC CHLORIDE
ZCO	ZIRCONIUM OXYCHLORIDE
ZCR	ZINC CHROMATE
ZCS	ZIRCONIUM SULFATE
ZDP	ZINC DIALKYLDITHIOPHOSPHATE
ZFB	ZINC FLUOROBORATE
ZIR	ZIRCONIUM NITRATE
ZNA	ZINC ACETATE
ZNT	ZINC NITRATE
ZPP	ZINC PHOSPHIDE
ZPS	ZINC PHENOLSULFONATE
ZSF	ZINC SULFATE
ZSL	ZINC SILICOFLUORIDE

10. DATA SOURCES

The source of every item of data contained in Section 11 is recorded in master data files and is available on request. The principal sources are listed below. Many other sources were consulted, but most of them provided only a few items and are not given here. In a few cases the information given is based on an analogy with that for a closely related chemical; the analogy was drawn by an expert in the field, whose identity appears in the master data file.

Where a source was used for a single category of data, the source is given in Section 3 ("Explanation of Terms") and is not repeated here.

10.1 GENERAL SOURCES

The following sources contained data for many of the 13 data categories used:

1. Manufacturers' Technical Bulletins – This is usually the best single source of general information about the chemical. All bulletins were solicited in late 1972 and contain the most recent data. Bulletins were not available for a few chemicals that are not items of commerce but are intermediates shipped from one manufacturing site to another.

2. Material Safety Data Sheets – These were provided by the manufacturer using the U.S. Department of Labor Form OSHA-20 or an approved modification.

3. Code of Federal Regulations – Office of the Federal Register, Archives and Record Service, Washington, D.C., 1972. Titles 46 (Shipping) and 49 (Transportation) were used in the most recent revision available, in all cases since January 1, 1971.

4. Chemical Safety Data Sheets – Manufacturing Chemists Association, Washington, D.C.

5. Industrial Safety Data Sheets – National Safety Council, Chicago, Illinois.

6. International Maritime Dangerous Goods Code – Inter-Governmental Maritime Consultative Organization (IMCO), London, 1972.

7. Petroleum Products Handbook – V.B. Guthrie (ed.), McGraw-Hill, New York, 1960.

8. Glossary of Terms Used in Petroleum Refining – 2nd edition, American Petroleum Institute, New York, 1962.

9. The Handling and Storage of Liquid Propellants – Office of Defense Research and Engineering, U.S. Government Printing Office, Washington, D.C., 1963.

10. Industrial Chemicals – W.L. Faith, D.B. Keyes, and R.L. Clark, 3rd edition, Wiley, New York, 1965.

11. Chemical Technology of Petroleum – W.A. Gruse and D.R. Stevens, 3rd edition, McGraw-Hill, New York, 1960.

12. Chemical Rocket/Propellant Hazards – CPIA Publication No. 194, Vol. III, 1970.

13. Organic Solvents – J.A. Riddick and W.B. Bunger, 3rd edition, Wiley-Interscience, New York, 1970.

14. Transport of Dangerous Goods – (4 vols) United Nations, New York, 1970.

15. Kirk-Othmer Encyclopedia of Chemical Technology – 1st edition (1947-1960) and 2nd edition (1963-1970), Interscience-Wiley, New York.

16. Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide – National Academy of Sciences, Washington, D.C., 1970; includes supplement with additions to March 1972.

17. Matheson Gas Data Book – 5th edition, Matheson Gas Products, East Rutherford, New Jersey, 1971.

18. Explosive and Toxic Hazardous Materials – J. H. Meidl, Glencoe Press, Beverly Hills, California, 1969.

20. Organic Phosphorus Compounds – G. M. Kosolapoff and L. Maier (6 Vols.), Wiley-Interscience, New York.

21. The Chemistry of Organo-Phosphorus Pesticides – C. Fest and K. J. Schmidt, Springer-Verlag, New York, 1973.

10.2 CHEMICAL DESIGNATIONS

1. Commercial Organic Chemical Names – Compiled by the Synthetic Organic Chemical Manufacturers Association (SOCMA), Chemical Abstracts Service, Columbus, Ohio, 1965.

2. Chemical Synonyms and Trade Names – W. Gardner and E.I. Cooke, 7th edition, CRC press, Cleveland, Ohio, 1971.

3. The Merck Index of Chemicals and Drugs – 8th edition, Merck and Co., Rahway, New Jersey, 1968.

10.3 HEALTH HAZARDS

1. Industrial Hygiene and Toxicology – F.A. Patty, 2nd edition, Vol. II, Interscience, New York, 1963.

2. Toxicity and Metabolism of Industrial Solvents – E. Browning, Elsevier, New York, 1965.

3. Practical Toxicology of Plastics – R. Lefaux, CRC Press, Cleveland, Ohio, 1968.

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11. CHEMICAL-SPECIFIC INFORMATION

AAD — ACETALDEHYDE

Common Synonyms
Acetic aldehyde
Ethanal

Watery liquid — Colorless — Sharp fruity odor

Floats and mixes with water. Flammable, irritating vapor is produced. Boiling point is 69° F

Fire

FLAMMABLE.
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause nausea, vomiting headache, difficult breathing, or loss of consciousness

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — high flammability
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetic aldehyde
Ethanal
Ethylaldehyde

3.2 **Coast Guard Compatibility Classification:** Aldehyde

3.3 **Chemical Formula:** CH_3CHO

3.4 **IMCO/United Nations Numerical Designation:** 3.1 1089

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Penetrating fruity sharp pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, eye goggles, and other equipment to prevent any contact with body. Organic canister or air pack as required

5.2 **Symptoms Following Exposure:** Breathing vapors will be irritating and may cause nausea, vomiting, headache and unconsciousness. Contact with eyes may cause burns. Skin contact from clothing wet with the chemical causes burns or severe irritation

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; if breathing has stopped give artificial respiration; if breathing difficult give oxygen; call a physician at once. SKIN: wash with soap and water. EYES: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5.5 **Short-Term Inhalation Limits:** 50 ppm for 60 min

5.6 **Toxicity by Ingestion:** Grade 2. LD50 [illegible] g/kg rat

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors moderately irritating such that personnel would not usually tolerate moderate or high concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. Dehydration, stinging and allowed to remain may cause smarting and reddening of the skin

5.10 **Odor Threshold:** 0.21 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** −36°F (C.C.) −38°F (O.C.)

6.2 **Flammable Limits in Air:** 4 – 60%

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Produces irritating vapor when heated

6.6 **Behavior in Fire:** Vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** 365°F

6.8 **Electrical Hazard:** Class I, Group C

6.9 **Burning Rate:** 3.3 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** May occur. Avoid heat, dust, strong oxidizing or reducing substances, strong acids and bases

7.6 **Inhibitor of Polymerization:** None

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 51 ppm/96 hr sunfish TLm (fresh water)
70 ppm/24 hr pink perch TLm (salt water)

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 93–127% 5 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Celanese Corp
Celanese Chemical Co. Division
245 Park Ave
New York, N.Y. 10017
2. Eastman Kodak Co
Texas Eastman Co. Division
Longview, Texas 75601
3. Union Carbide Corp
Chemicals & Plastics Division
270 Park Ave
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** >99%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Inerted

10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A B C K I — N Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	1
Poison	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 44.05

13.3 **Boiling Point at 1 atm:** 68.7°F = 20.4°C = 293.6°K

13.4 **Freezing Point:** −89°F = −123°C = 150°K

13.5 **Critical Temperature:** 370°F = 188°C = 461°K

13.6 **Critical Pressure:** 926 psia = [illegible] atm = [illegible] MN/m²

13.7 **Specific Gravity:** 0.780 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 1.5

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.152

13.12 **Latent Heat of Vaporization:** 245 Btu/lb = 136 cal/g = 569 × 10³ J/kg

13.13 **Heat of Combustion:** −13,600 Btu/lb = −7550 cal/g = −246.4 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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AAC	ACETIC ACID

Glacial acetic acid Ethanoic acid Vinegar acid	Watery liquid — Colorless — Strong vinegar odor Sinks and mixes with water. Irritating vapor is produced. Freezing point is 62° F

Fire	**Combustible** **Vapor may explode if ignited in an enclosed area**
Exposure	**VAPOR** **Irritating to nose and throat** **If inhaled, will cause coughing, nausea, vomiting, or difficult breathing.** **LIQUID OR SOLID** **Will burn skin and eyes.** **Harmful if swallowed.**
Water Pollution	**HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS** **May be dangerous if it enters water intakes.**

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning — corrosive
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Ethanoic acid
Glacial acetic acid
Vinegar acid

3.2 **Coast Guard Compatibility Classification:**
Organic acid

3.3 **Chemical Formula:** CH_3COOH

3.4 **IMCO/United Nations Numerical Designation:** 1.1 1842

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic vinegar — pungent vinegar-like sharp

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing should be worn when skin contact might occur. Respiratory protection necessary when exposed to vapor. Complete eye protection.

5.2 **Symptoms Following Exposure:** Breathing of vapors causes coughing, chest pain and irritation of nose and throat, may cause nausea and vomiting. Contact with skin causes severe burn.

5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air. If breathing become difficult give oxygen. Get medical care quickly. INGESTION: if victim is conscious have him drink water or milk. do NOT induce vomiting. SKIN OR EYE CONTACT: flush immediately with plenty of clean running water. Wash eyes for at least 15 min. and get medical care as quickly as possible. Remove contaminated clothing and launder before wearing again.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm

5.5 **Short-Term Inhalation Limits:** 40 ppm for 5 min

5.6 **Toxicity by Ingestion:** Grade 2. LD50 5 to 50 g/kg rat.

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate eye and nose irritation that persists until high concentrations are present. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Exhibits severe skin irritation, may cause pain and second degree burns after a few minutes of contact.

5.10 **Odor Threshold:** 1.0 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 112°F (C.C.) 104°F (C.C.)

6.2 **Flammable Limits in Air:**
5.4% - 16.0%

6.3 **Fire Extinguishing Agents:** Water, alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**
None

6.5 **Special Hazards of Combustion Products:**
Irritating vapor generated when heated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 800°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 1.6 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
Corrosive particularly when diluted. Attacks most common metals including most stainless steels. Excellent solvent for many synthetic resins or rubber.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water, rinse with sodium bicarbonate solution.

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
[illegible] ppm Sea water goldfish TLm fresh water
[illegible] 330 ppm 48 hr shrimp TLm aerated water

8.2 **Waterborne Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):**
[illegible] 62° 5 days

8.4 **Food Chain Concentration Potential:**
None noted

9 SELECTED MANUFACTURERS

1. Celanese Corp.
Celanese Chemical Co. Div.
245 Park Ave.
New York, N.Y. 10017

2. Eastman Kodak Co.
Tennessee Eastman Co. Div.
Kingsport, Tenn. 37662

3. Union Carbide Corp.
Chemicals & Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial USP CP

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-5)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Corrosive Material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicants	2
Aquatic Toxicant	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:**
Liquid

13.2 **Molecular Weight:** 60.05

13.3 **Boiling Point at 1 atm:**
244°F = 117.9°C = 391.1°K

13.4 **Freezing Point:** 62.1°F = 16.7°C = 290°K

13.5 **Critical Temperature:**
612°F = 321.6°C = 594.6°K

13.6 **Critical Pressure:**
850 psia = 57.1 atm = 5.78 MN/m²

13.7 **Specific Gravity:** 1.051 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.14

13.12 **Latent Heat of Vaporization:**
174 Btu/lb = 96.7 cal/g = 5.08 × 10⁵ J/kg

13.13 **Heat of Combustion:** -5645 Btu/lb
= -3136 cal/g = -13.13 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 3 and 4)

NOTES

ACA	ACETIC ANHYDRIDE

Common Synonyms			
Ethanoic anhydride	Watery liquid	Colorless	Strong vinegar odor
	Sinks and reacts slowly with water. Irritating vapor is produced.		

Fire

Combustible.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Will burn eyes.
Irritating to nose and throat.
If inhaled, will cause tumors, vomiting, or difficult breathing.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: continue.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethanoic anhydride
3.2 **Coast Guard Compatibility Classification:** Organic anhydride
3.3 **Chemical Formula:** $CH_3CO_2COCH_3$
3.4 **IMCO United Nations Numerical Designation:** No data

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Very strong, pungent, vinegar-like characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing when risks of skin contact; respiratory protection necessary for all exposures; complete eye protection.
5.2 **Symptoms Following Exposure:** Liquid is irritating and causes blistering if allowed to remain on skin. Is severely corrosive to eyes; causes severe burns when splashing in eyes with the chemical; [illegible] Vapor causes [illegible] and eye burns and irritation to respiratory tract. Nausea and vomiting may develop after exposure.
5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air. If breathing becomes difficult, give oxygen; get medical care quickly. INGESTION: do NOT induce vomiting. SKIN OR EYE CONTACT WITH LIQUID OR VAPOR: flush immediately with plenty of clear running water. [illegible] and get medical care quickly.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** [illegible] mg/kg
5.7 **Late Toxicity:** Not pertinent
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors [illegible] Not pertinent. [illegible] moderate to severe irritation to both eyes and respiratory tract.
5.9 **Liquid or Solid Irritant Characteristics:** Liquid [illegible] may cause pain and second-degree burns after a few minutes of contact.
5.10 **Odor Threshold:** 0.1 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 116°F (C.C.) 120°F (C.C.)
6.2 **Flammable Limits in Air:** 2.7% - 10.0%
6.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water and foam react, but heat liberated is not enough to create a hazard. Dry chemical forced below the surface can cause foaming and boiling.
6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 600°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** [illegible] mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly with water; considerable heat liberated when water spray is used.
7.2 **Reactivity with Common Materials:** Corrodes iron, steel, and other metals.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water; use sodium bicarbonate solution to rinse.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] ppm/96 hr Bluegill; [illegible] fresh water; 100-300 ppm 48 hr shrimp; [illegible] salt water
8.2 **Waterfowl Toxicity:** Not pertinent
8.3 **Biological Oxygen Demand (BOD):** 53% 5 days
8.4 **Food Chain Concentration Potential:** None noted

9. SELECTED MANUFACTURERS

1. Celanese Corp.
   Celanese Chemical Co. Div.
   245 Park Ave.
   New York, N.Y. 10017
2. Eastman Kodak Co.
   Tennessee Eastman Co. Div.
   Kingsport, Tenn. 37662
3. Union Carbide Corp.
   Chemicals and Plastics Div.
   270 Park Ave.
   New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure: 99% min; Technical: [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-5)

APQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive Material
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	2
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	1
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 102.09
13.3 **Boiling Point at 1 atm:** 282°F = 139°C = 412°K
13.4 **Freezing Point:** −70°F = −57.1°C = 215.9°K
13.5 **Critical Temperature:** 569°F = 298°C = 571°K
13.6 **Critical Pressure:** 670 psia = 45.2 atm = 4.58 MN/m²
13.7 **Specific Gravity:** 1.08 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** 169 Btu/lb = 93.2 cal/g = 2.33 × 10⁶ J/kg
13.13 **Heat of Combustion:** −7055 Btu/lb = −3920 cal/g = −16.2 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 2 and 3)

NOTES

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ACT	# ACETONE

Common Synonyms Dimethyl Ketone Propanone	Watery liquid Colorless Sweet odor Floats and mixes with water. Flammable, irritating vapor is produced
	[illegible]
Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area [illegible]
Exposure	CALIFORNIA [illegible] VAPOR Irritating to eyes, nose and throat If inhaled, may cause difficult breathing or loss of consciousness [illegible] LIQUID Irritating to eyes Not irritating to skin [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4:

Issue warning; high flammability. Dispersed and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dimethyl Ketone; 2-Propanone

3.2 **Coast Guard Compatibility Classification:** Acetone

3.3 **Chemical Formula:** CH_3COCH_3

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Acetone pleasant, [illegible] odor, [illegible] pungent, sharp, penetrating odor, [illegible] pleasant, non-residual

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister or a [illegible] supplied mask; synthetic rubber gloves; chemical safety goggles or face splash shield

5.2 **Symptoms Following Exposure:**
INHALATION: vapor irritating to eyes and mucous membranes; acts as an anesthetic in very high concentrations. INGESTION: [illegible] of toxicity but severe irritating to mucous membranes. SKIN: prolonged excessive contact causes defatting of the skin, possibly leading to dermatitis.

5.3 **Treatment for Exposure:**
INHALATION: if unconscious, remove to fresh air and call a physician. Administer artificial respiration if breathing is irregular or stopped. INGESTION: if victim has swallowed large amounts, and is conscious and not having convulsions, induce vomiting and get medical help promptly. No specific antidote known. SKIN: wash well with water. EYES: flush with water immediately for at least [illegible] min. Consult a physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm

5.5 **Short-Term Inhalation Limits:** [illegible] ppm for [illegible] min

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** Not pertinent

5.8 **Vapor (Gas) Irritant Characteristics:** If present in high concentrations, vapors cause moderate irritation of the eyes, respiratory system. Effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly from the skin.

5.10 **Odor Threshold:** [illegible] ppm

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Alcohol foam; dry chemical; carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water in straight hose stream will scatter and spread fire and should not be used

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** [illegible]

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
4,250 ppm, 24 hr, [illegible] water
[illegible] ppm, 48 hr, [illegible] turbid water

8.2 **Waterfowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** [illegible] 5 days

8.4 **Food Chain Concentration Potential:** None noted

9. SELECTED MANUFACTURERS

Allied Chemical Corp.
Specialty Chemicals Div.
Wilmington, Delaware
Marcus Hook, Pa. [illegible]

Shell Chemical Co.
Industrial Chemicals Div.
Houston, Texas [illegible]

Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
Technical: 99.5% plus [illegible] water
Reagent: 99.5% plus [illegible] water

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester or pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-2:

V P Q P N

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid or Solid Irritant	1
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetics Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible] at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

ACY	ACETONE CYANOHYDRIN

Common Synonyms
2-Methyl lactonitrile
Alpha-hydroxy isobutyronitrile

Watery liquid — Colorless — Mild almond odor

Floats and mixes with water. Poisonous vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear chemical protective suit and self-contained breathing apparatus.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Call fire department.
Isolate and restrict discharge area.
Notify authorities if [illegible]

Fire

Combustible
POISONOUS GASES ARE PRODUCED WHEN HEATED
Vapor may explode if ignited in an enclosed area

WEAR CHEMICAL PROTECTIVE SUIT WITH SELF-CONTAINED BREATHING APPARATUS
Combat fire from safe distance [illegible]
Extinguish with water [illegible]
Cool exposed containers with water.

Exposure

CAUTION: [illegible]
VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat

Move victim to fresh air.
If breathing has stopped give artificial respiration.
If breathing is difficult [illegible] oxygen.
LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes

Remove contaminated clothing [illegible]
Contact [illegible] Flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have vomiting induced [illegible]
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS [illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

Notify [illegible] health and wildlife officials.
Notify [illegible] if water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — poison
Restrict access
Should be removed — human toxicity

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** alpha Hydroxyisobutyronitrile; 2-Methyllactonitrile
3.2 **Coast Guard Compatibility Classification:** Cyanohydrin
3.3 **Chemical Formula** $(CH_3)_2COHCN$
3.4 **IMCO/United Nations Numerical Designation:** 6.1 1541

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color.** Colorless
4.3 **Odor** Characteristic, distinct, strong cyanide

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask with canister approved for use with acrylonitrile in less than 2% concentrations; rubber or plastic gloves; cover goggles or face mask; rubber boots; slicker suit; safety helmet
5.2 **Symptoms Following Exposure:** At low dosages the earliest symptoms may be weakness, headaches, confusion and occasionally nausea and vomiting. Respiratory rate and depth will usually be increased at the beginning and at later stages become slow and gasping.
5.3 **Treatment for Exposure:** Call a physician for all cases of exposure. **INHALATION**: remove victim to fresh air. (Rescuer should wear suitable mask.) **INGESTION**: if victim is conscious, induce vomiting by having him drink strong salt water. **SKIN**: remove contaminated clothing and wash affected skin thoroughly with soap and water. **EYES**: hold eyelids apart and wash with continuous gentle stream of water for at least 15 min.
If breathing has stopped, give artificial respiration until physician arrives. If victim is unconscious, administer amyl nitrite by crushing an ampule in a cloth and holding it under his nose for 15 seconds in every minute. Do not interrupt artificial respiration during this procedure. Replace ampule when its strength is spent. Continue treatment until victim's condition improves or physician arrives.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits** Data not available
5.6 **Toxicity by Ingestion:** Grade 4, below 50 mg/kg (mice)
5.7 **Late Toxicity:** Causes liver damage in rats
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors irritate the eyes and respiratory system if present in high concentrations. The effect is temporary.

Continued on page 4

6. FIRE HAZARDS

6.1 **Flash Point** 165°F C.C.
6.2 **Flammable Limits in Air:** 2.2% – 12%
6.3 **Fire Extinguishing Agents** Water spray, dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic hydrogen cyanide is generated when heated
6.6 **Behavior in Fire.** Not pertinent
6.7 **Ignition Temperature:** 1270°F
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate.** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Not pertinent
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential.** Data not available

9. SELECTED MANUFACTURERS

1. Aldrich Chemical Co., 940 West St. Paul Ave., Milwaukee, Wis. 53233
2. Eastman Kodak Co., Rochester, New York 14650
3. Rohm and Haas Co., Independence Mall West, Philadelphia, Pa. 19105

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 98–99%
10.2 **Storage Temperature.** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Pressure/vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	3
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	1
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 85.11
13.3 **Boiling Point at 1 atm:** Decomposes
13.4 **Freezing Point.** −5.5°F = −21°C = 252°K
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure.** Not pertinent
13.7 **Specific Gravity:** 0.925 at 25°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** (est.) 1.074
13.12 **Latent Heat of Vaporization** Data not available
13.13 **Heat of Combustion** Data not available
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

5. HEALTH HAZARDS (Cont'd)

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure and may cause secondary burns on long exposure
5.10 **Odor Threshold:** Data not available

ATN	ACETONITRILE

Common Synonyms Methyl cyanide Cyanomethane Ethanenitrile	Watery liquid Colorless Sweet odor Floats and mixes with water Flammable, irritating vapor is produced
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED WHEN HEATED Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled, will cause difficult breathing LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Ethanenitrile
Ethylnitrile
Cyanomethane
Methylcyanide

3 2 **Coast Guard Compatibility Classification:** Nitrile

3 3 **Chemical Formula** CH_3CN

3 4 **IMCO/United Nations Numerical Designation** 6 1 1648

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor** Sweet ethereal

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Wear self-contained breathing apparatus

5 2 **Symptoms Following Exposure** Exposure to 160 ppm for 4 5 hrs causes flushing of the face and a feeling of constriction in the chest 500 ppm for brief periods is irritating to the nose and throat Severe exposures cause irritability skin eruptions, confusion, delirium convulsions paralysis and death due to central nervous system depression

5 3 **Treatment for Exposure** Remove victim from contaminated atmosphere Give artificial respiration and oxygen if respiration is impaired

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 40 ppm

5 5 **Short-Term Inhalation Limits.** 40 ppm for 60 min

5 6 **Toxicity by Ingestion** Grade 3 50 - 500 mg kg (guinea pig)

5 7 **Late Toxicity** Not pertinent

5 8 **Vapor (Gas) Irritant Characteristics** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations Effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold** 4 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 42°F O C

6 2 **Flammable Limits in Air:** 4 4% 16%

6 3 **Fire Extinguishing Agents:** Alcohol foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Toxic vapors are generated when heated

6 6 **Behavior in Fire** Vapor heavier than air and may travel a considerable distance to a source of ignition and flash back

6 7 **Ignition Temperature** 975°F

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** 2 2 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 1130 ppm/24 hr fathead minnow Hard water

8 2 **Waterfowl Toxicity** Not pertinent

8 3 **Biological Oxygen Demand (BOD):** 1/5 5 days

8 4 **Food Chain Concentration Potential.** None noted

9. SELECTED MANUFACTURERS

1 American Cyanamid Co
Industrial Chemicals and Plastics Division
New Orleans La 70121

2 Eastman Kodak Co
Texas Eastman Co Division
Longview Texas 75601

3 Vistron Corp
Midland Building
Cleveland Ohio 44115

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Data not available

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

VPORS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight** 41 05

13 3 **Boiling Point at 1 atm** 179°F = 81 6°C = 354 8°K

13 4 **Freezing Point** −50 3°F = −45 7°C = 227 5°K

13 5 **Critical Temperature** 526 5°F = 274 7°C = 547 9 K

13 6 **Critical Pressure.** 701 psia = 47 7 atm = 4 83 MN m

13 7 **Specific Gravity:** 0 787 at 20 C (liquid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** 1 4

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 192

13 12 **Latent Heat of Vaporization** 313 Btu lb = 174 cal g = 7 29 × 10⁵ J kg

13 13 **Heat of Combustion:** −13 360 Btu lb = −7420 cal g = −3 17 × 10⁷ J kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page Sandb

NOTES

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ACP	# ACETOPHENONE

Common Synonyms Acetylbenzene; Methyl phenyl ketone	Liquid Colorless Flowery, sweet odor Sinks slowly in water Freezing point is 68° F
	[illegible]
Fire	**Combustible.** [illegible]
Exposure	[illegible] FORM [illegible] **LIQUID OR SOLID** **Irritating to skin and eyes** **Harmful if swallowed** [illegible]
Water Pollution	**Effect of low concentrations on aquatic life is unknown** **Floating to shoreline** **May be dangerous if it enters water intakes** [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Acetylbenzene
Methyl phenyl ketone

3 2 **Coast Guard Compatibility Classification:** Ketone

3 3 **Chemical Formula:** $C_6H_5COCH_3$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Persistent like orange blossoms and jasmine

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protect eyes and skin from direct contact

5 2 **Symptoms Following Exposure:** No toxicity expected from inhalation or ingestion except slight narcotic effect Liquid can cause eye and skin irritation on contact

5 3 **Treatment for Exposure:** SKIN OR EYE CONTACT Irrigate affected area with water for 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ 0 5 to 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Nonirritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** 0 01 - 0 025 mg/m^3

6 FIRE HAZARDS

6 1 **Flash Point:** 180°F O C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Water foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** None

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire** Not pertinent

5 7 **Ignition Temperature:** 1058°F

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None noted

9 SELECTED MANUFACTURERS

1 Givaudan Corp
Aroma Chemicals Div
125 Delawanna Ave
Clifton N J 07014

2 Orbis Products Corp
475 Tenth Ave
New York N Y 10018

3 Union Carbide Corp
Chemicals & Plastics Div
270 Park Ave
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity.** Technical [illegible] acetophenone

10 2 **Storage Temperature.** Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X T-U X Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 120 15

13 3 **Boiling Point at 1 atm**
395 1°F = 201 7°C = 474 9°K

13 4 **Freezing Point** 67 5°F = 19 7°C = 292 5°K

13 5 **Critical Temperature:**
802°F = 428°C = 701°K

13 6 **Critical Pressure:**
560 psia = 38 atm = 3 8 MN/m

13 7 **Specific Gravity:** 1 028 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
12 dynes/cm = 0 012 N/m at 30°C

13 9 **Liquid-Water Interfacial Tension:**
(est) 40 dynes/cm = 0 04 N/m at 27°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** (est) 1 071

13 12 **Latent Heat of Vaporization:**
150 Btu/lb = 83 6 cal/g =
3 5 × 10^5 J/kg

13 13 **Heat of Combustion:** −14 850 Btu/lb
= −8250 cal/g = −345 4 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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ATA	# ACETYLACETONE

Common Synonyms			
2,4-Pentanedione Diacetylmethane	Liquid	Colorless	Unpleasant Odor

Floats and mixes slowly with water. Flammable, irritating vapor is produced

Shut off ignition sources. Call fire department.
Stop discharge if possible. Keep people away.
Avoid contact with liquid and vapor.
Isolate area. Prevent further discharge of material.
Notify local health and pollution control agencies.

Fire

Combustible
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemicals, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes.
If inhaled will cause dizziness, coughing, headache, or loss of consciousness
If in eyes, hold eyelids open and flush with plenty of water.
If breathing is difficult, give oxygen.
If breathing is stopped, perform artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, if victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diacetylmethane
2,4-Pentanedione

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula:**
$CH_3COCH_2COCH_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Water white

4.3 **Odor:** Unpleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety glasses, eye bath and safety shower, air supplied mask for concentrations above 2%

5.2 **Symptoms Following Exposure:** Inhalation causes dizziness, headache, nausea, vomiting and loss of consciousness. Contact with liquid irritates eyes.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, if victim is not breathing, give artificial respiration and then oxygen, call a physician. EYES or SKIN: flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 1,000 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point.** 105°F O.C., 93°F C.C.

6.2 **Flammable Limits in Air:** 2.4% - 11.6%

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective on fire

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire.** Vapor is heavier than air and may travel to a source of ignition and flash back.

6.7 **Ignition Temperature:** 644°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.6 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May dissolve plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Avenue
New York, N.Y. 10017

2. Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

3. Eastman Organic Chemicals
343 State Street
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 100.12

13.3 **Boiling Point at 1 atm:** 284.7°F = 140.4°C = 413.6°K

13.4 **Freezing Point:** −10.3°F = −23.5°C = 249.7°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 0.975 at 20°C

13.8 **Liquid Surface Tension:** 31.2 dynes/cm = 0.0312 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 3.45

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.072

13.12 **Latent Heat of Vaporization.** 194 Btu/lb = 108 cal/g = 4.52×10^5 J/kg

13.13 **Heat of Combustion:** −11,070 Btu/lb = −6,150 cal/g = -257×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** −11.5 Btu/lb = −6.4 cal/g = -0.27×10^5 J/kg

13.16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

ABM	# ACETYL BROMIDE

Common Synonyms	Liquid Colorless Sharp unpleasant odor Flammable, irritating vapor is produced
	AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY [illegible]
Fire	**FLAMMABLE** **Irritating gases are produced when heated** **Flashback along vapor trail may occur** **Vapor may explode if ignited in an enclosed area** Wear goggles, safety clothing, [illegible] rubber over clothing (including gloves) Extinguish with dry chemical, alcohol foam, [illegible] **DO NOT USE WATER ON FIRE**
Exposure	CALL FOR MEDICAL AID **VAPOR** **Irritating to eyes, nose and throat** **If inhaled will cause difficult breathing.** If in eyes hold eyelids open and flush with plenty of water If breathing has stopped give artificial respiration If breathing difficult give oxygen **LIQUID** **Will burn skin and eyes.** **Harmful if swallowed** Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES hold eyelids open and flush with plenty of water IF SWALLOWED if victim is CONSCIOUS have victim drink water or milk IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm
Water Pollution	Effect of low concentrations on aquatic life is unknown **May be dangerous if it enters water intakes.** Notify Local Health and Wildlife Officials Notify operators of affected water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning corrosive
Restrict access
Evacuate area
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms

3.2 **Coast Guard Compatibility Classification** Not listed

3.3 **Chemical Formula:** CH_3COBr

3.4 **IMCO/United Nations Numerical Designation:** 8/1716

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Acrid and sharp

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety goggles, gloves, adequate ventilation, provisions for flushing eyes or skin with water

5.2 **Symptoms Following Exposure:** Inhalation produces primary irritation of the respiratory tract, symptoms of lung damage may be delayed. Contact with liquid produces primary irritation of eyes and severe skin damage, delayed blistering is not uncommon

5.3 **Treatment for Exposure:** INHALATION remove victim from exposure, if breathing has stopped give artificial respiration, if breathing is difficult, give oxygen, watch for delayed lung damage. EYES flush with water for at least 15 min, get medical attention. SKIN flush with water, treat burns as needed

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion.** Grade 2 oral rat LD_{50} = 3,310 mg/kg (acetic acid) (Decomposes violently in water forming bromic acid and acetic acid)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics** Data not available

5.10 **Odor Threshold:** 5.0 × 10⁻⁴ ppm

5. FIRE HAZARDS

6.1 **Flash Point:** Data not available

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents.** Carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used.** Water

6.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen bromide fumes may form in fires

6.6 **Behavior in Fire:** Do not apply water to adjacent fires. Reacts with water to produce toxic and irritating gases

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently forming corrosive and toxic fumes of hydrogen bromide

7.2 **Reactivity with Common Materials:** Attacks and corrodes wood and most metals in the presence of moisture. Flammable hydrogen gas may collect in enclosed spaces

7.3 **Stability During Transport.** Stable if protected from moisture

7.4 **Neutralizing Agents for Acids and Caustics.** Flood with water, rinse with dilute sodium bicarbonate or soda ash solution

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Eastman Organic Chemicals
343 State Street
Rochester, N.Y. 14650

2 Aldrich Chemical Co.
940 W. Saint Paul Ave
Milwaukee, Wis. 53233

3 Gallard Schlesinger Chemical Mfg. Co.
584 Mineola Ave
Carle Place, N.Y. 11514

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Analytical, Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Padded

10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-O

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** 122.95

13.3 **Boiling Point at 1 atm:** 169°F = 76°C = 349°K

13.4 **Freezing Point:** −141.7°F = −96.5°C = 176.7°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity.** 1.66 at 16°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 4.24

13.11 **Ratio of Specific Heats of Vapor (Gas)** (est.) 1.144

13.12 **Latent Heat of Vaporization.** 106 Btu/lb = 59 cal/g = 2.5 × 10⁵ J/kg

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on page Sand A

NOTES

ACC

ACETYL CHLORIDE

Common Synonyms

Liquid | Colorless | Sharp odor

Reacts violently with water. Irritating visible vapor cloud is produced

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning high flammability corrosive
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** CH_3COCl

3 4 **IMCO/United Nations Numerical Designation:** 1717

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pungent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety goggles rubber or plastic gloves self contained breathing apparatus

5 2 **Symptoms Following Exposure:** Vapor irritates mucous membranes. Ingestion of liquid or contact with eyes or skin causes severe irritation

5 3 **Treatment for Exposure:** INHALATION remove from exposure seek medical attention EYES flush with copious amounts of water SKIN flush with copious amounts of water INGESTION give pints of water do NOT induce vomiting

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Readily hydrolyzes to form hydrochloric and acetic acids. Oral human LD_{LO} = 1470 mg/kg (acetic acid). Grade 2 oral rat LD_{50} = 3310 mg/kg (acetic acid)

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations

5 9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to the eyes

5 10 **Odor Threshold:** Acetic acid 1 ppm hydrochloric acid 1 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 40°F C.C.

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Carbon dioxide dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Water foam

6 5 **Special Hazards of Combustion Products:** When heated to decomposition hydrogen chloride and phosgene extremely poisonous gases are evolved

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back

6 7 **Ignition Temperature:** 724°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 2.6 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously with water evolving hydrogen chloride fumes (hydrochloric acid)

7 2 **Reactivity with Common Materials:** Is highly corrosive to most metals in the presence of moisture

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Following dilution with water limestone or sodium bicarbonate can be used

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Eastman Kodak Co
Eastman Organic Chemicals
Rochester, N.Y. 14650

2 Allied Chemical Corp
Specialty Chemicals Division
P.O. Box 1087R
Morristown, N.J. 07960

3 White Chemical Corp
P.O. Box 278
Bayonne, N.J. 07002

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

A-O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive material

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	4
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 78.5

13 3 **Boiling Point at 1 atm:** 124°F = 51°C = 324°K

13 4 **Freezing Point:** −170°F = −112°C = 161°K

13 5 **Critical Temperature:** (est.) 475°F = 246°C = 519°K

13 6 **Critical Pressure:** (est.) 845 psia = 57.5 atm = 5.83 MN/m²

13 7 **Specific Gravity:** 1.1029 at 21°C (liquid)

13 8 **Liquid Surface Tension:** 26 dynes/cm = 0.026 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 3

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.1467

13 12 **Latent Heat of Vaporization:** 160 Btu/lb = 88 cal/g = 3.7 × 10⁵ J/kg

13 13 **Heat of Combustion:** −6,000 Btu/lb = −3,300 cal/g = −140 × 10⁶ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** (est.) −54 Btu/lb = −30 cal/g = −1.3 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

ACE	ACETYLENE

Common Synonyms
Ethyne
Ethine

Compressed gas | Colorless | Mild garlic odor

This flammable gas is slightly lighter than air and will disperse slowly unless confined

Fire

FLAMMABLE.
Containers may explode in fire
Flashback along gas trail may occur
May explode if ignited in an enclosed area

Exposure

GAS
Not irritating to eyes, nose or throat
If inhaled will cause headache, difficult breathing or loss of consciousness.

Water Pollution

Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethine
Ethyne

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** C_2H_2

3.4 **IMCO United Nations Numerical Designation:** 2.0 1001

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Compressed gas

4.2 **Color:** Colorless

4.3 **Odor:** Distinctive garlic like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied respirator in areas of high concentration. Avoid all sources of ignition

5.2 **Symptoms Following Exposure:** Headache, dizziness and loss of consciousness may occur. Death from smothering may occur if oxygen content of the air is severely reduced by dilution with acetylene

5.3 **Treatment for Exposure:** INHALATION: no specific antidote known, remove victim to fresh air, keep him warm and quiet and call doctor, recovery usually rapid. If patient is unconscious administer oxygen, if breathing has stopped give artificial respiration

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 500 ppm (suggested)

5.5 **Short-Term Inhalation Limits:** 100,000 ppm for 30 - 60 min

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** Not pertinent

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** Not pertinent

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Gas

6.2 **Flammable Limits in Air:** 2.5% - 80%

6.3 **Fire Extinguishing Agents:** Stop flow of gas

6.4 **Fire Extinguishing Agents Not to be Used:** Carbon dioxide, dry chemical and water sprays are not generally recommended because the discharged gas or volatile liquid may create a more serious explosion hazard

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** May explode in fire

6.7 **Ignition Temperature:** 581°F

6.8 **Electrical Hazard:** Class I, Group A

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Under certain conditions forms spontaneously explosive compounds with copper

7.3 **Stability During Transport:** Stable as shipped

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 1000 cc. 1 Ehr sunfish, not killed fresh water

8.2 **Waterfowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** Not pertinent

8.4 **Food Chain Concentration Potential:** Not pertinent

9. SELECTED MANUFACTURERS

1. Monochem Inc
P O Box 488
Gonzales Louisiana 70734
2. Monsanto Co
Monsanto Polymers & Petrochemicals Co
800 North Lindbergh Blvd
St Louis Mo 63166
3. Union Carbide Corp
Chemicals & Plastics Div
270 Park Ave
New York N Y 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial grade acetylene is supplied dissolved in acetone under pressure in cylinders

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A B C

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Compressed gas

13.2 **Molecular Weight:** 26.04

13.3 **Boiling Point at 1 atm.:** −119°F = −84.0°C = 189.2°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** 95.3°F = 35.2°C = 308.4°K

13.6 **Critical Pressure:** 890.7 psia = 60.59 atm = 6.138 MN/m²

13.7 **Specific Gravity:** 0.613 at −50°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 0.9

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.23

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** −20,747 Btu/lb = −11,526 cal/g = −482.57 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

NOTES

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APS	ACETYL PEROXIDE SOLUTION

Common Synonyms			
Diacetyl peroxide solution	Liquid Sinks in water	Colorless	Sharp odor

Fire	Combustible May explode on contact with combustibles. Containers may explode in fire
Exposure	VAPOR Irritating to eyes, nose and throat LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning. Oxidizing material. Water contaminant. Should be removed. Chemical and physical treatment.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diacetyl peroxide solution

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula:** $CH_3COOOOCCH_3$ (dimethyl peroxide)

3.4 **IMCO/United Nations Numerical Designation:** NA 1519

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, rubber apron and glasses

5.2 **Symptoms Following Exposure:** Contact with liquid causes [illegible] Ingestion irritates mouth and stomach

5.3 **Treatment for Exposure:** EYES wash with plenty of water, medical attention. SKIN wash with plenty of soap and water. INGESTION induce vomiting, [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion.** Data not available

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 114°F OC

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** May explode. Burns with accelerated intensity

6.7 **Ignition Temperature:** Explodes

6.8 **Electrical Hazard.** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May ignite combustible materials such as wood

7.3 **Stability During Transport:** Heat and shock sensitive crystals may separate at very low temperatures during transport

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

Pennwalt Corporation
Lucidol Division
1740 Military Road
Buffalo, N.Y. 14240

2. Atlas Chemical Division
Day Industries, Inc.
555 Garden Street
Elyria, Ohio 44035

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
25% acetyl peroxide, 75% dimethyl phthalate

*10.2 **Storage Temperature:**
32°F – 100°F (32°C – 38°C) pertinent

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X X X

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Organic Peroxide

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	4

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

*13.2 **Molecular Weight:** Mixture

*13.3 **Boiling Point at 1 atm.** Decomposes

*13.4 **Freezing Point:**
°F = –°C = [illegible] K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

*13.7 **Specific Gravity:** [illegible] at 20°C (liquid)

*13.8 **Liquid Surface Tension:**
(est.) [illegible] dynes/cm = [illegible] N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.**
(est.) [illegible] dynes/cm = [illegible] N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

*13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion:** (est.) [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10³ J/kg

*13.14 **Heat of Decomposition:** (est.) [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10³ J/kg

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages [illegible]

NOTES

ACD	ACRIDINE

Common Synonyms			
Dibenzo[b e]pyridine 10-Azaanthracene Benzo[b]quinoline	Solid Sinks in water	Yellow	Weak irritating odor

[illegible]

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible]
Exposure	[illegible] DUST Irritating to eyes nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 10-Azaanthracene
Benzo[b]quinoline
Dibenzo [b, e] pyridine

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_{13}H_9N$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellow

4 3 **Odor:** Weak somewhat irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator, chemical goggles rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation irritates respiratory system and causes sneezing coughing, and vomiting Contact with liquid irritates eyes skin, and mucous membranes At high temperature and during sun exposure damage to the cornea skin and mucous membranes may occur following the liberation of acridine vapor

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air if breathing has stopped give artificial respiration if breathing is difficult give oxygen EYES wash with copious amounts of water for 20 min seek medical attention SKIN wash with large amounts of water for 20 min

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral rat LD_{50} = [illegible] mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water foam monoammonium phosphate dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Carbon dioxide and other dry chemicals may not be effective

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:** Sublimes before melting

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
9 2 ppm/* /perch kill/fresh water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 W Saint Paul Avenue
Milwaukee Wis 53233

2 Eastman Kodak Inc
120-04 Northern Boulevard
Flushing N Y 11368

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 179 08

13 3 **Boiling Point at 1 atm:**
655°F = 346°C = 619°K

13 4 **Freezing Point:** 230°F = 110°C = 383°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (approx) 1 2 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** −15 800 Btu/lb
= −8790 cal/g = −36 8 × 10⁶ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

ARL	# ACROLEIN

Common Synonyms

Acrylaldehyde
Acrylic aldehyde
Allylaldehyde
Ethylene aldehyde
2-propenal
Acrylaldehyde

Water: liquid. Colorless to light yellow. Sharp irritating odor.

Floats and mixes with water. Poisonous, flammable vapor is produced.

[illegible]

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED WHEN HEATED
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

[illegible]

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat

LIQUID
POISONOUS IF SWALLOWED
Will burn eyes
Irritating to skin

[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, air contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABELS

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acrylaldehyde, Acrylic aldehyde, 2 Propenal, Acrylaldehyde

3.2 **Coast Guard Compatibility Classification:** Aldehyde

3.3 **Chemical Formula:** $CH_2=CH-CHO$

3.4 **IMCO/United Nations Numerical Designation:** UN 1092

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to slightly yellow

4.3 **Odor:** Extremely sharp, lachrymatory, piercing, disagreeable, extremely irritating, acrid, pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles and face shield; self-contained breathing apparatus, positive pressure hose mask, airline mask or industrial canister type gas mask; rubber gloves, shoes, clothing made of rubber or other impervious material

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat, a feeling of pressure in the chest and shortness of breath. Nausea and vomiting are usually least. Loss of consciousness. Exposure has been sufficiently great. Congestion in the chest may be present, causing air sacs and fluid may collect in the lungs (pulmonary edema) of severe exposed persons. Vapor also causes severe eye irritation (redness, weeping, and swelling of eyelids). Liquid burns eyes, mucous membrane, and skin causes reddening, blistering. Ingestion causes severe irritation of mouth and stomach.

5.3 **Treatment for Exposure:** Keep patient warm. Do not administer anything orally if unconscious or convulsing. *Call physician immediately. Antidotes for this compound.* INHALATION: remove patient to fresh air. If breathing becomes difficult give oxygen. If breathing has stopped, start artificial respiration. EYES: immediately flush with plenty of water for at least 5 min. If medical attention is not immediately available, continue eye irrigation for another 15 min period. Upon completion of the first 5 min of irrigation, a 1% solution of Pontocaine (amethocaine) or other local anesthetic for relief of pain. No other medications should be used unless ordered by the physician. SKIN: flush at once with large volumes of water. Wash thoroughly with soap and large quantities of running water. INGESTION: Give victim drink large amounts of water. Induce vomiting by tickling back of throat. Begin medical treatment immediately. Give a glass of water.
Keep patient warm and quiet.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 ppm

Continued on page 4

6. FIRE HAZARDS

6.1 **Flash Point:** <0°F O.C. (−18°C C.C.)

6.2 **Flammable Limits in Air:** 2.8% - 31%

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Poisonous vapor of acrolein is formed from hot liquid

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Polymerization may take place and containers may explode in fire

6.7 **Ignition Temperature:** 453°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.8 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable when inhibited

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Undergoes uncatalyzed polymerization reaction around 200°C. Light promotes polymerization

7.6 **Inhibitor of Polymerization:** Hydroquinone 0.10 to 0.25%

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 0.08 ppm/24hr, sunfish; 11 ppm fresh water; 0.055 ppm/96hr, oyster; TC_{50} salt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 33% 10 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
   Chemicals and Plastics Division
   270 Park Avenue
   New York, N.Y. 10017
2. Shell Chemical Company
   Industrial Chemicals Division
   P.O. Box 2463
   Houston, Texas 77001

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Industrial 92+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

V P Q R S Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	4
Liquid or Solid Irritant	
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effects	3
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	3
Reactivity (Yellow)	3

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 56.1

13.3 **Boiling Point at 1 atm:** 125°F = 52°C = 326°K

13.4 **Freezing Point:** −125°F = −87°C = 186°K

13.5 **Critical Temperature:** (est.) 459°F = 237°C = 510°K

13.6 **Critical Pressure:** (est.) 735 psia = 50.0 atm = 5.08 MN/m²

13.7 **Specific Gravity:** 0.843 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 1.94

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.145

13.12 **Latent Heat of Vaporization:** 216 Btu/lb = 120 cal/g = 5.02 × 10⁵ J/kg

13.13 **Heat of Combustion:** −12,500 Btu/lb = −6,950 cal/g = −290 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** (est.) −50 Btu/lb = −28 cal/g = −1.2 × 10⁵ J/kg

5. HEALTH HAZARDS (Cont'd)

5.5 **Short-Term Inhalation Limits:** [illegible] ppm; [illegible] 0.2 ppm, 60 min

5.6 **Toxicity by Ingestion:** Grade 4. Oral rat LD_{50} = below 50 mg/kg

5.7 **Late Toxicity:** Grade 4. Oral rat LD_{50} = 46 mg/kg. Grade 4. Oral rabbit LD_{50} = 7 mg/kg

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even in low concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and 1st-degree burns on short exposure; may cause 2nd degree burns on long exposure.

5.10 **Odor Threshold:** 0.21 ppm

AAM	ACRYLAMIDE

Common Synonyms			
Propenamide (50%) Acrylic acid amide (50%)	Liquid	Colorless	Odorless
	Sinks and mixes with water		

[illegible]

Fire	Not flammable
Exposure	VAPOR Irritating to eyes, nose and throat Harmful if inhaled [illegible] LIQUID Will harm skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes. [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning – water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acrylic amide 50%
Propenamide 50%

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $CH_2=CHCONH_2$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Clear

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety glasses with side shields, clean body covering clothing, rubber gloves, boots, apron as dictated by circumstances, in absence of proper environmental control, use approved dust respirator

5.2 **Symptoms Following Exposure:** Has produced central nervous system damage, which is partly reversible. Effects can be produced by oral or skin contact as well as by inhalation. Chronic acrylamide poisoning can cause midbrain disturbance and peripheral neuropathy. Contact with liquid can cause moderate irritation of eyes and skin and may cause moderate transient corneal injury

5.3 **Treatment for Exposure:** INHALATION: if ill effects occur, immediately get patient to fresh air. Keep him quiet and warm, and get medical help. INGESTION: if ingested, immediately give large amounts of water (or milk if immediately available), then induce vomiting and get medical help. EYES: immediately flush with plenty of water for at least 15 min. and get medical help promptly. SKIN: immediate, continuous, and thorough washing in flowing water is imperative, preferably deluge shower with abundant soap, if burns are present, get medical help, discard all contaminated clothing and wearing accessories

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 0.3 mg/m

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3, Oral rat LD_{50} = 170 mg/kg

5.7 **Late Toxicity:** Repeated exposure to small amounts may cause eventually reversible neurological effects

(Continued on page 4)

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

5.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may be produced in fire

6.6 **Behavior in Fire:** Sealed containers may burst as a result of polymerization

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Unreactive

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** May occur at temperatures above 50°C (122°F)

7.6 **Inhibitor of Polymerization:** Oxygen (air) plus 50 ppm of copper as copper sulfate

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 130 ppm/96 hr, species unknown, fish LC_{50}

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640
2. Nestron Corp.
Midland Building
Cleveland, Ohio 44115

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 15% – 50% solution in water

10.2 **Storage Temperature:** Below 50°C (122°F)

10.3 **Inert Atmosphere:** Ventilated (natural)

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications:** Data not available

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 71 (solute only)

13.3 **Boiling Point at 1 atm:** Data not available
(Vapor Pressure = 0.0033 atm at 125°C)

13.4 **Freezing Point:** 183°F = 84°C = 357°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.05 at 25°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Data not available

(Continued on page 3 and 4)

5 HEALTH HAZARDS (Cont'd)

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

ACR	ACRYLIC ACID

Common Synonyms			
Propenoic Acid	Water-white liquid	Colorless	Irritating odor

Sinks and mixes with water. Irritating vapor is produced. Freezing point is 54°F.

[illegible]

Fire

Combustible.
POISONOUS GAS MAY BE PRODUCED IN FIRE.
Containers may explode when heated.
Vapor may explode if ignited in an enclosed area.

[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat.

[illegible]

LIQUID OR SOLID
Will burn skin and eyes.
Harmful if swallowed.

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Isolate area. Corrosive.
Restrict access.
Disperse and flush.

2 LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Propenoic acid
3.2 **Coast Guard Compatibility Classification:** Organic acid
3.3 **Chemical Formula:** $CH_2=CHCOOH$
3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Acid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical respirator at ambient temperatures to avoid inhalation of noxious fumes; rubber gloves if exposed to wet material; acid goggles or face shield for splash exposure; safety shower and eye fountain may be required.
5.2 **Symptoms Following Exposure:** May burn skin or eyes upon short contact. INHALATION: eye and nasal irritation and lacrimation. INGESTION: may cause severe damage to the gastrointestinal tract.
5.3 **Treatment for Exposure:** Get medical attention promptly for all exposures. INHALATION: remove victim to fresh air. INGESTION: do NOT induce vomiting. SKIN OR EYES: flush with water for at least 15 min.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2. LD50: 5 to 5.2 g/kg rat
5.7 **Late Toxicity:** Not pertinent
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating to eyes, but personnel will not usually tolerate moderate or high vapor concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant; may cause third and second degree burns after a few minutes of contact.
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** (Glacial) 68°F (O.C.)
6.2 **Flammable Limits in Air:** (Tech.) 2.4% 11%
6.3 **Fire Extinguishing Agents:** Water spray, alcohol foam, dry chemical or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
6.6 **Behavior in Fire:** May polymerize and explode.
6.7 **Ignition Temperature:** 874°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive
7.2 **Reactivity with Common Materials:** Not reactive
7.3 **Stability During Transport:** Normally stable but will not det state
7.4 **Neutralizing Agents for Acids and Caustics:** Wash with water, rinse with sodium bicarbonate solution.
7.5 **Polymerization:** May occur on contact with acids, iron salts, or at elevated temperatures and release high energy rapidly; may cause explosion under confinement.
7.6 **Inhibitor of Polymerization:** Monomethyl ether of hydroquinone (450-500 ppm phenothiazine (for tech. grades) (100 ppm hydroquinone (0.1%) methylene blue (0.15%) N,N-di-beta-naphthyl-p-phenylenediamine (0.05%))

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 395 10 days
8.4 **Food Chain Concentration Potential:** Not listed

9. SELECTED MANUFACTURERS

1. Celanese Corporation
Celanese Chemical Co. Division
245 Park Ave.
New York, N.Y. 10017
2. Rohm and Haas Co.
Independence Mall West
Philadelphia, Pa. 19105
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 98.0% glacial 99.0%
10.2 **Storage Temperature:** 60°-70°F
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A P Q Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive Material
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self-Reactive	3

12.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 72.06
13.3 **Boiling Point at 1 atm:** 286°F = 141.3°C = 414.5°K
13.4 **Freezing Point:** 54.5°F = 12.5°C = 285.5°K
13.5 **Critical Temperature:** 546°F = 342°C = 615°K
13.6 **Critical Pressure:** 650 psia = 57 atm = 5.5 MN/m²
13.7 **Specific Gravity:** 1.049 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.22
13.12 **Latent Heat of Vaporization:** 272.2 Btu/lb = 152 cal/g = 6.35 × 10⁵ J/kg
13.13 **Heat of Combustion:** −9100 Btu/lb = −4800 cal/g = −20.1 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** −453 Btu/lb = −252 cal/g = −10.5 × 10⁵ J/kg

(Values for pure liquid)

NOTES

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ACN — ACRYLONITRILE

Common Synonyms

Watery liquid — Colorless to light yellow — Irritating odor

Floats on water. Poisonous flammable vapor is produced

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Floating to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook

Isolate area — prevent high concentrations
Remove sources
Disperse and flush

2. LABELS

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cyanoethylene, Fumigran, Vertrel, Vinylcyanide

3.2 **Coast Guard Compatibility Classification:** Substituted alkyl

3.3 **Chemical Formula:** CH_2CHCN

3.4 **IMCO United Nations Numerical Designation:** 1093

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild pungent odor. Similar to that of peach seed extract

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause flashback

6.5 **Special Hazards of Combustion Products:** [illegible]

6.6 **Behavior in Fire:** [illegible]

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** [illegible]

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** [illegible]

7.6 **Inhibitor of Polymerization:** [illegible]

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** [illegible]

8.4 **Food Chain Concentration Potential:** Not pertinent

9. SELECTED MANUFACTURERS

[illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook

V P O F N Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	
Poisons	3
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** -14,300 Btu/lb = -7930 cal/g = -332×10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on reverse side

5. HEALTH HAZARDS (Cont'd.)

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** If spilled on clothing and allowed to remain, it causes smarting and reddening of the skin. Large amounts may be absorbed through the skin and cause poisoning

5.10 **Odor Threshold:** [illegible]

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ADA — ADIPIC ACID

Common Synonyms			
Adipic acid 1,4-Butanedicarboxylic acid Hexanedioic acid	Solid crystals Sinks and mixes slowly with water	White	Odorless

Fire	Combustible Dust cloud may explode if ignited in an enclosed area
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Adipic acid
1,4-Butanedicarboxylic acid
Hexanedioic acid

3.2 **Coast Guard Compatibility Classification:** Data not available

3.3 **Chemical Formula:** $HOOC(CH_2)_4COOH$

3.4 **IMCO/UN Regulations Numerical Designation:** Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Crystalline

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Normal protection against exposure to finely divided organic solids (rubber gloves, plastic goggles)

5.2 **Symptoms Following Exposure:** Inhalation of vapor irritates mucous membranes of the nose and lungs, causes coughing and sneezing. Contact with liquid irritates eyes and has a pronounced drying effect on the skin, may produce dermatitis

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, get medical attention if irritation persists. EYES: flush with water for at least 15 min. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 oral mouse LD_{50} = 1,900 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Combustible solid
[illegible] °F C.C.

6.2 **Flammable Limits in Air:** Data not available
10.15 mg/l

6.3 **Fire Extinguishing Agents:** Foam, water fog, carbon dioxide or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:** Melts and decomposes to give volatile acids, vapors of adipic acid and other substances. Dust may form explosive mixture with air

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Rinse with dilute sodium bicarbonate or soda ash solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
<130 ppm, 24 hr Morgan Hill, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):**
Theoretical 1.15, 0.5 days

8.4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

1. Celanese Chemical Corp
A Division of Celanese Corp
245 Park Avenue
New York, N.Y. 10017

2. E. I. duPont de Nemours & Co., Inc.
1007 Market St
Wilmington, Del. 19898

3. Monsanto Company
800 North Lindbergh Blvd
St. Louis, Mo. 63166

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, 99.9%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

NS II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:**
Solid

13.2 **Molecular Weight:** 146.1

13.3 **Boiling Point at 1 atm:** Not pertinent
(decomposes)

13.4 **Freezing Point:**
304°F = 151°C = 424°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.36 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13.12 **Latent Heat of Vaporization:**
Not pertinent

13.13 **Heat of Combustion:** −8,242 Btu/lb
= −4,578 cal/g = −19.16 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 4

NOTES

ADN	ADIPONITRILE

Common Synonyms		
1,4-Dicyanobutane	Liquid	Colorless to light yellow	Odorless
	Floats on water Freezing point is 36°F	

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Vapor may explode if ignited in an enclosed area

Exposure

LIQUID OR SOLID
Irritating to skin and eyes
If swallowed will cause nausea or vomiting

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning poison water contaminant
Mechanical containment
Should be removed

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** 1 4 Dicyanobutane

3 2 **Coast Guard Compatibility Classification:** Nitrile

3 3 **Chemical Formula.** $CN(CH_2)_4CN$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Water white to light yellow

4 3 **Odor:** Practically odorless

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Rubber gloves and clothing giving full body and face protection to avoid contact with skin Air or oxygen mask

5 2 **Symptoms Following Exposure** Ingestion of a few ml may cause weakness mental confusion vomiting rapid respiration and tachycardia and convulsions Headache and convulsions can result from exposure to vapor

5 3 **Treatment for Exposure** Symptomatic treatment Call physician Thiosulfate should be considered Administer vapor or amyl nitrite if patient is unconscious

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 50 ppm

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** If present in high concentrations vapors cause a slight smarting of the eyes or respiratory system and may also cause more severe symptoms such as headache and convulsions

5 9 **Liquid or Solid Irritant Characteristics:** If spilled on clothing and allowed to remain may cause smarting and reddening of the skin If absorbed by skin may cause more severe symptoms such as headache and convulsions

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 199°F O C

6 2 **Flammable Limits in Air:** LFL = 1 0% at 200°C

6 3 **Fire Extinguishing Agents** Water spray dry chemical foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic gases are generated nitrites

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** 2 7 mm/min.

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 1250 ppm 24 hr sunfish TL_m fresh water

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD):** 40% 5 days

8 4 **Food Chain Concentration Potential.** Data not available

9 SELECTED MANUFACTURERS

1 Celanese Corporation
Celanese Chemical Co Division
245 Park Ave
New York N Y 10017

2 E I duPont de Nemours Inc
Plastics Department
DuPont Building
Wilmington Del 19898

3 Monsanto Company
Monsanto Textiles Co
800 N Lindbergh Blvd
St Louis Mo 63166

10 SHIPPING INFORMATION

10 1 **Grades or Purity.** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-E U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self-Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 108

13 3 **Boiling Point at 1 atm** 594°F = 290°C = 563°K

13 4 **Freezing Point** 36°F = 2 4°C = 275 5°K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 0 9611 at 25°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization** (est) 240 Btu/lb = 134 cal/g = $5 59 \times 10^5$ J/kg

13 13 **Heat of Combustion.** -14,230 Btu/lb = -7910 cal/g = -331×10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

ALD	ALDRIN

Common Synonyms
1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4-endo-exo-5,8-dimethano naphthalene

Solid crystals or solution — Light to dark brown — Mild chemical odor

Solid sinks in water solution floats on water

AVOID CONTACT WITH LIQUID OR SOLID KEEP PEOPLE AWAY
Wear goggles self contained breathing apparatus and rubber overclothing including gloves
Stop discharge if possible
Call fire department if container discharged
Isolate area from discharged material
Notify local health and pollution control agencies

Fire

Solid is not flammable but usually is dissolved in a combustible liquid
POISONOUS GASES ARE PRODUCED WHEN HEATED
Wear goggles self contained breathing apparatus and rubber overclothing including gloves
Extinguish with water dry chemical foam or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
SOLID OR SOLUTION
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin, eyes.
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison, water contaminant liquid forms are flammable
Mechanical containment (of liquid form)
Should be removed

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
endo-exo-1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-dimethanonaphthalene
HHDN

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula:** $C_{12}H_8Cl_6$

3.4 **IMCO/United Nations Numerical Designation** 6.1 1542

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Tan to dark Brown

4.3 **Odor:** Mild chemical

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** During prolonged exposure to mixing and loading operations wear clean synthetic rubber gloves and mask or respirator of the type passed by the U.S. Bureau of Mines for aldrin protection

5.2 **Symptoms Following Exposure:** Ingestion inhalation or skin absorption of a toxic dose will induce nausea vomiting hyperexcitability tremors epileptiform convulsions and ventricular fibrillation. Aldrin may cause temporary reversible kidney and liver injury. Symptoms may be seen after ingestion of less than 1 gram in an adult ingestion of 25 mg has caused death in children

5.3 **Treatment for Exposure:** SKIN CONTACT wash with soap and running water. If material gets into eyes wash immediately with running water for at least 15 minutes get medical attention INGESTION call physician immediately induce vomiting immediately. Repeat until vomit fluid is clear. Never give anything by mouth to an unconscious person. Keep patient prone and quiet PHYSICIAN administer barbiturates or anticonvulsant therapy. Observe patient carefully because repeated treatment may be necessary

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 0.25 mg/m³

5.5 **Short-Term Inhalation Limits:** 1 mg/m³ for 30 min

5.6 **Toxicity by Ingestion** (grade 3 LD50 to 500 mg/kg rat)

5.7 **Late Toxicity:** Chronic exposure produces benign tumors in mice

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause slight smarting of the eyes or respiratory system if present in high concentrations. Effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air.** Not pertinent

6.3 **Fire Extinguishing Agents.** Water spray dry chemical foam or carbon dioxide for fires involving solutions of aldrin in hydrocarbon solvents

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating fumes of hydrochloric acid and chlorinated decomposition products are given off

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.130 ppm 24 hr bluegill LC_{50} fresh water
0.05 ppm 24 hr goldfish LC_{50} fresh water
0.01 ppm 24 hr oyster sublethal effect salt water

8.2 **Waterfowl Toxicity:** 520 mg/kg

8.3 **Biological Oxygen Demand (BOD):** Not pertinent

8.4 **Food Chain Concentration Potential** High

9. SELECTED MANUFACTURERS

Shell Chemical Co
Agricultural Div
2401 Crow Canyon Rd
San Ramon Calif 94583

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 20.95% aldrin
5.80% inert ingredients Several solutions in hydrocarbon solvents

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

11

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	4
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid

13.2 **Molecular Weight.** 364.93

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** 219°F = 104°C = 377°K

13.5 **Critical Temperature.** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.6 at 20°C (solid)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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ABS	ALKYLBENZENESULFONIC ACIDS

Common Synonyms			
Decylbenzen sulfonic acid Un De In Tetra Penta Hexa } benzenesulfonic acid	Liquid	White to yellow	Odorless
	Mixes with water		

[illegible]

Fire

Combustible
Flammable gas may be produced on contact with metals.
[illegible]

Exposure

[illegible]
LIQUID
Irritating to skin and eyes
If swallowed will cause nausea
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning [illegible]
Disperse and flush

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Un
De
In
Tetra
Penta
Hexa } decylbenzenesulfonic acid

3 2 **Coast Guard Compatibility Classification**
Not listed

(Continued on page 4)

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color** Colorless to yellow
4 3 **Odor.** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure** Ingestion causes irritation of mouth and stomach Contact with liquid irritates eyes and skin
5 3 **Treatment for Exposure** INGESTION give large amount of water EYES flush with water for at least 15 min SKIN flush with water wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 2 LD 0 5 5 g kg (rat)
5 7 **Late Toxicity.** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 395 F O C
6 2 **Flammable Limits in Air**
Data not available
6 3 **Fire Extinguishing Agents** Alcohol foam dry chemical carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:**
Water may be ineffective
6 5 **Special Hazards of Combustion Products.**
Irritating sulfuric acid mist may form in fire
6 6 **Behavior in Fire**
6 7 **Ignition Temperature** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** May attack metals causing accumulation of flammable hydrogen gas in enclosed spaces
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Flush with water rinse with dilute sodium bicarbonate or soda ash solution
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)**
Data not available
8 4 **Food Chain Concentration Potential.**
None

9. SELECTED MANUFACTURERS

1 Continental Oil Co
Petrochemical Dept
Park 80 Plaza East
Saddle Brook N J 07662

2 Witco Chemical Co
Organics Div
277 Park Avenue
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 88% 97%
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.**
Liquid
13 2 **Molecular Weight:** 310 394
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point:** Data not available
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 1 0 to 1 4 at 20°C (liquid)
13 8 **Liquid Surface Tension**
Data not available
13 9 **Liquid-Water Interfacial Tension**
Not pertinent
13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent
13 12 **Latent Heat of Vaporization:**
Not pertinent
13 13 **Heat of Combustion.** Data not available
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

5 HEALTH HAZARDS (Cont'd)

3 3 **Chemical Formula:**
$C_{10}H_{13+}C_{12}H_{25}SO_3H$ (x 0–10)
3 4 **IMCO/United Nations Numerical Designation.** Not listed

ALA

ALLYL ALCOHOL

Common Synonyms
Vinyl carbinol
2-Propen-1-ol

Watery liquid | Colorless | Sharp mustard odor

Floats and mixes with water. Poisonous, flammable vapor is produced.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Shut off ignition sources and call fire department.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with dry chemical, alcohol foam, carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes, nose and throat.

Move to fresh air.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, poison.
Restrict access.
Disperse and flush.

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
2-Propen-1-ol
Vinylcarbinol

3.2 **Coast Guard Compatibility Classification:** Substituted allyl

3.3 **Chemical Formula:** $CH_2=CHCH_2OH$

3.4 **IMCO/United Nations Numerical Designation.** 3.2/1098

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic, pungent, sharp; causes tears

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister or air pack, rubber gloves, goggles, other protective equipment as required to prevent all body contact.

5.2 **Symptoms Following Exposure:** Vapors are quite irritating to eyes, nose, and throat. Eye irritation may be accompanied by complaints of photophobia and pain in the eyeball; pain may not begin until 1-6 hours after exposure. Liquid may cause first- and second-degree burns of the skin, with blister formation; underlying part will become swollen and painful, and local muscle spasms may occur.

5.3 **Treatment for Exposure:** INHALATION: remove victim from contaminated area and administer oxygen; get medical attention immediately. SKIN: remove liquid with soap and water. EYES: flush with continuous stream of water for 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 2 ppm

5.5 **Short-Term Inhalation Limits:** 5 ppm for 30 min

5.6 **Toxicity by Ingestion.** Grade 3. LD_{50} to 500 mg/kg (mouse, rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.

5.10 **Odor Threshold:** 0.78 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 72°F (C.C.), 90°F (O.C.)

6.2 **Flammable Limits in Air:** 2.5% - 18%

6.3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products.** Toxic vapors are generated when heated

6.6 **Behavior in Fire:** Vapor heavier than air and may travel a considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** 829°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 2.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable at ordinary temperatures and pressures

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.**
10 ppm/*/threshold/fresh water
2.5 ppm/*/bivalve larvae/lethal/salt water
* Time period not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 57% 10 days, 20% 5 days

8.4 **Food Chain Concentration Potential:** None noted

9 SELECTED MANUFACTURERS

1. FMC Corp
Organic Chemicals Div
633 Third Ave
New York, N.Y. 10042
2. Olin Corp
Chemicals Div
Brandenburg, Ky. 40108
3. Shell Chemical Co
Industrial Chemicals Div
Houston, Texas 77001

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 98%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure/vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 58.08

13.3 **Boiling Point at 1 atm:** 206°F = 96.9°C = 370.1°K

13.4 **Freezing Point:** −200°F = −129°C = 144°K

13.5 **Critical Temperature:** 521.4°F = 271.9°C = 545.1°K

13.6 **Critical Pressure:** 840 psia = 57 atm = 5.8 MN/m²

13.7 **Specific Gravity:** 0.852 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 2.0

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.12

13.12 **Latent Heat of Vaporization:** 295 Btu/lb = 164 cal/g = 6.87 × 10⁵ J/kg

13.13 **Heat of Combustion:** −13,720 Btu/lb = −7620 cal/g = −319.0 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) Negligible

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

ABR	ALLYL BROMIDE

Common Synonyms
3-bromopropene
Bromallylene
3-bromopropylene

Liquid — Colorless to light yellow — Irritating odor

Sinks in water. Flammable, irritating vapor is produced

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, dizziness, coughing or difficult breathing

LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Bromallylene
3-Bromopropene
3-Bromopropylene

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CH_2 = CH \cdot CH_2Br$

3.4 **IMCO/United Nations Numerical Designation:** 3.2/1099

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to light yellow

4.3 **Odor:** Irritating, unpleasant, pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles and face shield, protective clothing, self-contained breathing apparatus for high vapor concentrations

5.2 **Symptoms Following Exposure:** Inhalation of vapor irritates mucous membranes and causes dizziness, headache, and lung irritation. Contact with liquid irritates eyes and skin. Ingestion causes irritation of mouth and stomach

5.3 **Treatment for Exposure:** INHALATION: remove from exposure, if breathing is difficult give oxygen, call physician. EYES: flush with water for at least 15 min and call physician. SKIN: flush with water, get medical attention for skin irritation. INGESTION: do NOT induce vomiting, get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 30 mg/kg (guinea pig)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant. May cause pain and second degree burns after a few minutes contact

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 30°F C.C.

6.2 **Flammable Limits in Air:** 1.4% - 7.3%

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Toxic hydrogen bromide gas formed in fire

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** 563°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.5 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. White Chemical Corporation
East 22nd Street
Box 278
Bayonne, N. J. 07002
2. American Hoechst Corporation
Chemicals and Plastics Division
Somerville, N. J. 08876
3. Columbia Organic Chemical Co.
912 Drake St.
Columbia, S. C. 29205

10. SHIPPING FORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A X-1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self-Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 121

13.3 **Boiling Point at 1 atm:** 158°F = 70°C = 343°K

13.4 **Freezing Point:** −182°F = −119°C = 154°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.4161 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 26.9 dynes/cm = 0.0269 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 4.2

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.210

13.12 **Latent Heat of Vaporization:** (est.) 110 Btu/lb = 59 cal/g = 2.5 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) 6,700 Btu/lb = 3,700 cal/g = 1.50 × 10⁷ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 ...)

NOTES

ALC	# ALLYL CHLORIDE

Common Synonyms
3-Chloropropene
3-Chloropropylene

Liquid — Colorless to yellowish brown or red — Sharp irritating odor

Floats on water. Flammable. Irritating vapor is produced

Avoid contact with liquid and vapor. Keep people away.
[illegible]

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes, nose and throat
[illegible]
If breathing has stopped [illegible]
[illegible]

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible] CONSCIOUS [illegible] drink water [illegible]
IF SWALLOWED [illegible] CONSCIOUS OR HAVING CONVULSIONS [illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability
Restrict access

2 LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms**
3-Chloropropene
3-Chloropropylene

3.2 **Coast Guard Compatibility Classification**
Substituted allyl

3.3 **Chemical Formula** $CH_2=CHCH_2Cl$

3.4 **IMCO United Nations Numerical Designation.** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** [illegible]

4.3 **Odor** [illegible] characteristic pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** [illegible] full face mask and canister (greater concentration) self contained breathing apparatus or its equivalent. Rubber or neoprene gloves, apron, boots, clean body covering clothes, chemical goggles, gas tight goggles or equivalent, full face shield

5.2 **Symptoms Following Exposure** [illegible] effects may be delayed

5.3 **Treatment of Exposure:** INHALATION: if ill effects develop move persons to fresh air, keep them warm and quiet. Get medical attention immediately. Start artificial respiration if breathing stops. INGESTION: promptly induce vomiting. Get medical attention immediately. Do not administer treatment symptomatically. EYES: immediately flush with plenty of water for at least 15 min; get medical attention promptly. SKIN: remove clothing and flush affected area thoroughly.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 [illegible]

5.7 **Late Toxicity:** Lung, liver and kidney damage in experimental animals

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor is moderately [illegible] usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Causes severe [illegible] the skin and [illegible] exposure and may cause secondary burns on long exposure

5.10 **Odor Threshold** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point** [illegible]

6.2 **Flammable Limits in Air** [illegible]

6.3 **Fire Extinguishing Agents** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used** [illegible]

6.5 **Special Hazards of Combustion Products** [illegible]

6.6 **Behavior in Fire.** [illegible]

6.7 **Ignition Temperature.** [illegible]

6.8 **Electrical Hazard** [illegible]

6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** [illegible]

7.2 **Reactivity with Common Materials** [illegible]

7.3 **Stability During Transport.** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics** [illegible]

7.5 **Polymerization** [illegible]

7.6 **Inhibitor of Polymerization** [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity** [illegible]

8.2 **Waterfowl Toxicity** [illegible]

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** [illegible]

9 SELECTED MANUFACTURERS

Aldrich Chemical Co.
940 West St. Paul Ave.
Milwaukee, Wis. 53233

2. Dow Chemical Co.
Midland, Michigan 48640

Eastman Kodak Co.
Rochester, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere** [illegible]

10.4 **Venting** [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-2

A T U V W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poison	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** [illegible]

13.3 **Boiling Point at 1 atm** [illegible]

13.4 **Freezing Point** [illegible]

13.5 **Critical Temperature** [illegible]

13.6 **Critical Pressure** [illegible]

13.7 **Specific Gravity** [illegible]

13.8 **Liquid Surface Tension** [illegible]

13.9 **Liquid-Water Interfacial Tension.** Data not available

13.10 **Vapor (Gas) Specific Gravity** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas)** [illegible]

13.12 **Latent Heat of Vaporization:** Data not available

13.13 **Heat of Combustion** [illegible]

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** [illegible]

Continued on next page

NOTES

ACF

ALLYL CHLOROFORMATE

Common Synonyms
Allyl chlorocarbonate

Water: liquid Colorless Extremely irritating odor

Sinks in water. Flammable irritating vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

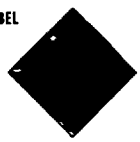
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: evacuate
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Allyl chlorocarbonate
3.2 **Coast Guard Compatibility Classification.** Not applicable
3.3 **Chemical Formula** $CH_2=CH-CH_2-O-COCl$
3.4 **IMCO/United Nations Numerical Designation:** 1722

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Extremely irritating causes tears, pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Vapor proof protective goggles and face shield, plastic or rubber gloves, shoes and clothing, gas mask or self-contained breathing apparatus
5.2 **Symptoms Following Exposure** Vapor irritates eyes and respiratory tract. Contact with liquid causes eye and skin irritation, and may cause irritation to mouth and stomach
5.3 **Treatment for Exposure** INHALATION: remove from exposure, support respiration if necessary, call physician. EYES: if irritated by either vapor or liquid, flush with water for at least 15 min. SKIN: wash with large amounts of water for at least 15 min. INGESTION: do NOT induce vomiting, give water, call physician
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 LD50: 500-50 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Vapor is moderately irritating such that most people will not usually tolerate moderate or high vapor concentrations
5.9 **Liquid or Solid Irritant Characteristics.** Liquid is severe irritant. May cause painful, severe degree burns after a few minutes contact
5.10 **Odor Threshold** 1.4 ppm

6 FIRE HAZARDS

6.1 **Flash Point** 92 F (O.C.) 88 F (C.C.)
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6.5 **Special Hazards of Combustion Products** When heated to decomposition, emits highly toxic phosgene gas
6.6 **Behavior in Fire** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature** Data not available
6.8 **Electrical Hazard** Data not available
6.9 **Burning Rate** 4.9 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly generating hydrogen chloride
7.2 **Reactivity with Common Materials** Corrodes metals
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Flush with water, rinse with lime or sodium bicarbonate solution
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Chemetron Corporation
   Organic Chemicals Division
   347 Seventh Avenue
   New York, N.Y. 10001
2. Olin Chemical Co.
   500 Agard Rd
   Muskegon, Mich. 49445
3. Polysciences, Inc.
   Paul Valley Industrial Park
   Warrington, Pa. 18976

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 97+
10.2 **Storage Temperature:** Keep cool
10.3 **Inert Atmosphere** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

X O X Y

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Corrosive, Flammable Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 120.5
13.3 **Boiling Point at 1 atm:** 116 F = 45°C = 318°K
13.4 **Freezing Point.** −112 F = −80°C = 193 K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure.** Not pertinent
13.7 **Specific Gravity:** 1.139 at 20°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 4.15
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0504
13.12 **Latent Heat of Vaporization** (est.) 100 Btu/lb = 56 cal/g = 2.3 × 10⁵ J/kg
13.13 **Heat of Combustion** (est.) −7,800 Btu/lb = −4,300 cal/g = −180 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on page 4 and 5

NOTES

ATC	ALLYLTRICHLOROSILANE

Common Synonyms			
Allylchlorosilane trichloride	Liquid	Colorless	Sharp, irritating odor
	Reacts violently with water. Irritating visible vapor cloud is produced		

Fire	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible] DO NOT USE WATER [illegible]
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing. [illegible] LIQUID Will burn skin and eyes. Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Allylsilicone trichloride
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $CH_2{=}CH{-}CH{-}SiCl$
3.4 **IMCO/United Nations Numerical Designation:** 8 1724

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sharp pungent irritating like hydrochloric acid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor type respirators protection rubber gloves chemical goggles, other equipment necessary to protect skin and eyes
5.2 **Symptoms Following Exposure:** Inhalation of vapor irritates mucous membranes. Liquid causes severe burns of eyes and skin and severe internal burns if ingested
5.3 **Treatment for Exposure:** Get medical attention after all exposures to this compound INHALATION remove from exposure support respiration EYES flush with water 15 min SKIN flush with water INGESTION do NOT induce vomiting give water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 LD_{50} 50 to 500 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to the eyes
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 100°F (O.C.) 95°F (C.C.)
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water
6.5 **Special Hazards of Combustion Products:** Irritating vapors of hydrogen chloride and phosgene may form
6.6 **Behavior in Fire:** Difficult to extinguish Reignition may occur
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 2.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously generating hydrogen chloride (hydrochloric acid)
7.2 **Reactivity with Common Materials:** Corrodes metal because of hydrochloric acid formed
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water rinse with sodium bicarbonate
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Corning Corporation
P.O. Box 592
Midland, Mich. 48640
2. Polysciences, Inc.
Paul Valley Industrial Park
Warrington, Pa. 18976
3. Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	4
Self Reaction	4

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 175.5
13.3 **Boiling Point at 1 atm:** 241°F = 116°C = 389°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.215 at 20°C (liquid)
13.8 **Liquid Surface Tension.** (est.) 20 dynes/cm = 0.020 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 6
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0863
13.12 **Latent Heat of Vaporization.** 97 Btu/lb = 54 cal/g = 2.3 × 10⁵ J/kg
13.13 **Heat of Combustion.** (est.) −5,200 Btu/lb = −2,900 cal/g = −12.0 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(continued on page 5 and 6)

NOTES

ACL	ALUMINUM CHLORIDE

Common Synonyms Anhydrous aluminum chloride	Solid crystals or powder — Yellow-orange to grayish-white — Irritating odor Sinks in water. Poisonous gas is produced on contact with water
[illegible]	
Fire	Not flammable [illegible]
Exposure	CAUTIONARY MEDICAL **DUST** Irritating to eyes, nose and throat Harmful if inhaled [illegible] **SOLID** Will burn skin and eyes. Harmful if swallowed [illegible] DO NOT [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush with water
Issue warning — corrosive

2. LABELS

No hazard labels required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Anhydrous aluminum chloride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $AlCl_3$

3.4 **IMCO United Nations Numerical Designation:** NO 1726

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Orange to yellow through gray to white

4.3 **Odor:** Like hydrogen chloride, like hydrochloric acid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** All personnel in the area should wear safety clothing, including fully closed goggles, rubber or plastic coveralls, rubber shoes and overall coat and resistant material. An acid vapor canister mask should be carried in case of emergency. In certain applications, it may be advisable to wear this equipment on a routine basis.

5.2 **Symptoms Following Exposure:** Contact with the skin or eyes in the presence of moisture causes thermal and acid burn.

5.3 **Treatment for Exposure:** INGESTION: If victim is conscious, have him drink water or milk. Do NOT induce vomiting. SKIN: flush immediately with plenty of water. For eye contact, flush with water for at least 15 min. and get medical attention immediately.

5.4 **Toxicity L_D Inhalation (Threshold Limit Value)** 5 ppm (hydrogen chloride)

5.5 **Short-Term Inhalation Limits:** 5 ppm for 5 min., 30 ppm for 30 min., 20 ppm for 20 min., 10 ppm for 60 min. (all for hydrogen chloride)

5.6 **Toxicity by Ingestion:** No systemic effects but severe burn of mouth

5.7 **Late Toxicity:** None recognized

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor of hydrogen chloride is moderately irritating and Navy personnel will not usually tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Is a severe skin irritant; may cause pain and second-degree burns after a few minutes contact.

5.10 **Odor Threshold:** 1.5 ppm (hydrogen chloride)

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Reacts violently with water used in extinguishing adjacent fires

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently with water liberating hydrogen chloride gas and heat

7.2 **Reactivity with Common Materials:** None if dry. If wet it attacks metals because of hydrochloric acid formed. Flammable hydrogen is formed.

7.3 **Stability During Transport:** Stable if kept dry and protected from atmospheric moisture

7.4 **Neutralizing Agents for Acids and Caustics:** Hydrochloric acid formed by reaction with water can be flushed away with water. Rinse with sodium bicarbonate or lime solution.

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Not pertinent

8.2 **Waterfowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD)** Not pertinent

8.4 **Food Chain Concentration Potential.** Not pertinent

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp.
   Industrial Chemicals Division
   Morristown, N.J. 07960
2. Pearsall Corp.
   Pearsall Chemical Co., Div.
   4615 Southwest Freeway
   Houston, Texas 77027
3. Stauffer Chemical Co.
   Industrial Chemical Div.
   Baton Rouge, La. 70821

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure, 99.7%; technical, 99%

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

RRC

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	2
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 133.34

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.44 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

*13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

*13.16 **Heat of Polymerization** Not pertinent

Continued on next sheet

NOTES

ALF	ALUMINUM FLUORIDE

Common Synonyms	Solid powder or granules — White — Odorless Sinks in water
Fire	Not Flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	DUST If inhaled irritating to nose and throat
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:

3.2 Coast Guard Compatibility Classification

3.3 Chemical Formula

3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):

4.2 Color:

4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:

5.2 Symptoms Following Exposure:

5.3 Treatment for Exposure:

5.4 Toxicity by Inhalation (Threshold Limit Value):

5.5 Short-Term Inhalation Limits:

5.6 Toxicity by Ingestion: LD_{50} = 600 mg/kg (Guinea pig)

5.7 Late Toxicity: Skeletal fluorosis (bone abnormalities) in humans working in aluminum plant for 12 years

5.8 Vapor (Gas) Irritant Characteristics:

5.9 Liquid or Solid Irritant Characteristics:

5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:

6.2 Flammable Limits in Air:

6.3 Fire Extinguishing Agents:

6.4 Fire Extinguishing Agents Not to be Used:

6.5 Special Hazards of Combustion Products:

6.6 Behavior in Fire:

6.7 Ignition Temperature:

6.8 Electrical Hazard:

6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:

7.2 Reactivity with Common Materials:

7.3 Stability During Transport:

7.4 Neutralizing Agents for Acids and Caustics:

7.5 Polymerization:

7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:

8.2 Waterfowl Toxicity:

8.3 Biological Oxygen Demand (BOD):

8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:

10.2 Storage Temperature:

10.3 Inert Atmosphere:

10.4 Venting:

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:

12.2 NAS Hazard Rating for Bulk Water Transportation:

12.3 NFPA Hazard Classifications

Category	Classification
Health	
Flammability	
Reactivity	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:

13.2 Molecular Weight:

13.3 Boiling Point at 1 atm:

13.4 Freezing Point:

13.5 Critical Temperature:

13.6 Critical Pressure:

13.7 Specific Gravity:

13.8 Liquid Surface Tension:

13.9 Liquid-Water Interfacial Tension:

13.10 Vapor (Gas) Specific Gravity:

13.11 Ratio of Specific Heats of Vapor (Gas):

13.12 Latent Heat of Vaporization:

13.13 Heat of Combustion:

13.14 Heat of Decomposition:

13.15 Heat of Solution:

13.16 Heat of Polymerization:

NOTES

REVISED 1978

ALN	ALUMINUM NITRATE

Common Synonyms Aluminum nitrate nonahydrate Nitric acid aluminum salt	Solid White Odorless Sinks and mixes slowly with water
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat Harmful if inhaled SOLID Irritating to skin and eyes If swallowed will cause nausea or vomiting
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning: water contaminant

Disperse and flush

2. LABEL

OXIDIZER

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Aluminum nitrate nonahydrate, Nitric acid aluminum salt

3.2 **Coast Guard Compatibility Classification** [illegible]

3.3 **Chemical Formula** $Al(NO_3)_3 \cdot 9H_2O$

3.4 **IMCO/United Nations Numerical Designation** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid

4.2 **Color** White

4.3 **Odor** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Goggles, [illegible]

5.2 **Symptoms Following Exposure** Ingestion [illegible]

5.3 **Treatment for Exposure** EYES [illegible] SKIN [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** [illegible]

5.6 **Toxicity by Ingestion** [illegible]

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Data not available

5.9 **Liquid or Solid Irritant Characteristics** Data not available

5.10 **Odor Threshold** Odorless

6 FIRE HAZARDS

6.1 **Flash Point** [illegible]

6.2 **Flammable Limits in Air** [illegible]

6.3 **Fire Extinguishing Agents** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used** [illegible]

6.5 **Special Hazards of Combustion Products** [illegible]

6.6 **Behavior in Fire** [illegible]

6.7 **Ignition Temperature** [illegible]

6.8 **Electrical Hazard** [illegible]

6.9 **Burning Rate** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** [illegible]

7.2 **Reactivity with Common Materials** [illegible]

7.3 **Stability During Transport** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics** Flush with water

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** 0.07 ppm, 10 days, stickleback, killed, fresh water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** None

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

Mallinckrodt Chemical Works
223 Westside Ave
P.O. Box 384
Jersey City, N.J. 07303

2 Allied Chemical Corp
Specialty Chemicals Div
P.O. Box [illegible]
Morristown, N.J. 07960

J. T. Baker Chemical Co
Phillipsburg, N.J. 08865

10. SHIPPING INFORMATION

10.1 **Grades or Purity** Reagent, 99+, Technical

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** Not requirement

10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Oxidizer

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight.** [illegible]

13.3 **Boiling Point at 1 atm** Not pertinent, decomposes

13.4 **Freezing Point.** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity** [illegible] at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

ALM	ALUMINUM SULFATE

Common Synonyms			
Cake alumum Patent alumum	Solid	Gray white	Odorless
	Sinks and mixes slowly with water		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP LOOSE AWAY

Fire

Not flammable

DO NOT USE WATER ON FIRE

Exposure

CAUTION MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea or vomiting

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cake alum
Patent alum

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Al_2SO_4)_3 18H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not Listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Gray white

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator, goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and mouth Ingestion of large doses causes gastric irritation nausea vomiting and purging Dust irritates eyes and skin

5 3 **Treatment for Exposure:** INHALATION rinse nose and mouth with water INGESTION give large amounts of water EYES flush with water for at least 15 min SKIN flush with water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral mouse LD_{50} = 770 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May corrode metals in presence of moisture

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity**
14pg = 96 h fundulus fatal fresh water
240ppm 48 hr nonaquatic 11 m *
*Water 1 pt per sq ft

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Industrial Chemicals Div
Morristown, N J 07960

2 American Cyanamid Co
Industrial Chemicals and Plastics Div
Wayne, N J 07470

3 W R Grace & Co
Davison Chemicals Div
Baltimore, Md 21203

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 666.4

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.7 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** −22.1 Btu/lb
= −12.3 cal/g = −0.515 × 10³ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

AEA	AMINOETHYLETHANOLAMINE

Common Synonyms N-(2-Aminoethyl) ethanolamine 2-[(2-Aminoethyl)amino] ethanol N-(2-Hydroxyethyl)-1,2-ethanediamine N-Hydroxyethyl-1,2-ethanediamine	Liquid Colorless Mild ammonia odor Sinks and mixes with water
Fire	Combustible
Exposure	LIQUID Will burn skin and eyes.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Disperse and flush.

2. LABELS

No hazard labels required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
2-(2-Aminoethylamino)ethanol
N-(2-Aminoethyl)ethanolamine
N-beta-Hydroxyethylethylenediamine
N-Hydroxyethyl-1,2-ethanediamine

3.2 **Coast Guard Compatibility Classification:** Monoalkylamine

3.3 **Chemical Formula:** $HOCH_2CH_2NHCH_2CH_2NH_2$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild ammonia-like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, protective clothing

5.2 **Symptoms Following Exposure:** Skin contact will cause irritation; eye contact will cause more severe irritation

5.3 **Treatment for Exposure:** INGESTION: do NOT induce vomiting; call physician immediately. SKIN: wash area with plenty of water. EYES: flush thoroughly with running water preferably for 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD50 [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** High concentrations of vapor may cause a slight smarting of the eyes or respiratory system. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes contact.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640
2. Jefferson Chemical Co.
[illegible] Richmond Ave.
Houston, Tex. [illegible]
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

APO

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** Data not available

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 25°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** Not pertinent

(Continued on back page)

NOTES

AMA	AMMONIA, ANHYDROUS

Common Synonyms
Liquid Ammonia

Liquefied compressed gas Colorless Ammonia odor

Floats and boils on water. Poisonous visible vapor cloud is produced

[illegible]

Fire

Combustible

[illegible]

Exposure

[illegible]

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat

[illegible]

LIQUID
Will burn skin and eyes
Harmful if swallowed
Will cause frostbite

[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

[illegible]

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible]
3.2 Coast Guard Compatibility Classification: [illegible]
3.3 Chemical Formula: NH
3.4 IMCO United Nations Numerical Designation: [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): [illegible]
4.2 Color: [illegible]
4.3 Odor: [illegible]

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]
5.2 Symptoms Following Exposure: [illegible]
5.3 Treatment for Exposure: [illegible]
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: 50 ppm for 5 min
5.6 Toxicity by Ingestion: [illegible]
5.7 Late Toxicity: [illegible]
5.8 Vapor (Gas) Irritant Characteristics: [illegible]
5.9 Liquid or Solid Irritant Characteristics: [illegible]
5.10 Odor Threshold: [illegible]

6. FIRE HAZARDS

6.1 Flash Point: [illegible]
6.2 Flammable Limits in Air: [illegible]
6.3 Fire Extinguishing Agents: [illegible]
6.4 Fire Extinguishing Agents Not to be Used: [illegible]
6.5 Special Hazards of Combustion Products: [illegible]
6.6 Behavior in Fire: [illegible]
6.7 Ignition Temperature: [illegible]
6.8 Electrical Hazard: [illegible]
6.9 Burning Rate: [illegible]

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water: [illegible]
7.2 Reactivity with Common Materials: [illegible]
7.3 Stability During Transport: [illegible]
7.4 Neutralizing Agents for Acids and Caustics: [illegible]
7.5 Polymerization: [illegible]
7.6 Inhibitor of Polymerization: [illegible]

8. WATER POLLUTION

8.1 Aquatic Toxicity:
2.0 - 2.5 ppm 1-4 days goldfish and yellow perch LC
60 - 80 ppm 3 days crayfish LC_{100}
5.2 ppm 96 hr fathead minnow TL_m
[illegible]
8.2 Water owl Toxicity: [illegible]
8.3 Biological Oxygen Demand (BOD): [illegible]
8.4 Food Chain Concentration Potential: [illegible]

9. SELECTED MANUFACTURERS

[illegible]

10. SHIPPING INFORMATION

10.1 Grades or Purity: [illegible]
10.2 Storage Temperature: [illegible]
10.3 Inert Atmosphere: [illegible]
10.4 Venting: [illegible]

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-4

A B C K L M N O

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: [illegible]
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
[illegible]	
Health	
[illegible]	[illegible]
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
Net Reaction	

12.3 NFPA Hazard Classifications

Category	Classification
Health Hazard (B)	2
[illegible]	
[illegible]	

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: [illegible]
13.2 Molecular Weight: [illegible]
13.3 Boiling Point at 1 atm: [illegible]
13.4 Freezing Point: [illegible]
13.5 Critical Temperature: [illegible]
13.6 Critical Pressure: [illegible]
13.7 Specific Gravity: [illegible]
13.8 Liquid Surface Tension: [illegible]
13.9 Liquid Water Interfacial Tension: [illegible]
13.10 Vapor (Gas) Specific Gravity: [illegible]
13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]
13.12 Latent Heat of Vaporization: [illegible]
13.13 Heat of Combustion: [illegible]
13.14 Heat of Decomposition: [illegible]
13.15 Heat of Solution: [illegible]
13.16 Heat of Polymerization: [illegible]

[illegible]

NOTES

REVISED 1978

AAT	AMMONIUM ACETATE

Common Synonyms	Solid	White	Weak ammonia odor
Acetic acid, ammonium salt	Sinks and mixes with water		

[illegible]

Fire	Not flammable Irritating gases may be produced when heated [illegible]
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause difficult breathing [illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea [illegible] IF SWALLOWED [illegible] CONSCIOUS [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes. [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Acetic acid, ammonium salt

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula** $NH_4C_2H_3O_2$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** White

4 3 **Odor:** Weak ammonia

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Dust mask, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure** Inhalation of dust irritates nose and mouth. Ingestion irritates mouth and stomach. Contact with dust causes irritation of eyes and mild irritation of skin

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air, rinse nose and mouth with water. INGESTION give large amounts of water. EYES flush with water [illegible] at least 15 min. SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products** Irritating vapors of ammonia and acetic acid may form in fires

6 6 **Behavior in Fire**

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** [illegible] ppm 24 hr mosquito fish TL_m fresh water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** 79% 1 5 days

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown N J 07960

2 Mallinckrodt Chemical Works
223 Westside Ave
P O Box 284
Jersey City N J 07303

3 J T Baker Chemical Co
Phillipsburg N J 08865

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent CP Technical 97+%

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight** [illegible]

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point.** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity.** 1 17 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity.** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution** −5 8 Btu/lb = −3 2 cal/g = −0 13 x 10⁶ J/kg

13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

ABZ

AMMONIUM BENZOATE

Common Synonyms			
Benzoic acid, ammonium salt	Solid	White	Odorless
	Sinks and mixes slowly with water		

[illegible]

Fire

Combustible
Dust cloud may explode if ignited in an enclosed area
POISONOUS GASES MAY BE PRODUCED IN FIRE
Irritating gases may be produced when heated
[illegible]

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat.
Harmful if inhaled
[illegible]

SOLID
Irritating to skin and eyes.
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Benzoic acid ammonium salt
3 2 **Coast Guard Compatibility Classification** Not listed
3 3 **Chemical Formula:** $C_6H_5COONH_4$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety glasses gloves
5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose Contact with eyes causes irritation
5 3 **Treatment for Exposure:** INHALATION move to uncontaminated atmosphere EYES flush with water for at least 15 min SKIN flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)
6 2 **Flammable Limits in Air** Not pertinent
6 3 **Fire Extinguishing Agents.** Water foam dry chemical carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:**
6 5 **Special Hazards of Combustion Products:** Irritating toxic ammonia gas may form in fires
6 6 **Behavior in Fire**
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Slowly releases ammonia gas, which may collect in closed container
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Ashland Oil Inc
P O Box 2219
Columbus Ohio 43216

2 Heico Inc
Delaware Water Gap Pa 18327

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 139 15
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point:** 388°F = 198°C = 471°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 26 at 25°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** 34 Btu/lb = 19 cal/g = 0 80 x 10^3 J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

ABC	AMMONIUM BICARBONATE

Common Synonyms			
Acid ammonium carbonate Ammonium hydrogen carbonate Carbonic acid, monoammonium salt	Solid	White	Weak ammonia odor
	Sinks and mixes slowly with water. Freezing point is 95°F		

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Acid ammonium carbonate
Ammonium hydrogen carbonate
Carbonic acid, monoammonium salt

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula:** NH_4HCO_3

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** White

4 3 **Odor:** Slight ammonia

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Work gloves, dust respirator, safety glasses or chemical safety goggles if dusty

5 2 **Symptoms Following Exposure:** Inhalation may cause respiratory irritation. Ingestion could be harmful. Contact with eyes or skin causes irritation

5 3 **Treatment for Exposure:** Consult physician in case of ingestion or severe irritation. INHALATION move to uncontaminated atmosphere. EYES OR SKIN wash with large amounts of water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products.** Irritating and toxic ammonia gas may form in fires

6 6 **Behavior in Fire:** Decomposes but reaction is not explosive. Ammonia gas is formed

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May attack copper, nickel and zinc

7 3 **Stability During Transport:** Decomposes above 34°C (91°F) with formation of ammonia gas, which may collect in closed containers

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Water Flow Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Diamond Shamrock Chemical Co
300 Union Commerce Building
Cleveland, Ohio 44115

2 Allied Chemical Corp
Industrial Chemicals Division
P O Box 1139R
Morristown, N J 07960

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Food, Reagent

10 2 **Storage Temperature:** Below 33°C (91°F)

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 79.06

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent (decomposes at 35°C)

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.57 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** 140 Btu/lb = 80 cal/g = 3.3×10^5 J/kg

13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

ABF	# AMMONIUM BIFLUORIDE

Common Synonyms			
Ammonium hydrogen fluoride Acid ammonium fluoride Ammonium acid fluoride	Solid	White	Odorless
	Sinks and mixes with water		

	[illegible]
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible]
Exposure	[illegible] DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Will burn skin and eyes. If swallowed will cause nausea or vomiting [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - corrosive water contaminant
Restrict access
Disperse and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.**
Acid ammonium fluoride
Ammonium acid fluoride
Ammonium hydrogen fluoride

3 2 **Coast Guard Compatibility Classification**
Not listed

3 3 **Chemical Formula** NH_4HF_2

3 4 **IMCO/United Nations Numerical Designation** 8 1727

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color** White

4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Bu Mines approved respirator, rubber gloves, safety goggles

5 2 **Symptoms Following Exposure** Inhalation of gas may cause irritation of the respiratory system. Ingestion causes irritation of mouth and stomach, vomiting, abdominal pain, convulsions, collapse, acute toxic nephritis. Contact with dust irritates eyes and may cause burns or ulceration. High concentrations of fluorine in the urine have been reported following skin contact.

5 3 **Treatment for Exposure** *Begin first aid as quickly as possible.* INHALATION: remove victim to fresh air. INGESTION: perform gastric lavage with dilute aqueous solution of 1% calcium chloride solution, support respiration, call a physician. EYES: flush with water for at least 15 min, consult physician. SKIN: flush with water, treat burns. OTHER: remove all contaminated clothing in the shower at once.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 2.5 mg/m³ (as fluorides)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion.** Grade 3 LD_{50} = 50 mg/kg (guinea pig) 60 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Do not apply water to adjacent fires

6 5 **Special Hazards of Combustion Products** Toxic ammonia and hydrogen fluoride gases may form in fire

6 6 **Behavior in Fire**

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Dissolves and forms a weak solution of hydrofluoric acid

7 2 **Reactivity with Common Materials.** In presence of moisture will corrode glass, cement, and most metals. Flammable hydrogen gas may collect in enclosed spaces

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 American Hoechst Corp
Chemicals and Plastics Division
Route 202 206 North
Somerville, N J 08876

2 The Harshaw Chemical Co
1945 E 97th Street
Cleveland, Ohio 44106

3 Allied Chemical Corp
Specialty Chemicals Division
P O Box 1087R
Morristown, N J 07960

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Pure 99+%
Technical 97 - 98.5%

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Corrosive solid

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	1
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight:** 57.04

13 3 **Boiling Point at 1 atm:**
463.1°F = 239.5°C = 512.7°K

13 4 **Freezing Point**
258.0°F = 125.6°C = 398.8°K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** [illegible] at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** 154 Btu/lb
= 85.7 cal/g = 3.59 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 5

NOTES

ACB

AMMONIUM CARBONATE

Common Synonyms

Solid White Strong Ammonia Odor

Sinks and mixes with water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

FOR MEDICAL

DUST
Irritating to eyes nose and throat
If inhaled will cause difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Hartshorn Salt volatile
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $(NH_4)_2CO_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** White
4 3 **Odor:** Strong ammonia

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator protection against ammonia vapors
5 2 **Symptoms following Exposure:** Inhalation causes irritation of nose and throat Ingestion may cause gastric irritation Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INHALATION leave contaminated area INGESTION give large amount of water EYES flush with copious amounts of water SKIN flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** [illegible] ppm ammonia gas

6 FIRE HAZARDS

6 1 **Flash Point** Not pertinent
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents** Water
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic ammonia gas will form in fires
6 6 **Behavior in Fire** Decomposes but reaction is not explosive Ammonia gas is formed
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials**
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
24 ppm 3 5 hr goldfish killed fresh water
10 ppm > 10 [illegible]
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

Agrico Chemical Co
National Bank of Tulsa Building
Tulsa Okla 74103

2 Allied Chemical Corp
Specialty Chemicals Division
P O Box 1087R
Morristown N J 07960

Mallinckrodt Chemical Works
223 Westside Avenue
P O Box 384
Jersey City N J 07303

10 SHIPPING INFORMATION

10 1 **Grades or Purity** C P NF USP Reagent Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** [illegible]
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity** [illegible] at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

NOTES

AMC	# AMMONIUM CHLORIDE

Common Synonyms			
Ammonium muriate Sal ammoniac Salmiac Amchlorde Ammoneric	Solid	White	Odorless
	Sinks and mixes slowly with water		

[illegible]

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated [illegible]
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes If swallowed will cause nause [illegible] IF SWALLOWED [illegible] NOT INDUCE VOMITING OR HAVING CONVULSIONS [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Amchlor Ammoneric, Ammonium muriate, Sal ammoniac Salmiac

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** NH_4Cl

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Gloves of any material safety glasses or chemical safety goggles dust mask or respirator as necessary

5 2 **Symptoms Following Exposure:** Inhalation of fumes irritates respiratory passages Ingestion irritates mouth and stomach Fumes are irritating to eyes Contact with skin may cause irritation

5 3 **Treatment for Exposure:** INHALATION remove to fresh air INGESTION give large amount of water, get medical attention if irritation persists EYES OR SKIN flush with plenty of water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m³

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral rat LD_{50} = 1 650 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to Be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic and irritating ammonia and hydrogen chloride gases may form in fire

6 6 **Behavior in Fire:** May volatilize and condense on cool surfaces

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 6 ppm 96 hr sunfish TLm fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Pennwalt Corp
Three Parkway
Philadelphia Pa 19102

2 Allied Chemical Corp
Industrial Chemicals Division
P O Box 1139 R
Morristown, N J 07960

3 Mallinckrodt Chemical Works
223 Westside Avenue
P O Box 384
Jersey City N J 07304

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** USP Reagent Technical 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 53 5

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 53 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** 130 Btu lb = 72 cal g = 3 0 × 10⁵ J kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

ACI	AMMONIUM CITRATE

Common Synonyms			
Diammonium citrate Ammonium citrate Citric acid Diammonium salt	Solid	White	Weak Ammonia Odor
	Sinks and mixes with water		

	[illegible]
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible]
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-[illegible] 4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ammonium citrate dibasic
Citric acid diammonium salt
Diammonium citrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $(NH_4)_2HC_6H_5O_7$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Slight ammoniacal

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved dust respirator eye goggles

5 2 **Symptoms Following Exposure:** Inhalation causes respiratory irritation Ingestion causes diarrhea Contact with eyes causes mild irritation

5 3 **Treatment for Exposure:** INHALATION: move to fresh air EYES: flush with water or physiological saline get medical care if irritation persists SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic ammonia gas may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Pfizer Chemicals Div
235 E 42nd St
New York N Y 10017

2 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown N J 07960

3 J T Baker Chemical Co
Phillipsburg N J 08865

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 226

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.48 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages [illegible]

NOTES

AMD	AMMONIUM DICHROMATE

Common Synonyms		
Ammonium bichromate	Solid crystals or powder Orange to red	Odorless
	Sinks and mixes with water	

	[illegible]
Fire	FLAMMABLE May cause fire on contact with combustibles Containers may explode in fire [illegible]
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Vehicles Manual CG 446-4

Issue warning, high flammability, isolate material

Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Ammonium bichromate

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** NH_4CrO

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** [illegible]

4.2 **Color:** Orange-yellow to bright red, range [illegible] red

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Use respiratory protection, goggles, gloves, clothing

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nasal passages, mucous membranes, throat and respiratory tract. Respiratory tract damage slows up, may even lead to death. Contact irritates eyes, skin, mucous membranes, causes pain, redness, swelling, and ulceration. External contact can cause contact burns of eyes, skin, and mucous membranes, and ulcerations of nasal passages and septum. Ingestion causes irritation of mouth, throat, and stomach. Prolonged irritation causes inflammation and ulceration of mucous membrane and [illegible]

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air and administer oxygen if breathing difficult. EYES: immediately flush with water for at least 15 minutes, even if pain persists. SKIN: flush with water, remove contaminated clothing, get medical attention. INGESTION: [illegible] water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible] mg

5.5 **Short-Term Inhalation Limits.** Not pertinent

5.6 **Toxicity by Ingestion.** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** [illegible]

6.2 **Flammable Limits in Air** Not pertinent

6.3 **Fire Extinguishing Agents** Water

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** [illegible]

6.6 **Behavior in Fire** Decomposes above 180°C. Decomposition is self-sustaining at 225°C with rapid glowing [illegible] Oxygen [illegible] Pressure [illegible] explosion

6.7 **Ignition Temperature:** 450°F

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** [illegible] shavings

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** None

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

Allied Chemical Corporation
Specialty Chemicals Division
P.O. Box 1087R
Morristown, N.J. 07960

J.T. Baker Chemical Co.
222 Red School Lane
Phillipsburg, N.J. 08865

Mallinckrodt Chemical Works
222 West Side Avenue
P.O. Box 164
Jersey City, N.J. 07304

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Analytical reagent grade 99.0, chemically pure grade, technical grade, water grade 99.7, C.P. grade or grade 99.8

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

SSZ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Oxidizer

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard	Blue
Flammability	Red
Reactivity	Yellow

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 252.07

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.15 at 25°C/4°C

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** [illegible] at 20°C in 100 g

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

AFR

AMMONIUM FLUORIDE

Common Synonyms
Neutral ammonium fluoride

Solid White Odorless

Sinks and mixes with water

[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

[illegible]

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
POISONOUS IF SWALLOWED
Will burn skin and eyes
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning - water contaminant
Dispose and flush

2. LABELS

Hazard label [illegible]
Code of Federal Regulations [illegible]

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: Neutral ammonium fluoride
3.2 Coast Guard Compatibility Classification: Not listed
3.3 Chemical Formula: NH_4F
3.4 IMCO/United Nations Numerical Designation: Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: White
4.3 Odor: None

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]
5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of the upper respiratory tract. Ingestion is harmful; readily soluble in water and may be taken up through the skin. Swallowed. Contact with eyes causes [illegible] irritation. Skin contact may cause burns. High doses of fluoride ions have been reported [illegible]
5.3 Treatment for Exposure: Remove victim to fresh air. If not breathing, give INHALATION [illegible] INGESTION [illegible] EYES [illegible] SKIN [illegible]
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Data not available
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Data not available
5.9 Liquid or Solid Irritant Characteristics: Data not available
5.10 Odor Threshold: Data not available

6 FIRE HAZARDS

6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not flammable
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: [illegible] gaseous [illegible] fluoride
6.6 Behavior in Fire: Melts [illegible] and [illegible]
6.7 Ignition Temperature: Not pertinent
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not pertinent

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water: Dissolves and [illegible]
7.2 Reactivity with Common Materials: May corrode glass, ceramics and some metals
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Allied Chemical Corp
General Chemical Div
40 Rector St
New York, N.Y. [illegible]
2. J.T. Baker Chemical Co
Phillipsburg, N.J. [illegible]
3. Gulf & Western Chemicals Mfg Co
Mill Metal, N.Y.
Carle Place, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 Grades or Purity: Technical, Pure, Reagent, Electronic, [illegible] and MOS
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

NS

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: ORM-B
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 37.04
13.3 Boiling Point at 1 atm: Not pertinent (decomposes)
13.4 Freezing Point: Not pertinent
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 1.32 at 25°C (solid)
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Not pertinent
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: 72 Btu/lbm 40 cal/gm [illegible]
13.16 Heat of Polymerization: Not pertinent

Continued on next page

NOTES

AFM	AMMONIUM FORMATE

Common Synonyms Formic acid ammonium salt	Solid White Weak ammonia odor Sinks and mixes slowly with water

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes. If swallowed will cause nausea
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Dispersed and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Formic acid ammonium salt

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $HCOONH_4$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Weak ammonia

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion irritates mouth and stomach. Contact with eyes or skin causes irritation

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air. INGESTION: give large amounts of water, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 2,250 mg/kg (mouse)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water fog

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:** Toxic and irritating ammonia and formic acid gases may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. R.S.A. Corporation
   [illegible]
   Aldsley, N.Y. 10502
2. Mallinckrodt Chemical Works
   223 Westside Avenue
   P.O. Box 384
   Jersey City, N.Y. 07303
3. Gallard Schlesinger Chemical Mfg. Co.
   584 Mineola Avenue
   Carle Place, N.Y. 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Analytical grade
Organic chemical grade

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 63.06

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** 231°F = 116°C = 389°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.28 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** 84 Btu/lb = 47 Kcal/g = 1.97 × 10^5 J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

AGC	# AMMONIUM GLUCONATE

Common Synonyms	Solid White Weak ammonia odor Sinks and mixes with water
	[illegible]
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE.
Exposure	[illegible] DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Summary Handbook CG-446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $NH_4C_6H_{11}O_7$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Weak ammonia

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Respirator for nuisance dust

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Contact with eyes causes mild irritation

5 3 **Treatment for Exposure:** INHALATION remove to fresh air. EYES or SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 213

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** >1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 3 and 4)

NOTES

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Pfizer Incorporated
Chemicals Div
235 E 42nd St
New York, N Y 10017

2 Pfaltz and Bauer Inc
126-04 Northern Blvd
Flushing, N Y 11368

3 Schwartz Mann
Orangeburg, N Y 10962

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

AMH	# AMMONIUM HYDROXIDE (< 28% AQUEOUS AMMONIA)

Common Synonyms: Ammonia water, Aqueous ammonia	Water liquid; colorless; Ammonia odor. Floats and mixes with water. Irritating vapor is produced.
Fire	Not flammable
Exposure	VAPOR: Irritating to skin, eyes, nose and throat. If inhaled will cause nausea, vomiting, difficult breathing or loss of consciousness. LIQUID: Will burn skin and eyes. Harmful if swallowed.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 Synonyms
3.2 Coast Guard Compatibility Classification
3.3 Chemical Formula NH_4OH
3.4 IMCO United Nations Numerical Designation

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped)
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: INHALATION; INGESTION; EYES OR SKIN
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion: Grade 3, oral rat, LD_{50} = 350 mg/kg
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents
6.4 Fire Extinguishing Agents Not to be Used
6.5 Special Hazards of Combustion Products
6.6 Behavior in Fire
6.7 Ignition Temperature
6.8 Electrical Hazard
6.9 Burning Rate

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water
7.2 Reactivity with Common Materials
7.3 Stability During Transport
7.4 Neutralizing Agents for Acids and Caustics
7.5 Polymerization:
7.6 Inhibitor of Polymerization

8 WATER POLLUTION

8.1 Aquatic Toxicity
8.2 Waterfowl Toxicity
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations (Hazardous Materials)
12.2 NAS Hazard Rating for Bulk Water Transportation:
12.3 NFPA Hazard Classifications

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm.
13.4 Freezing Point:
13.5 Critical Temperature
13.6 Critical Pressure
13.7 Specific Gravity:
13.8 Liquid Surface Tension
13.9 Liquid-Water Interfacial Tension
13.10 Vapor (Gas) Specific Gravity
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization
13.13 Heat of Combustion
13.14 Heat of Decomposition
13.15 Heat of Solution
13.16 Heat of Polymerization

NOTES

REVISED 1978

AID	AMMONIUM IODIDE

Common Synonyms	Solid White Odorless Sinks and mixes with water
Fire	Not Flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Isolate material, water, shoreline, shoreline and flow

2. LABELS

Not hazardous by Federal regulation

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: None

3.2 Coast Guard Compatibility Classification: Not listed

3.3 Chemical Formula: NH_4I

3.4 IMCO/United Nations Numerical Designation: None

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid

4.2 Color: White

4.3 Odor: None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Use manufacturer's recommendations

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of the nose and throat, irritation of the eyes causes tearing

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. INGESTION: if large amount has been ingested, get medical attention. EYES: wash with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not known

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic and irritating fumes (hydrogen iodide, iodine and iodides, nitrogen oxides) may be produced

6.6 **Behavior in Fire:** Compound may sublime in fire and undergo decomposition

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

American Hydro Corp
Chemicals and Plastics Division
Somerset, N.J. 08875

2. Mallinckrodt Chemical Works
222 Wyckoff Avenue
P.O. Box 164
Jersey City, N.J. 07304

3. J.T. Baker Chemical Co.
Phillipsburg, N.J. 08865

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** NF, Reagent ACS

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

NN

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** None

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** None

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 144.94

13.3 **Boiling Point at 1 atm:** Not pertinent
Melt: 401°

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.54 at 20°C/4°C

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Endothermic
Initial: 4.8 kcal/mole, 10 moles

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

ALT	AMMONIUM LACTATE

Common Synonyms			
DL-Lactic acid, ammonium salt Ammonium lactate syrup	Solid or liquid Sinks and mixes with water	White	Odorless

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE.
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing. LIQUID OR SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods for Spills CG-446-4)

Disperse and flush

2. LABELS

No hazard labels required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Ammonium lactate syrup
dl-Lactic acid; ammonium salt

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:**
$CH_3CH(OH)COONH_4$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat; contact with eyes causes irritation

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (Combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water spray

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may be formed in a fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Tanatex Chemical Corp
P.O. Box 188
Lyndhurst, N.J. 07071
2. Pfaltz and Bauer, Inc
126-04 Northern Boulevard
Flushing, N.Y. 11368
3. Gallard-Schlesinger Chemical Mfg. Co
584 Mineola Avenue
Carle Place, N.Y. 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure
60% syrup in water

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-2)

NS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 107.11

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.2 at 15°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

NOTES

ALS	AMMONIUM LAURYL SULFATE

Common Synonyms	
Dodecyl sulfate, ammonium salt Lauryl ammonium sulfate	Liquid Light yellow May float or sink and mix with water

[illegible]

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes. Harmful if swallowed [illegible] IF IN EYES [illegible] IF SWALLOWED [illegible] CONSCIOUS [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Dodecyl sulfate, ammonium salt, Lauryl ammonium sulfate

3 2 **Coast Guard Compatibility Classification**
Not listed

3 3 **Chemical Formula:**
$C_{12}H_{25}OSO\text{-}ONH_4 \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Light yellow

4 3 **Odor** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves goggles or face shield

5 2 **Symptoms Following Exposure** Contact with liquid irritates eyes and may have drying effect on the skin Prolonged contact will cause skin irritation

5 3 **Treatment for Exposure** EYES OR SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short [illegible] Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not pertinent (non combustible water solution)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen and sulfur may form in fires

6 6 **Behavior in Fire**

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Richardson Company
Organic Chemicals Div
100 New Street
Paterson N J 07501

2 Stepan Chemical Co
Edens and Winnetka
Northfield Ill 60093

10. SHIPPING INFORMATION

10 1 **Grades or Purity** 28 30% solution in water

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

A P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 283 (solute only)

13 3 **Boiling Point at 1 atm** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 03 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

AMB	# AMMONIUM MOLYBDATE

Common Synonyms: Molybdic acid (85%)	Solid Colorless to greenish-yellow or white Odorless Sinks and mixes with water

[illegible]

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible]
Exposure	ALL FOR MEDICAL [illegible] DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** Molybdic acid 85%

3.2 **Coast Guard Compatibility Classification** Not listed

3.3 **Chemical Formula:** $(NH_4)_6Mo_7O_{24}4H_2O$ (for CP and Reagent grades only)

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid

4.2 **Color:** White or greenish-yellow colorless to yellow

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Dust mask goggles face shield rubber gloves

5.2 **Symptoms Following Exposure.** Inhalation causes irritation of nose and throat Contact with eyes causes irritation

5.3 **Treatment for Exposure:** INHALATION move to fresh air EYES flush with water for at least 15 min

5.4 **Toxicity by Inhalation (Threshold Limit Value,** 5 mg/m³ (as molybdenum)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion** Grade 3 oral rat LD_{50} = 333 mg/kg

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air** Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen may form in fire

6.6 **Behavior in Fire**

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction

7.2 **Reactivity with Common Materials**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. J. T. Baker Chemical Co
   Phillipsburg, N. J. 08865
2. Climax Molybdenum Company
   One Greenwich Plaza
   Greenwich, Conn. 06830
3. Varlacoid Chemical Co
   666 South Front St
   Elizabeth, N. J. 07202

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent CP
A closely related substitute is [illegible] molybdic acid 85%

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid

13.2 **Molecular Weight** 1235.86

13.3 **Boiling Point at 1 atm** Not pertinent

13.4 **Freezing Point** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity.** 3.14 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity.** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Data not available

13.16 **Heat of Polymerization** Not pertinent

Continued on page 4 and 5

NOTES

AMN — AMMONIUM NITRATE

Common Synonyms
Nitrate

Solid pellets or flakes — White to light gray or brown — Odorless

Sinks and mixes with water

Call Fire Department. Keep people away.
Use water to cool containers.
Large deluge.
Isolate area for [illegible]
Note [illegible]

Fire

May cause fire and explode on contact with combustibles
CONTAINERS MAY EXPLODE IN FIRE
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Water self-contained breathing apparatus
Use water to cool containers. Water [illegible]
Combustible [illegible]
[illegible]
Extinguishing agents: Water
Do not spread contaminated water [illegible]
[illegible]

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to eyes, nose, and throat
If inhaled: may cause coughing or difficult breathing
Move victim to fresh air. [illegible] 2 minutes [illegible]
Keep victim quiet and maintain normal temperature.
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify [illegible] if spill [illegible]
Note [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Dispose of [illegible]

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** None
3.2 **Coast Guard Compatibility Classification** Ammonia
3.3 **Chemical Formula** NH_4NO_3
3.4 **IMCO United Nations Numerical Designation** 1942

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color** Colorless crystals or white granules
4.3 **Odor** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Wear self-contained breathing apparatus
5.2 **Symptoms Following Exposure.** Irritation of eyes and mucous membranes
Absorption via ingestion or inhalation causes urination and acid urine. Large amount causes systemic acidosis and methemoglobinemia (abnormal hemoglobin)
5.3 **Treatment for Exposure** Remove from exposure — symptoms reversible
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not [illegible]
5.5 **Short-Term Inhalation Limits** Not [illegible]
5.6 **Toxicity by Ingestion** Data [illegible]
5.7 **Late Toxicity** Data [illegible]
5.8 **Vapor (Gas) Irritant Characteristics** None [illegible]
5.9 **Liquid or Solid Irritant Characteristics.** None
5.10 **Odor Threshold** None [illegible]

6 FIRE HAZARDS

6.1 **Flash Point** Not [illegible]
6.2 **Flammable Limits in Air** Not [illegible]
6.3 **Fire Extinguishing Agents** Use flooding amounts of water in early stages of fire. When large quantities are involved in mass fires control efforts should be confined to protection of exposures.
6.4 **Fire Extinguishing Agents Not to Be Used** Not [illegible]
6.5 **Special Hazards of Combustion Products** Decomposition [illegible]
6.6 **Behavior in Fire** May explode in fire. Support [illegible] combustion [illegible]
6.7 **Ignition Temperature** Not [illegible]
6.8 **Electrical Hazard** None [illegible]
6.9 **Burning Rate.** Not [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** None [illegible]
7.2 **Reactivity with Common Materials** None [illegible]
7.3 **Stability During Transport.** If heated strongly decomposes giving [illegible] gas and gases which support combustion. Undergoes detonation if heated under confinement
7.4 **Neutralizing Agents for Acids and Caustics** None [illegible]
7.5 **Polymerization** Not [illegible]
7.6 **Inhibitor of Polymerization** Not [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data [illegible]
8.2 **Waterfowl Toxicity:** Data [illegible]
8.3 **Biological Oxygen Demand (BOD)** Data [illegible]
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Allied Chemical Corp
Agricultural Div
Morristown, N.J. 07960

Hercules Inc
Explosives & Chemical Propulsion Dept
Bessemer, Ala. 35020

Mississippi Chemical Corp
Mississippi Commercial Products Co
Agricultural Div
and Nor-Am Industrial Prod
Yazoo City, Miss. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity.** Prilled fertilizer grade 33.5% nitrogen
10.2 **Storage Temperature** Data [illegible]
10.3 **Inert Atmosphere** Data [illegible]
10.4 **Venting** Data [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications**

Category	Classification*
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]
Special (White)	OXY

*Explanation [illegible] on back of sheet

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid
13.2 **Molecular Weight** 80.05
13.3 **Boiling Point at 1 atm** Not [illegible]
13.4 **Freezing Point** Not [illegible] = 443.1 K
13.5 **Critical Temperature** Not [illegible]
13.6 **Critical Pressure** Not [illegible]
13.7 **Specific Gravity** [illegible]
13.8 **Liquid Surface Tension** Not [illegible]
13.9 **Liquid-Water Interfacial Tension** Not [illegible]
13.10 **Vapor (Gas) Specific Gravity** Not [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not [illegible]
13.12 **Latent Heat of Vaporization** Not [illegible]
13.13 **Heat of Combustion** [illegible]
13.14 **Heat of Decomposition** Not [illegible]
13.15 **Heat of Solution** Not [illegible]
13.16 **Heat of Polymerization** Not [illegible]

Continued [illegible]

NOTES

REVISED 1978

ANP	AMMONIUM NITRATE-PHOSPHATE MIXTURE

Common Synonyms

Solid Grayish white Odorless

Sinks and mixes with water

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED IN FIRE
Irritating gases may be produced when heated
Containers may explode in fire

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes.
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning oxidizing material
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** NH_4NO_3 $(NH_4)_2HPO_4$ $NH_4H_2PO_4$ $CaHPO_4$ KCl K_2SO_4
3 4 **IMCO/United Nations Numerical Designation:** 9/

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Grayish white
4 3 **Odor:** Characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus must be used when fighting fires At other times a dust mask is adequate
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat Contact with eyes causes irritation
5 3 **Treatment for Exposure.** INHALATION move to fresh air EYES flush with water for 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water
6 4 **Fire Extinguishing Agents Not to be Used** Steam inert gases foam dry chemical
6 5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of nitrogen may form in fires
6 6 **Behavior in Fire:** Will increase intensity of fire when in contact with combustible material Containers may explode
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Corrodes metals to same degree as ordinary fertilizer the reaction is not hazardous
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

Chevron Chemical Co
940 Hensley Street
Richmond Calif 94804

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Several grades of varying composition all of which contain less than 70% of ammonium nitrate the only hazardous ingredient
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Ventilated (natural)
10 4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizing material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** Not pertinent (mixture)
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 1 8 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Data not available
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

ANS	AMMONIUM NITRATE-SULFATE MIXTURE

Common Synonyms	Solid	Grayish white	Odorless
	Sinks and mixes with water		

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Irritating gases may be produced when heated
Containers may explode in fire

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning oxidizing material
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $NH_4NO_3 \cdot (NH_4)_2SO_4$
3 4 **IMCO/United Nations Numerical Designation:** 9/

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Grayish white
4 3 **Odor:** Characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus must be used when fighting fires At other times a dust mask is adequate
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat Contact with eyes causes irritation
5 3 **Treatment for Exposure:** INHALATION move to fresh air EYES flush with water for 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3, oral rat LD_{50} = 58 mg/kg (ammonium sulfate)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6 1 **Flash Point:** Not pertinent
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water
6 4 **Fire Extinguishing Agents Not to be Used:** Steam inert gases foam dry chemical
6 5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of nitrogen may form in fires
6 6 **Behavior in Fire:** Will increase intensity of fire when in contact with combustible material Containers may explode
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Corrodes metals to same degree as ordinary fertilizer the reaction is not hazardous
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Chevron Chemical Co
940 Hensley Street
Richmond Calif 94804

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Several grades of varying composition all of which contain less than 70% of ammonium nitrate the only hazardous ingredient
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Ventilated (natural)
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM C
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight.** Not pertinent
13 3 **Boiling Point at 1 atm.** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 8 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Data not available
13 15 **Heat of Solution.** Data not available
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 4 and 5

NOTES

ANU	AMMONIUM NITRATE-UREA SOLUTION

Common Synonyms	Liquid Colorless Slight ammonia odor Sinks and mixes with water
	[illegible]
Fire	Not flammable
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Dispersant [illegible]

2. LABELS

[illegible]

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** [illegible] Nitrogen solution (non pressure)

3.2 **Coast Guard Compatibility Classification** [illegible]

3.3 **Chemical Formula:** NH_4NO_3 NH_2CONH_2 H_2O

3.4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color** Colorless

4.3 **Odor** Weak ammonia

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Goggles [illegible] rubber gloves

5.2 **Symptoms Following Exposure** Liquid [illegible] irritates [illegible] high free ammonia

5.3 **Treatment for Exposure** EYES wash with plenty [illegible] SKIN [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data [illegible]

5.5 **Short-Term Inhalation Limits** Data [illegible]

5.6 **Toxicity by Ingestion** Grade 2 [illegible]

5.7 **Late Toxicity** None

5.8 **Vapor (Gas) Irritant Characteristics** [illegible]

5.9 **Liquid or Solid Irritant Characteristics** [illegible]

5.10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air** Not [illegible]

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** [illegible]

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data [illegible]

8.2 **Waterfowl Toxicity** Data [illegible]

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Solu [illegible] Nitrogen Chemicals
[illegible]
[illegible] W. R. Grace & Co.
Agricultural Chemicals Group
P. O. Box [illegible]
Memphis, Tenn. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data are for non pressure solutions containing 40% ammonium nitrate, 35% urea and 25% water. Other grades contain 0.70% free ammonia and 0.4% urea or 0.8% free ammonia and water. Those containing more than 2% free ammonia are stored under pressure or refrigerated at 104°F for hazards of these see Ammonium Hydroxide.

10.2 **Storage Temperature.** Ambient

Continued on page 4

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

VP

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	[illegible]
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	[illegible]
Poisons	[illegible]
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Synergistic Effect	[illegible]
Reactivity	
Other Chemicals	2
Water	1
Self Reaction	[illegible]

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

Physical State at 15°C and 1 atm Liquid

13.2 **Molecular Weight** Not pertinent

13.3 **Boiling Point at 1 atm** [illegible]

13.4 **Freezing Point.** [illegible]

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity.** [illegible] Liquid

13.8 **Liquid-Water Interfacial Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** 0 Btu/lb = 0 cal/g = 0 J/kg

13.16 **Heat of Polymerization** Not pertinent

Continued on page 5

10 SHIPPING INFORMATION (Cont'd)

10.3 **Inert Atmosphere** Not required

10.4 **Venting.** Open if > 2% free ammonia, then pressure vacuum

AOL	AMMONIUM OLEATE

Common Synonyms Oleic acid, ammonium salt Ammonia soap	Solid paste Yellow brown Weak ammonia odor Sinks and mixes with water

Stop discharge if possible. Keep people away.
Avoid contact with solid.
Isolate and remove discharged material.
Notify [illegible] collection [illegible] agencies.

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical [illegible] water.
Exposure	CALL FOR MEDICAL AID SOLID Irritating to skin and eyes. Harmful if swallowed Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water [illegible] IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of health water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Ammonia soap, Oleic acid, ammonium salt

3.2 **Coast Guard Compatibility Classification** Not listed

3.3 **Chemical Formula:** $C_{17}H_{33}COONH_4 \cdot H_2O$

3.4 **IMCO/United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Pasty solid

4.2 **Color:** Yellow brown

4.3 **Odor:** Weak ammonia

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Contact with eyes causes irritation. Prolonged contact may cause skin irritation.

5.3 **Treatment for Exposure:** EYES OR SKIN, flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion.** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent

6.2 **Flammable Limits in Air.** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature.** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction

7.2 **Reactivity with Common Materials.**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Emkay Chemical Co.
319 Second Street
Elizabeth, N. J. 07206

2. Pfaltz and Bauer, Inc.
126-04 Northern Blvd.
Flushing, N. Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 70% in water, Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Ventilated (natural)

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation** Data not available

12.3 **NFPA Hazard Classifications:** Data not available

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid or liquid

13.2 **Molecular Weight:** 299.5 (solute)

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** >1 at 20°C (liquid or solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** Data not available

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

AOX	# AMMONIUM OXALATE

Common Synonyms			
Oxalic acid, diammonium salt Diammonium oxalate Ammonium oxalate hydrate	Solid	White	Odorless
	Sinks and mixes slowly with water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear fire respirator and [illegible] including goggles
[illegible]
Call fire department
[illegible]
[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and [illegible]
Extinguish with water [illegible]

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing.
[illegible]
SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn skin and eyes.
[illegible]
FLUSH OFF [illegible] AREAS WITH PLENTY OF WATER
IF INGESTED [illegible]
IF SWALLOWED [illegible] CONSCIOUS [illegible] WATER [illegible]
IF SWALLOWED and [illegible] NO CONSCIOUSNESS [illegible] HAVING CONVULSIONS [illegible]
[illegible] WATER

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ammonium oxalate hydrate, Diammonium oxalate, Oxalic acid diammonium salt
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $(NH_4)_2C_2O_4 \cdot H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved dust respirator, rubber or plastic coated gloves, chemical goggles
5 2 **Symptoms Following Exposure:** Ingestion or excessive inhalation of dust causes systemic poisoning, possible symptoms include pain in throat, esophagus and stomach, mucous membranes turn white, vomiting, severe purging, weak pulse, and vascular collapse, neuromuscular symptoms. Contact with eyes causes irritation. Contact with skin causes irritation or severe burns.
5 3 **Treatment for Exposure:** *Speed is essential.* INHALATION: remove to fresh air. INGESTION: call physician immediately, induce vomiting. EYES: flush with water and seek medical attention. SKIN: flush with water. OTHER: watch for swelling of the glottis and delayed constriction of the esophagus.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Kidney damage
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water, foam
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Pfizer Chemical Div
235 E 42nd Street
New York, N Y 10017

2 Hexco Inc
Delaware Water Gap, Pa 18327

3 American Hoechst Corp
Chemicals and Plastics Div
Rt 202-206 North
Somerville, N J 08876

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure 98 - 100.5%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS - II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 142 11
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes at 70°C)
13 4 **Freezing Point:** Not pertinent (decomposes at 70°C)
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 50 at 18 5°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** 101 Btu/lb = 56 cal/g = 2 3×10⁵ J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

APB — AMMONIUM PENTABORATE

Common Synonyms			
Ammonium pentaborate tetrahydrate Ammonium decaborate octahydrate	Solid	White	Odorless
	Sinks and mixes slowly with water		

[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.
[illegible]

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting.
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Ammonium decaborate octahydrate
Ammonium pentaborate tetrahydrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $NH_4B_5O_8 \cdot 4H_2O$ or $(NH_4)_2B_{10}O_{16} \cdot 8H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Disposable type respirator side shield safety spectacles full brimmed hard hat goggles ammonia gas mask

5 2 **Symptoms Following Exposure:** Inhalation of dust may result in non specific irritation of upper respiratory tract Ingestion of large quantities may produce symptoms of non specific irritation of the gastrointestinal tract nausea vomiting cramps diarrhea Contact with dust causes moderate eye irritation and minor skin irritation

5 3 **Treatment for Exposure:** INHALATION move from contaminated atmosphere, if respiratory discomfort persists see a physician INGESTION give large amounts of water or warm salty water to induce vomiting and continue until vomitus is clear obtain medical attention if abdominal discomfort persists EYES flush with large quantities of running water for a minimum of 15 min obtain medical help if irritation persists SKIN immediately flush affected areas with water obtain medical help if irritation persists

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m³ (as borate dust)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 U S Borax and Chemical Corp
3075 Wilshire Blvd
Los Angeles Calif 90010

2 American Hoechst Corp
Chemicals and Plastics Div
Rt 206-206 North
Somerville N J 08876

3 Stauffer Chemical Co
Industrial Chemical Div
Westport Conn 06[illegible]

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure 99% Radio 99 95% Technical 99 8%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not pertinent

12 3 **NFPA Hazard Classifications:** Not pertinent

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 58 at 15°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

AMP	AMMONIUM PERCHLORATE

Common Synonyms	Solid crystals — White — Odorless Sinks and mixes with water
	Wear goggles and self-contained breathing apparatus Isolate and remove discharged material Notify local health and pollution control agencies
Fire	May cause fire and explode on contact with combustibles **CONTAINERS MAY EXPLODE IN FIRE** **POISONOUS GASES MAY BE PRODUCED IN FIRE** Wear goggles and self-contained breathing apparatus Evacuate surrounding area Combat large fires from protected location with water, water fog, base blanket, or foam
Exposure	FIRST AID *SOLID* Irritating to eyes and skin Harmful if swallowed Flush affected areas with plenty of water IF IN EYES hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of affected water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — oxidizing material

Disperse and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** NH_4ClO_4

3.4 **IMCO United Nations Numerical Designation.** 9.1.1442

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Data not available

5.2 **Symptoms Following Exposure:** Irritating to skin and mucous membranes

5.3 **Treatment for Exposure:** Data not available

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion.** Grade 2, oral rat LD_{50} = 3500 mg/kg

5.7 **Late Toxicity:** Not pertinent

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Water from protected locations

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products.** Toxic gases are produced in fire

6.6 **Behavior in Fire:** May explode when heated in fire or exposed to shock or friction

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** If contaminated with organic materials it can become an explosive which is sensitive to shock and friction. Readily detonates or explodes

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Kerr-McGee Chemical Corp.
   Kerr-McGee Bldg.
   Oklahoma City, Okla. 73102
2. Pacific Engineering & Production Co. of Nevada
   Henderson, Nev. 89015
3. G. Frederick Smith Chemical Co.
   P.O. Box 23344
   Columbus, Ohio 43223

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	0	2
Flammability (Red)	0	1
Reactivity (Yellow)	4	4
	OX	OX

*First column refers to non-fire situation

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 117.49

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.95 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

APE	# AMMONIUM PERSULFATE

Common Synonyms		
Ammonium peroxydisulfate Peroxydisulfuric acid, diammonium salt	Solid Light straw to colorless Mild unpleasant odor Sinks and mixes with water	

[illegible]

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
Harmful if inhaled
[illegible]

SOLID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Isolate warning and evacuate
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ammonium peroxydisulfate
Peroxydisulfuric acid, diammonium salt

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $(NH_4)_2S_2O_8$

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Light straw to colorless

4.3 **Odor:** Slight acrid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** U.S. Bur. M. [illegible] approved toxic dust mask, chemical goggles, rubber gloves, neoprene-coated shoes

5.2 **Symptoms Following Exposure:** Inhalation produces slight toxic effects. Contact with dust irritates eyes and causes skin rash

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES: wash with water for 20 min, call a physician. SKIN: wash with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = [illegible] mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water

6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and sulfur, toxic fumes of ammonia

6.6 **Behavior in Fire:** Decomposes with [illegible] oxygen that increases intensity of fire

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Contact with grease, wood and other combustibles may result in a fire

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 120 ppm, 48 hr, daphnia, TL_{50}, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. FMC Corporation
8410 River Rd. and Sawyer Ave.
Tonawanda, N.Y. 14150

2. Allied Chemical Corp.
Specialty Chemicals Div.
P.O. Box 1087R
Morristown, N.J. 07960

3. J.T. Baker Chemical Co.
Phillipsburg, N.J. 08865

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, pure

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing solid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 228.20

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes at 120°C)

13.4 **Freezing Point:** Not pertinent (decomposes at 120°C)

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.98 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Data not available

13.15 **Heat of Solution:** [illegible] Btu/lb = [illegible] cal/g = [illegible] x 10^3 J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

APP

AMMONIUM PHOSPHATE

Common Synonyms			
Monoammonium orthophosphate Ammonium phosphate, dibasic Secondary ammonium phosphate Diammonium hydrogen phosphate Diammonium orthophosphate	Solid	White	Weak ammonia odor
	Sinks and mixes with water		

[illegible]

Fire

Not flammable
Irritating [illegible] may be produced when heated

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

[illegible]

SOLID
Irritating to skin and eyes
Harmful if swallowed

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ammonium phosphate, dibasic
Diammonium hydrogen phosphate
Diammonium orthophosphate
Monoammonium orthophosphate
Secondary ammonium phosphate

3.2 **Coast Guard Compatibility Classification:** Not Listed

3.3 **Chemical Formula:** $NH_4H_2PO_4$ and $(NH_4)_2HPO_4$

(Continued on page 4)

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Diammonium: faint ammonia
Monoammonium: faint acid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, protective gloves and goggles. When diammonium phosphate is stored in closed area, self contained breathing apparatus is required to protect against ammonia fumes

5.2 **Symptoms Following Exposure:** Inhalation of monoammonium form causes irritation of mucous membranes, while diammonium form ammonia vapors [illegible] pulmonary edema and asphyxia. Contact with solid or with ammonia gas causes irritation of eyes and skin

5.3 **Treatment for Exposure:** INHALATION: if exposed to ammonia fumes from diammonium phosphate, give artificial respiration and oxygen if needed, enforce rest. EYES: flush with water for at least 15 min. If irritation persists, get medical attention. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic and irritating fumes of ammonia and oxides of nitrogen may form in fires

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 155 ppm 96 hr fathead minnow [illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (dOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. J. T. Baker Chemical Co
Phillipsburg, N.J. 08865

2. Mobil Oil Corporation
150 E. 42nd Street
New York, N.Y. 10017

3. Occidental Chemical Co
P.O. Box 198
Lathrop, Calif. 95330

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Ventilated (covered)

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:**
Monoammonium: 115
Diammonium: 132

13.3 **Boiling Point at 1 atm:** Not pertinent (begins to decompose at 100°C)

13.4 **Freezing Point:** Not pertinent (begins to decompose at 100°C)

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:**
Diammonium: 1.8 at 20°C (solid)
Monoammonium: 1.6 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** 42 Btu/lb = 23 cal/g = 0.9 × 10⁵ J/kg

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 3 and 4)

3. CHEMICAL DESIGNATIONS (Cont'd)

3.4 **IMCO/United Nations Numerical Designation:** Not listed

ASL	AMMONIUM SILICOFLUORIDE

Common Synonyms			
Ammonium fluosilicate	Solid	White	Odorless
	Sinks and mixes slowly with water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
Irritating gases may be produced when heated

Exposure

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Inhaled will cause coughing or difficult breathing

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning - water contaminant
Protect access
Disperse and flush

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ammonium fluosilicate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $(NH_4)_2SiF_6$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator and resistant clothing and hat, rubber gloves, goggles and safety shoes
5.2 **Symptoms Following Exposure:** Inhalation - dust causes pain in nose, irritation and [illegible] fatal in some cases. Ingestion may be fatal. Contact - causes irritation of eyes and irritation or alteration of skin
5.3 **Treatment for Exposure:** INHALATION - remove patient to fresh air. INGESTION - induce vomiting by giving warm water or mustard water. Have patient drink large quantities of lime water. If necessary, give stimulant such as strong coffee. Keep patient warm. EYES - flush with water [illegible] min. holding eyelids open. SKIN - wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** [illegible] mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen fluoride, silicon tetrafluoride and oxides of nitrogen may form in fires
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Agrico Chemical Co.
P. O. Box [illegible]
Pierce (Polk County) Fla. 33[illegible]
2. Essex Chemical Co.
Chemicals Division
140 Broad Street
Clifton, N. J. 07015
3. W. R. Grace & Co.
Agricultural Chemicals Group
Baltimore, Md. 21203

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure, 98+%
Commercial 90+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.0 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** [illegible] Btu/lb
[illegible] cal/g = 2.0 x 10⁶ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

AMR	AMMONIUM STEARATE

Common Synonyms Ammonium stearate dispersion Stearic acid, ammonium salt	Solid paste or liquid White to yellow Weak ammonia odor May float or sink in water

Stop discharge if possible. Keep people away.
Call fire department.
Avoid contact with liquid and solid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire	Combustible solid Solution not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles and self contained breathing apparatus Extinguish with water, dry chemicals, foam, or carbon dioxide
Exposure	CALL FOR MEDICAL AID LIQUID OR SOLID Irritating to skin and eyes If swallowed will cause nausea Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

[illegible]

2. LABELS

[illegible]

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ammonium stearate dispersion; Stearic acid, ammonium salt
3.2 **Coast Guard Compatibility Classification:** [illegible]
3.3 **Chemical Formula:** $C_{17}H_{35}COONH_4 \cdot H_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Paste, solid or liquid
4.2 **Color:** White to yellow
4.3 **Odor:** Slight ammoniacal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]
5.2 **Symptoms Following Exposure:** [illegible]
5.3 **Treatment for Exposure:** INHALATION [illegible] INGESTION [illegible] EYES [illegible] SKIN [illegible]
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]
5.5 **Short-Term Inhalation Limits:** [illegible]
5.6 **Toxicity by Ingestion:** [illegible]
5.7 **Late Toxicity:** [illegible]
5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]
5.9 **Liquid or Solid Irritant Characteristics:** [illegible]
5.10 **Odor Threshold:** [illegible]

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water, foam, dry chemicals, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:**
6.5 **Special Hazards of Combustion Products:** Toxic ammonia and oxides of nitrogen may form in fires
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Diamond Shamrock Chemical Co.
[illegible] Superior Avenue
Cleveland, Ohio 44114
2. [illegible] Chemicals
[illegible] Second Street
Elizabeth, N.J. 07206

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible] dispersion in water, technical paste
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P NS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid or liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

ASM

AMMONIUM SULFAMATE

Common Synonyms

Ammate
Sulfamic acid, monoammonium salt
Ammonium amidosulfonate
Ammonium amidosulphate
AMS

Solid — White or brownish gray — Odorless

Sinks and mixes with water

Stop discharge if possible. Keep people away
Avoid contact with solid and dust
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and self contained breathing apparatus

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

If in eyes hold eyelids open and flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes

Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ammate Ammonium amidosulfonate Ammonium amidosulphate AMS Sulfamic acid monoammonium salt

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $NH_2SO_3NH_4$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White or brownish gray

4 3 **Odor** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat Ingestion causes gastrointestinal disturbances Dust irritates eyes

5 3 **Treatment for Exposure:** INHALATION remove to fresh air INGESTION give large amount of water get medical attention EYES flush with water for 15 min SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Grade 2 oral rat LD_{50} = 1,600 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires

6 6 **Behavior in Fire**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 299 ppm/24 hr catfish 50% kill fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Hexco Inc
Delaware Water Gap Pa 18327

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

3 Pfaltz and Bauer Inc
126 04 Northern Blvd
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent 99 0+ Commercial 80%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 114 13

13 3 **Boiling Point at 1 atm:** Decomposes above 200°C

13 4 **Freezing Point:** 268°F = 131°C = 404°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** > 1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

AMS	AMMONIUM SULFATE

Common Synonyms	Solid White Odorless Sinks and mixes with water
Isolate and remove discharged material Notify local health and pollution control agencies	
Fire	Not flammable
Exposure	Not harmful.
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes. Notify local health and wildlife officials Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $(NH_4)_2SO_4$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Data not available

5 2 **Symptoms Following Exposure:** Data not available

5 3 **Treatment for Exposure:** Data not available

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 3; LD_{50} = 58 mg/kg (rat)

5 7 **Late Toxicity:** Not pertinent

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Not pertinent

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
1290 ppm/96 hr/mosquitofish/fresh-water/TL_m
292 ppm/96 hr/Daphnia magna/fresh-water/TL_m

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Agricultural Div
Morristown, N J 07960

2 Occidental Petroleum Corp
Occidental Chemical Co
Western Division
Lathrop, Calif 95330

3 Valley Nitrogen Producers Inc
Fresno, Calif 93717

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 132 14

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 78 at 15°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

ASF

AMMONIUM SULFIDE

Common Synonyms
Ammonium sulfide solution
Ammonium hydrogen sulfide solution
Ammonium sulfhydrate solution

Liquid — Colorless to yellow — Strong odor of rotten eggs and ammonia

Mixes with water. Irritating vapor is produced. Boiling point is 104°F

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CAUTIONARY LEVEL

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause dizziness, headache, coughing, or difficult breathing.

LIQUID
Will burn skin and eyes.
If swallowed will cause nausea

IF IN EYES
IF SWALLOWED
IF SWALLOWED
DO NOT INDUCE VOMITING

Water Pollution

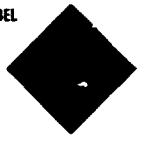
Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: air contaminant, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ammonium hydrogen sulfide solution, Ammonium sulfhydrate solution, Ammonium sulfide solution

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $(NH_4)_2S$, NH_4SH, H_2O

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Yellow to orange (fuming solutions), colorless to yellow

4 3 **Odor:** Strong odor of sulfide and ammonia

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus, rubber or plastic gloves, splash goggles, rubber shoes

5 2 **Symptoms Following Exposure:** Inhalation of 500 ppm for 30 min produces headaches, dizziness, bronchial pneumonia. 600 ppm for 30 min can cause death. Ingestion causes severe irritation of mucous membranes and stomach. Contact with liquid causes severe burns of eyes and severe skin irritation. May be absorbed through skin and cause hydrogen sulfide poisoning.

5 3 **Treatment for Exposure:** *Get medical attention following all overexposures to this compound.* INHALATION: move victim to fresh air, give artificial respiration, oxygen, consult physician. INGESTION: give large amount of water. EYES OR SKIN: wash with large quantities of water for 15 min, consult physician.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 72°F C C

6 2 **Flammable Limits in Air:** 4% - 46% (hydrogen sulfide)

6 3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Toxic hydrogen sulfide gas is released when solution is heated. If ignited this will form irritating sulfur dioxide gas

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Severely corrodes copper, zinc and their alloys

7 3 **Stability During Transport:** Stable, but toxic hydrogen sulfide and ammonia gases may collect in enclosed spaces

7 4 **Neutralizing Agents for Acids and Caustics:** Dilute with water. Do not attempt to neutralize with acid

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 100 ppm/72 hr/goldfish/killed/fresh water; 248 ppm/48 hr/mosquitofish/TL_m/fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Argus Chemical Corp
Halby Division
600 Terminal Avenue
New Castle, Del 19720

2 J T Baker Chemical Co
Phillipsburg, N J 08865

3 Chemical Products Corporation
Cartersville, Ga 30120

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, 45 - 50% in water, Reagent, 52 - 60% in water

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** Ventilated (natural)

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid or liquid

13 2 **Molecular Weight:** 68 14 (solute)

13 3 **Boiling Point at 1 atm:** 104°F = 40°C = 313°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 99 - 1 01 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** 95 0 Btu/lb = 52 8 cal/g = 2 21 × 10^5 J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

AMF	# AMMONIUM SULFITE

Common Synonyms	Solid	White	Odorless
	Sinks and mixes slowly with water		

Stop discharge if possible. Keep people away.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles and self-contained breathing apparatus.
Exposure	CALL FOR MEDICAL AID **DUST** **Irritating to eyes, nose and throat** **If inhaled will cause coughing or difficult breathing.** If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. **SOLID** **Irritating to skin and eyes.** **If swallowed will cause nausea.** Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is NONCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification.** Not listed
3.3 **Chemical Formula:** $(NH_4)_2SO_3$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes.
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water, get medical attention. EYES: flush with water for 15 min. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics** Data not available
5.10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents.** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic sulfur dioxide and oxides of nitrogen may form in fires
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water. Do not attempt to neutralize with acids
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 240 ppm/48 hr/mosquitofish/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 J. T. Baker Chemical Co.
Phillipsburg, N. J. 08865

2 Pfaltz and Bauer, Inc.
126-04 Northern Blvd.
Flushing, N. Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous, Purified monohydrate
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Data not available
12.3 **NFPA Hazard Classifications.** Data not available

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid
13.2 **Molecular Weight:** 134.2
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity** >1.1 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution.** 20.5 Btu/lb = 11.4 cal/g = 0.477×10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 1 and 6)

NOTES

ATR	AMMONIUM TARTRATE

Common Synonyms	
1 Tartaric acid, ammonium salt	Solid White Odorless Sinks and mixes with water

Stop discharge if possible. Keep people away.
Call fire department.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water.
Exposure	CALL FOR MEDICAL AID **DUST** **Irritating to eyes, nose and throat** **Harmful if inhaled** If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. **SOLID** **Irritating to skin and eyes.** **Harmful if swallowed** Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 Tartaric acid, ammonium salt

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** $C_4H_{12}N_2O_6$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Contact with solid may irritate eyes

5 3 **Treatment for Exposure:** EYES, flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen or ammonia gas may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Ganes Chemical Works, Inc.
611 Broad Street
Carlstadt, N. J. 07072

2 American Hoechst Corp.
Chemicals and Plastics Division
Rt. 202-206 North
Somerville, N. J. 08876

3 Gallard Schlesinger Chemical Mfg. Co.
584 Mineola Ave.
Carle Place, N. Y. 11514

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Analytical, Pure

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Data not available

12 3 **NFPA Hazard Classifications:** Data not available

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 184

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** [illegible] (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

AMT — AMMONIUM THIOCYANATE

Common Synonyms
Ammonium sulfocyanate
Ammonium rhodanate
Ammonium rhodanide
Ammonium sulfocyanide
Thiocyanic acid, ammonium salt

Solid or solution (in water) — White — Odorless

Sinks and mixes with water

Stop discharge if possible. Keep people away. Call fire department.
Avoid contact with spilled material.
Avoid contact with fire fighting water.
Isolate area until gas has dispersed.
Notify appropriate agencies.

Fire

Combustible Solid. Solution not flammable.
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and self-contained breathing apparatus.
Extinguish with water.

Exposure

CALL FOR MEDICAL AID

VAPOR OR DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.
Remove to fresh air. If not breathing, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID OR SOLID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids apart and flush with plenty of water.
IF SWALLOWED induce VOMITING immediately if conscious.
IF SWALLOWED by unconscious OR HAVING CONVULSIONS do nothing except keep warm.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify appropriate agencies immediately.
Notify downstream water users.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ammonium rhodanate, Ammonium rhodanide, Ammonium sulfocyanate, Ammonium sulfocyanide, Thiocyanic acid, ammonium salt

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula.** NH_4SCN

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid, or solution in water

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber or plastic gloves, rubber or plastic apron, standard goggles

5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes dizziness, cramps, nervous disturbances. Dust irritates eyes. Can be absorbed through skin, prolonged contact may produce various skin eruptions, dizziness, cramps, nausea, and mild to severe disturbance of the nervous system.

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water, get medical attention. EYES OR SKIN: wash with water, consult physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 854 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Solid may be combustible, solution is not flammable

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agent:** Water

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:** Decomposes to form ammonia, hydrogen sulfide, and hydrogen cyanide. Oxides of nitrogen may also form. All of these products are toxic.

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent.

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
280–300 ppm/1 hr orange-spotted sunfish/killed fresh water
420 ppm/48 hr mosquitofish/TLm/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
< 0.010 lb/lb/5 days

8.4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1. Argus Chemical Corp
   Halby Division
   600 Terminal Ave
   New Castle, Del 19720
2. Mallinckrodt Chemical Works
   223 Westside Avenue
   P O Box 394
   Jersey City, N J 07303
3. J T Baker Chemical Co
   Phillipsburg, N J 08865

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, Technical, 50–65% solution in water

10.2 **Storage Temperature:** ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 445-3)

A P N S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid or liquid

13.2 **Molecular Weight:** 76.12

13.3 **Boiling Point at 1 atm:** (solution, solid decomposes) 230°F = 110°C = 383°K

13.4 **Freezing Point:** (solid) 320°F = 160°C = 433°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:**
> 1.1 at 20°C (solid)
1.1–1.15 at 20°C (solution)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:**
133 Btu/lb = 75 cal/g = 3.1 × 10⁵ J/kg

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

ATF

AMMONIUM THIOSULFATE

Common Synonyms			
Ammonium hyposulfite	Solid or solution (in water)	Colorless liquid or white solid	Ammonia odor
	Sinks and mixes with water		

Stop discharge if possible. Keep people away.
Avoid contact with liquid and solid.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing
If in eyes hold eyelids open and flush with plenty of water.
If breathing has stopped give artificial respiration.
If breathing is difficult give oxygen.

SOLUTION OR SOLID
Irritating to skin and eyes
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IN EYES hold eyelids open and flush with plenty of water.
SWALLOWED drink two glasses of water or milk.
IF SWALLOWED DO NOT INDUCE VOMITING OR HAVE CONVULSIONS
Loosen clothing except if keep tight for fire.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ammonium hypo, Ammonium hyposulfite
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $(NH_4)_2S_2O_3$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid, or solution in water
4.2 **Color:** Clear, colorless
4.3 **Odor:** Ammonia

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator, rubber gloves, safety glasses, face shield, rubber apron, shield or suit as necessary to prevent skin contact
5.2 **Symptoms Following Exposure:** Inhalation of dust may irritate respiratory system. Ingestion could be harmful. Contact with eyes or skin may cause irritation.
5.3 **Treatment for Exposure:** INHALATION move to fresh air. INGESTION get medical attention at once. EYES flush with plenty of water for at least 15 min. and get immediate medical attention. SKIN wash with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic ammonia, hydrogen sulfide and oxides of nitrogen and sulfur may form in fires
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable but toxic ammonia gas may collect in enclosed spaces
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0.62 lb/lb 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp
   Industrial Chemicals Div
   P O Box 1139R
   Morristown, N J 07960
2. Natco Corporation
   12520 Cerise Avenue
   Hawthorne, Calif 90250
3. Gallard-Schlesinger Chemical Mfg Co
   584 Mineola Avenue
   Carle Place, N Y 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, Analytical, Technical, 60% solution in water
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Ventilated (natural)
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P-SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid or liquid
13.2 **Molecular Weight:** 148.2
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

AML	# AMYL ACETATE

Common Synonyms
Acetic acid
n-amyl ester

Watery liquid — Colorless to yellow — Banana odor

Floats on water. Flammable. Irritating vapor is produced.

Shut off ignition sources and call fire department.
Stop discharge if possible. Keep people away.
Avoid contact with liquid and vapor.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, headache or dizziness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.

Water Pollution

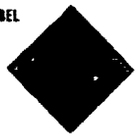
Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Mechanical containment.
Chemical and physical treatment.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Amyl acetate, mixed isomers; Pentyl acetates
3.2 **Coast Guard Compatibility Classification:** Ester
3.3 **Chemical Formula:** $CH_3COOC_5H_{11}$
3.4 **IMCO United Nations Numerical Designation.** 1104

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to yellow
4.3 **Odor:** Pleasant banana-like, mild characteristic banana or pear fruit odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask or chemical cartridge respirator, protective gloves, goggles, safety shower and eye bath.
5.2 **Symptoms Following Exposure:** Irritation of eyes, nose and throat. Dizziness, nausea, headache.
5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air, call physician, administer oxygen. SKIN OR EYES: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm
5.5 **Short-Term Inhalation Limits:** 200 ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 1; LD_{50} = 6.5 g/kg (rat)
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentration. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.08 ppm

6 FIRE HAZARDS

6.1 **Flash Point.** [illegible]
6.2 **Flammable Limits in Air:** 1.1% – 7.5% (n)
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water in straight hose stream; water and sprinkled water should not be used.
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 775°F (n)
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 4.1 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
120 ppm 48 hr daphnia, 11 pH, tap water
180 ppm 96 hr scenedesmus, 11 pH, fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0.5 – 0.8 lb/lb/5 days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Commercial Solvents Corp.
245 Park Avenue
New York, N.Y. 10017
2. Publicker Industries, Inc.
1429 Walnut St.
Philadelphia, Pa. 19102
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 85 – 90% technical, commercial
10.2 **Storage Temperature:** Ambient (n)
10.3 **Inert Atmosphere:** Not required (n)
10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

X T U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 130.19
13.3 **Boiling Point at 1 atm.** 295°F = 146°C = 419 K
13.4 **Freezing Point:** < –145°F = < –98°C = < 175 K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.876 at 20°C (liquid)
13.8 **Liquid Surface Tension** 12 dynes/cm = 0.012 N/m at 30°C
13.9 **Liquid-Water Interfacial Tension.** 16 – 30 dynes/cm = 0.016 – 0.030 N/m at 18°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** 140 Btu/lb = 75 cal/g = 3.1 × 10⁵ J/kg
13.13 **Heat of Combustion.** –13,160 Btu/lb = –7421 cal/g = –3.10 × 10⁷ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued – pages 5 and 6

NOTES

REVISED 1978

AAN	n-AMYL ALCOHOL

Common Synonyms
Pentyl alcohol
1-Pentanol
n-Butylcarbinol

Liquid — Colorless — Mild sweet odor

Floats on water. Flammable. Irritating vapor is produced.

[illegible]

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause coughing, nausea, headache, or difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to eyes.
Harmful if swallowed.
Not irritating to skin.
Flush affected areas with plenty of water.
IF IN EYES: Hold eyelids open and flush with plenty of water.
IF SWALLOWED: Induce vomiting. CONSCIOUS: have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Floating to shoreline.
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
1-Amylalcohol
n-Butylcarbinol
1-Pentanol
Pentyl alcohol

3.2 **Coast Guard Compatibility Classification:**
Alcohol

3.3 **Chemical Formula:** $CH_3(CH_2)_4OH$

3.4 **IMCO United Nations Numerical Designation:** 3.2, 1105

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Like alcohol, causes coughing

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Face splash shield, goggles, protective clothing, and cartridge respirator

5.2 **Symptoms Following Exposure:** Irritation of skin, eyes, and respiratory tract, headache and vertigo, dyspnea and cough, nausea, vomiting, and diarrhea. Drowsiness, deafness, delirium, and occasionally fatal poisoning preceded by severe nervous symptoms have been reported. Coma, glycosuria, and methemoglobinemia can occur.

5.3 **Treatment for Exposure:** SKIN: remove chemicals by thorough washing with soap and water. EYES: wash promptly with large quantities of water for at least 15 mins. Call a doctor.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** 150 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 2. LD50 3 to 5 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.

5.10 **Odor Threshold:** 0.12 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible] C.C.

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.

6.5 **Special Hazards of Combustion Products:** Not pertinent.

6.6 **Behavior in Fire:** Not pertinent.

6.7 **Ignition Temperature:** [illegible] F

6.8 **Electrical Hazard:** Not pertinent.

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** [illegible] days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp., Specialty Chemicals Division, Morristown, N.J. 07960
2. Exxon Chemical Company, Baton Rouge, La. 70821
3. Union Carbide Corp., Chemicals and Plastics Division, 270 Park Ave., New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 98% [illegible] 2-methyl-1-butanol

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-O-T-C

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Another Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 88.1

13.3 **Boiling Point at 1 atm:** 280.2°F = 137.9°C = 411°K

13.4 **Freezing Point:** −110°F = −79°C = 194°K

13.5 **Critical Temperature:** 590°F = 327°C = 600°K

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.8[illegible] at 15°C (liquid)

13.8 **Liquid Surface Tension:** 25.60 dynes/cm = 0.2560 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 5 dynes/cm = 0.005 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0[illegible]

13.12 **Latent Heat of Vaporization:** 217.1 Btu/lb = 120 cal/g = 5.04 × 10⁵ J/kg

13.13 **Heat of Combustion:** −16,500 Btu/lb = −9200 cal/g = −3.85 × 10⁷ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

AMY	n-AMYL CHLORIDE

Common Synonyms

Amyl chloride
1-Chloropentane
n-Butylcarbinyl chloride
1-Pentyl chloride
Chloride of amyl

Liquid — Colorless to purple — Pleasant odor

Floats on water. Flammable vapor is produced.

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Irritating gases may be produced when heated
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
[illegible]

LIQUID
Irritating to skin and eyes
[illegible]

Water Pollution

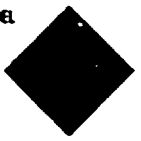
Effect of low concentrations on aquatic life is unknown
Floating to shoreline
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Amyl chloride, Chloropentane, n-Butylcarbinyl chloride, Pentyl chloride, Chloride of amyl
3.2 **Coast Guard Compatibility Classification:** Halogenated compounds (5)
3.3 **Chemical Formula:** $CH_3CH_2CH_2CH_2CH_2Cl$
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to pale deep purple
4.3 **Odor:** Aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles or face shield; rubber gloves
5.2 **Symptoms Following Exposure:** Inhalation causes mild irritation of mucous membranes. Ingestion of liquid or contact with skin or eyes causes mild irritation.
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, apply artificial respiration if required. EYES: flush with water. SKIN: wash well with soap and water. INGESTION: induce vomiting, give water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1 LD50 [illegible] g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride and toxic phosgene may be formed in fires
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 500°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** [illegible] mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650
2. Lachat Chemicals, Inc.
[illegible] Ashland Avenue
Chicago Heights, Ill. 60411
3. Pfaltz and Bauer, Inc.
[illegible] Northern Boulevard
Flushing, N.Y. 11354

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A T U

12. HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:**
Flammable liquid

*12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	[illegible]
Poisons	[illegible]
Water Pollution	
Acute Toxicity	
Aquatic Toxicity	[illegible]
Aesthetic Effect	[illegible]
Reactivity	
Other Chemicals	[illegible]
Water	0
Self Reaction	0

*12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	[illegible]
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.8834 at 20°C (liquid)
13.8 **Liquid Surface Tension:** [illegible] dynes/cm = [illegible] N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** [illegible] dynes/cm = [illegible] N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0650
13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10³ J/kg
13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
*13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages [illegible])

NOTES

AMM	# n-AMYL MERCAPTAN

Common Synonyms			
1-Pentanethiol Amyl hydrosulfide Amyl sulfhydrate Amyl thioalcohol	Liquid	Colorless to yellow	Strong garlic odor
	Floats on water. Flammable vapor is produced		

Fire	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Containers may explode in fire
Exposure	VAPOR LIQUID Irritating to skin and eyes.
Water Pollution	Effect of low concentrations on aquatic life is unknown Foaming to shoreline May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1-Pentanethiol, Amyl hydrosulfide, Amyl sulfhydrate, Amyl thioalcohol

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $CH_3CH_2CH_2CH_2SH$

3.4 **IMCO/United Nations Numerical Designation:** 12 1111

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless, water white to yellow

4.3 **Odor:** Strong offensive garlic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Plastic gloves, goggles

5.2 **Symptoms Following Exposure:** Inhalation may cause nausea because of offensive odor, contact with eyes or skin causes slight irritation. Ingestion may cause vomiting

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, apply artificial respiration if required. EYES: wash with water, see a physician. SKIN: wash with soap and water. INGESTION: induce vomiting if it does not cause spasm/convulsions

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 0.3 mg/m³

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible] °C

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Sulfur dioxide gas is formed

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible] mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Pennwalt Corporation
Industrial Chemicals Department
Three Parkway
Philadelphia, Pa. 19102

2 Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

3 Aldrich Chemical Co.
940 West St. Paul Ave.
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 96.0+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

X T 1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 104.2

13.3 **Boiling Point at 1 atm:** 248°F = 120°C = 393°K

13.4 **Freezing Point:** −109°F = −78°C = 195°K

13.5 **Critical Temperature:** 610°F = 321°C = 594°K

13.6 **Critical Pressure:** 508 psia = 34.5 atm = 3.50 MN/m²

13.7 **Specific Gravity:** 0.8392 at 25°C (liquid)

13.8 **Liquid Surface Tension:** 26.8 dynes/cm = 0.0268 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** [illegible] dynes/cm = 0.0135 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 3.59

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0622

13.12 **Latent Heat of Vaporization:** 177 Btu/lb = 94.5 cal/g = 3.95 × 10⁵ J/kg

13.13 **Heat of Combustion:** −17,070 Btu/lb = −9,480 cal/g = −3.97 × 10⁷ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

NOTES

AMK	# n-AMYL METHYL KETONE

Synonyms Methyl amyl Ketone 2-Heptanone 2-Ketoheptane Methyl pentyl Ketone Pentyl methyl Ketone	Liquid White Penetrating fruity odor Floats and moves slowly with water

	[illegible]
Fire	Combustible [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat If inhaled will cause dizziness, headache, or difficult breathing [illegible] LIQUID Irritating to skin and eyes. If swallowed will cause nausea or vomiting [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Toxic warning water contamination
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Heptanone, 2-Ketoheptane, Methylamylketone, Methylpentylketone, Pentylmethyl ketone

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $CH_3CH_2CH_2CH_2CH_2C(=O)CH_3$

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Gloves and goggles

5.2 **Symptoms Following Exposure:** Inhalation of concentrated vapor may have narcotic effect. Ingestion causes gastrointestinal disturbances. Contact with eyes causes irritation. Prolonged and repeated contact with skin may cause defatting with resultant irritation.

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: no medical attention. EYES: flush with water for 15 to 20 min. SKIN: flush affected areas with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm (suggested)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = [illegible] mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** [illegible] ppm

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Will attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 0.5% in 10 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastman Chemical Products Inc, Industrial Chemicals Div, Kingsport, Tenn 37662
2. Aldrich Chemical Co, 940 W. Saint Paul Ave, Milwaukee, Wis 53233
3. Fisher and Bayer Inc, 126 [illegible] Northern Blvd, Flushing, N.Y. 11354

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical Pure

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Nitrogen blanket [illegible]

10.4 **Venting:** Open flame arresters

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

N.A.A.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 114.19

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Data not available

13.6 **Critical Pressure:** Data not available

13.7 **Specific Gravity:** 0.8204 at 15°C (liquid)

13.8 **Liquid Surface Tension:** 26.17 dynes/cm = 0.0261 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension:** [illegible] dynes/cm = 0.0124 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** 3.94

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

ANT

n-AMYL NITRATE

Common Synonyms
Mixed primary amyl nitrates
Diesel ignition improver

Liquid | Colorless to light straw | Ether like odor

May float or sink in water

Stop discharge if possible. Keep people away.
Avoid contact with liquid and vapor.
Shut off ignition sources. Call fire department.
Stay upwind. Use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
May explode if exposed to heat or flames

Wear goggles and self contained breathing apparatus.
Extinguish with dry chemicals, foam, carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache

If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea or headache

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intake.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: air contaminant
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diesel ignition improver, Mixed primary amyl nitrates
3.2 **Coast Guard Compatibility Classification.** Not listed
3.3 **Chemical Formula:** $C_5H_{11}ONO_2$
3.4 **IMCO/United Nations Numerical Designation:** 3.3/1112

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Light straw, water white
4.3 **Odor:** Ethereal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator with canister for vapors at high concentrations
5.2 **Symptoms Following Exposure:** Inhalation or ingestion may cause headache, methemoglobin and nausea. Liquid and vapor irritate eyes. Contact with skin may cause slight irritation.
5.3 **Treatment for Exposure.** INHALATION: move to fresh air, support respiration, get medical attention. INGESTION: induce vomiting, get medical attention. EYES: irrigate thoroughly with water. SKIN: wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 120°F O.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents.** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to Be Used:**
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in a fire
6.6 **Behavior in Fire:** Overheated material may detonate
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** May form combustible mixture with wood or other combustibles. Liquid will attack some plastics.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

Ethyl Corporation
Industrial Chemicals Div
451 Florida St
Baton Rouge, La 70801

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Mixture containing n-amyl nitrate 60%, iso-amyl nitrate 5%, 2 methylbutyl nitrate 35%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-1-U X Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	1	2
Flammability (Red)	2	2
Reactivity (Yellow)	0	0
	oxy	oxy

*First column refers to nonfire situation

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 133
13.3 **Boiling Point at 1 atm:** 292–314°F = 144–156°C = 417–429°K
13.4 **Freezing Point.** −190°F = −123°C = 150°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.0 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** 4.59
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Data not available
13.13 **Heat of Combustion.** Data not available
13.14 **Heat of Decomposition:** Data not available
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

iso-AMYL NITRITE

Common Synonyms

Isopentyl nitrite
Amyl nitrite
3-Methylbutyl nitrite

Liquid — Colorless to light yellow — Pleasant fruity odor

Floats on water. Poisonous gas is produced on contact with water

Shut off ignition sources. Call fire department.
Wear goggles, self-contained breathing apparatus and rubber overclothing.
[illegible]
Avoid [illegible]
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE

POISONOUS GASES ARE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
DO NOT USE WATER ON FIRE
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
If swallowed will cause dizziness, headache or loss of consciousness
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water.
[illegible]
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.
Notify [illegible] authorities.
Notify operators of downstream water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Isopentyl nitrite
Amyl nitrite
3-Methylbutyl nitrite

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $(CH_3)_2CHCH_2CH_2ONO$

3.4 **IMCO/United Nations Numerical Designation:** 3.1/1113

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Light yellow, transparent

4.3 **Odor:** Pleasant, fragrant, fruity

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles or face shield, self contained breathing apparatus, protective gloves and clothing

5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes flushing of the face, pulsatile headache, disturbing tachycardia, cyanosis (methemoglobinemia), weakness, confusion, restlessness, faintness, and collapse. Contact with eyes or skin causes irritation

5.3 **Treatment for Exposure:** INHALATION or INGESTION: place patient in recumbent position, if necessary, administer oxygen. For treatment of severe methemoglobinemia: transfuse with whole blood or give I.V. or I.M. a dose of 1.2 mg/kg methylene blue or an oral dose of 3.5 mg/kg. EYES: after contact with liquid, irrigate with large quantities of water for 15 min., call physician. SKIN: after contact with liquid, wash with large amounts water. Call physician

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade I, LD_{50} 5 to 15 g/kg

5.7 **Late Toxicity:** Methemoglobinemia may occur

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 0°F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen are formed

6.6 **Behavior in Fire:** Containers may explode

6.7 **Ignition Temperature:** 410°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Decomposes on exposure to air, light, or water, evolving toxic oxides of nitrogen which are orange in color

7.2 **Reactivity with Common Materials:** May corrode metals if wet

7.3 **Stability During Transport:** Stable if kept sealed and not exposed to light

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650
2. Aldrich Chemical Co.
940 West St. Paul Avenue
Milwaukee, Wis. 53233
3. Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, USP

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U V W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	0
Liquid or Solid Irritant	4
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	4

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 117.1

13.3 **Boiling Point at 1 atm:** 210°F = 99°C = 372°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.8758 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 4

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0709

13.12 **Latent Heat of Vaporization:** 212 Btu/lb = 118 cal/g = 4.94×10^5 J/kg

13.13 **Heat of Combustion:** −12,500 Btu/lb = −6,930 cal/g = -290×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

ATS

n-AMYLTRICHLOROSILANE

Common Synonyms
Trichloropentylsilane
Pentylsilicon trichloride
Trichloroamylsilane

Liquid — Colorless — Sharp irritating odor

Reacts violently with water. Irritating visible vapor cloud is produced

Avoid contact with liquid and vapor. Keep people away.
Wear approved self-contained breathing apparatus and rubber clothing, gloves.
Stop discharge if possible.
Call fire department.
Isolate and remove damaged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemicals or carbon dioxide.
DO NOT USE WATER OR FOAM ON FIRE.

Exposure

Call for medical aid.

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing, shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold lids open and flush with plenty of water.
IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of affected water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichloropentylsilane
Pentylsilicon trichloride
Trichloroamylsilane

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CH_3CH_2CH_2CH_2SiCl_3$

3.4 **IMCO/United Nations Numerical Designation.** 8/1728

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp like hydrochloric acid, pungent acrid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor type respiratory protection, rubber gloves, chemical worker's goggles

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membrane. Contact of liquid with eyes or skin causes severe burns, and ingestion causes severe burns of mouth and stomach.

5.3 **Treatment for Exposure:** Get medical attention immediately after exposure to this compound. INHALATION: remove from exposure, support respiration. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: give large amounts of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 2,340 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point.** 145°F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water, foam

6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride and toxic phosgene may be formed

6.6 **Behavior in Fire.** Difficult to extinguish. Reignition may occur

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 2.5 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously to generate toxic hydrogen chloride gas (hydrochloric acid)

7.2 **Reactivity with Common Materials:** Corrodes metal

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** After flushing with water, rinse with sodium bicarbonate solution or lime water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2. Dow Corning Corporation
P.O. Box 592
Midland, Mich. 48640

3. PCR, Inc.
P.O. Box 1466
Gainesville, Fla. 32602

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	4
Self Reaction	1

12.3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight** 205.6

13.3 **Boiling Point at 1 atm.**
320°F = 160°C = 433°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.147 at 25°C (liquid)

13.8 **Liquid Surface Tension:**
(est.) 20 dynes/cm = 0.020 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 7.1

13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available

13.12 **Latent Heat of Vaporization:**
(est.) 86.8 Btu/lb = 48.2 cal/g
= 2.02 × 10^5 J/kg

13.13 **Heat of Combustion:** (est.) −6,630 Btu/lb
= −3,680 cal/g = −1.54 × 10^7 J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** (est.) 180 Btu/lb
= 100 cal/g = 4.6 × 10^5 J/kg

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

ANL

ANILINE

Common Synonyms
Aminobenzene
Aniline oil
Phenylamine
Blue oil

Oily liquid — Colorless to yellowish brown — Weak odor

Sinks slowly in water

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY
Wear chemical protective suit with self-contained breathing apparatus
Stop discharge if possible
Stay upwind and use water spray to "knock down" vapor
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GAS IS PRODUCED WHEN HEATED
Vapor may explode if ignited in an enclosed area
Wear chemical protective suit with self-contained breathing apparatus
Extinguish with water, dry chemical, foam, or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk

Water Pollution

Dangerous to Aquatic Life in high concentrations
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Aminobenzene
Aniline oil
Blue oil
Phenylamine

3.2 **Coast Guard Compatibility Classification.** Aromatic amine

3.3 **Chemical Formula:** $C_6H_5NH_2$

3.4 **IMCO/United Nations Numerical Designation:** 6.1 — 547

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale brown

4.3 **Odor:** Aromatic amine, like, characteristic, peculiar, strongly amine like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Respirator for organic vapors, splashproof goggles, rubber gloves, boots

5.2 **Symptoms Following Exposure:** ACUTE EXPOSURE: Blue discoloration of finger tips, cheeks, lips and nose, nausea, vomiting, headache and drowsiness followed by delirium, coma and shock. CHRONIC EXPOSURE: Loss of appetite, loss of weight, headaches, visual disturbances, skin lesions

5.3 **Treatment for Exposure:** Remove victim to fresh air and call a physician at once. SKIN EYE CONTACT: immediately flush skin or eyes with plenty of water for at least 15 min. If cyanosis is present, shower with soap and warm water, with special attention to scalp and fingernails. Administer oxygen until physician arrives

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5.5 **Short-Term Inhalation Limits.** 50 ppm for 30 min, 5 ppm for 8 hr

5.6 **Toxicity by Ingestion:** Grade 3, LD_{50} 50 to 500 mg/kg

5.7 **Late Toxicity:** None recognized

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** 0.5 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 165°F (70°C), 158°F (70°C)

6.2 **Flammable Limits in Air:** 1.3% (11%)

6.3 **Fire Extinguishing Agents.** Water, foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 1418°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 3.0 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water and rinse with dilute acetic acid

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
1020 ppm/1 hr — catfish, killed, fresh water
10 ppm/96 hr — scenedesmus, EL_{50}, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 1.90% 5 days

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Baychem Corp
Mobay Chemical Co. Division
Penn Lincoln Pkwy. West
Pittsburgh, Pa. 15220

2. E. I. duPont de Nemours and Co.
Explosives Department
Wilmington, Del. 19898

3. First Mississippi Corp
First Chemical Corp
Pascagoula, Miss. 39567

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 99.5

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q, T-U-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	4
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight.** 93.13

13.3 **Boiling Point at 1 atm:**
363.6°F = 184.2°C = 457.4°K

13.4 **Freezing Point**
21.1°F = −6.1°C = 267.15°K

13.5 **Critical Temperature**
798.15°F = 425°C = 698.5°K

13.6 **Critical Pressure:**
770 psia = 52.4 atm = 5.31 MN/m²

13.7 **Specific Gravity:** 1.022 at 20°C (liquid)

13.8 **Liquid Surface Tension**
45.5 dynes/cm = 0.0455 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
5.5 dynes/cm = 0.0055 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.1

13.12 **Latent Heat of Vaporization:**
198 Btu/lb = 110 cal/g = 4.61 × 10⁵ J/kg

13.13 **Heat of Combustion:** −14,930 Btu/lb
= −8320 cal/g = −348.3 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

ASC	ANISOYL CHLORIDE

Common Synonyms	
p-Anisoyl chloride	Liquid Yellow to brown Sharp penetrating odor Reacts with water Irritating vapor is produced Freezing point is 72° F

Wear goggles and self-contained breathing apparatus
Stop discharge if possible Keep people away
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	Combustible POISONOUS GASES MAY BE PRODUCED WHEN HEATED Extinguish with dry chemicals carbon dioxide DO NOT USE WATER ON ADJACENT FIRES
Exposure	Call for medical aid VAPOR Irritating to eyes nose and throat Move victim to fresh air LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning corrosive
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** p-Anisoyl chloride
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula** p-CH OC.H.COCl
3 4 **IMCO/United Nations Numerical Designation.** N 1/2?

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color.** Yellow brown
4 3 **Odor.** Sharp penetrating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles and face shield plastic gloves protective clothing
5 2 **Symptoms Following Exposure** Vapor irritates mucous membranes Contact of liquid with eyes or skin causes severe irritation Ingestion causes severe irritation of mouth and stomach
5 3 **Treatment for Exposure** INHALATION remove to fresh air EYES flush with water for at least 15 min get medical attention SKIN flush with water wash well with soap and water INGESTION do NOT induce vomiting give large amounts of water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Data not available
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents** Carbon dioxide dry chemical
6 4 **Fire Extinguishing Agents Not to be Used** Water foam
6 5 **Special Hazards of Combustion Products** Irritating hydrogen chloride fumes may be formed
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** Reacts slowly to generate hydrogen chloride (hydrochloric acid) The reaction is not hazardous
7 2 **Reactivity with Common Materials.** Corrodes metal slowly
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Eastman Kodak Co
Eastman Organic Chemicals
Rochester N Y 14650
2 Aldrich Chemical Co
940 West St Paul Avenue
Milwaukee Wis 53233
3 Pfaltz and Bauer Inc
126-04 Northern Boulevard
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

X O X

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 171 6
13 3 **Boiling Point at 1 atm:** 504°F = 262°C = 535°K
13 4 **Freezing Point** 72°F = 22°C = 295°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity** 1 25 at 20°C (liquid)
13 8 **Liquid Surface Tension.** (est) 25 dynes/cm = 0 025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** (est) −10 500 Btu/lb = −5 830 cal/g = −244 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** (est) 90 Btu/lb = 50 cal/g = 2 1 × 10³ J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6

NOTES

ATH	ANTHRACENE

Common Synonyms			
Anthracin Paranaphthalene Green oil	Solid	White to yellow	Weak aromatic odor
	Sinks in water		

Stop discharge if possible. Keep people away.
Avoid contact with solid and liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Dust cloud may explode if ignited in an enclosed area
Extinguish with water, dry chemical, foam, or carbon dioxide

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Anthracin, Green oil, Paranaphthalene
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula.** $C_{14}H_{10}$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White to yellow
4 3 **Odor:** Weak aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Contact with eyes causes irritation
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. EYES: flush with water for 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used**
6 5 **Special Hazards of Combustion Products.**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** 1004°F
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 5 ppm 24 hr trout & bluegill no effect
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Gallard Schlesinger Chemical Mfg. Co.
584 Mineola Avenue
Carle Place, N. Y. 11514

2 Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

3 Eastman Organic Chemicals
Rochester, N. Y. 14650

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Various fluorescence grades, Scintillation grade, Technical grade, 90 - 98%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 178.23
13 3 **Boiling Point at 1 atm:** 646.2°F = 341.2°C = 614.4°K
13 4 **Freezing Point:** 421.7°F = 216.5°C = 489.7°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.24 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** −17,100 Btu/lb = −9 510 cal/g = −398 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

APC

ANTIMONY PENTACHLORIDE

Common Synonyms

Antimony (V) chloride
Antimony perchloride

Liquid — Colorless to brown — Unpleasant odor

Sinks in water. Irritating vapor is produced. Freezing point is 370°F

[illegible]

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED
DO NOT USE WATER ON ADJACENT FIRES

Exposure

[illegible] irritated

VAPOR

Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

LIQUID

Will burn skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness.
[illegible]
IF EYES [illegible] with plenty of water
IF SWALLOWED [illegible] CONSCIOUS [illegible] milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Antimony (V) chloride
Antimony perchloride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $SbCl_5$

3.4 **IMCO/United Nations Numerical Designation:** N 1730

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to medium brown, yellow red brown

4.3 **Odor:** Pungent, offensive

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor acid gas type canister mask, rubber, neoprene vinyl etc. gloves, chemical safety goggles, plus face shield where appropriate, acid resistant clothing, plus apron for splash protection, rubber safety shoes or boots, hard hat

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact of liquid with eyes or skin causes severe burns. Ingestion causes vomiting and severe burns of mouth and stomach. Overexposure by any route can cause bloody stools, slow pulse, low blood pressure, coma, convulsions, cardiac arrest

5.3 **Treatment for Exposure:** INHALATION: remove to clean air, rinse mouth and gargle with water, if overexposure is serious get prompt medical attention. EYES: flush eyes and eye lids thoroughly with large amounts of water, get prompt medical attention. SKIN: flush thoroughly with water, remove contaminated clothing, wash affected area with soap and water, if overexposure is serious get prompt medical attention. INGESTION: dilute by drinking water, if vomiting occurs administer more water. If overexposure is serious get prompt medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ as antimony

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 1,115 mg/kg (oral) 900 mg (oral pig)

5.7 **Late Toxicity:** Antimony poisoning may result

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

(Continued on page 4)

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Do not use water or foam on adjacent fires

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Irritating fumes of hydrogen chloride given off when water or foam is used to extinguish adjacent fire

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts to form hydrogen chloride gas (hydrochloric acid)

7.2 **Reactivity with Common Materials:** Causes corrosion of metal

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Soda ash or soda ash lime mixture

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Hooker Chemical Corporation
Specialty Chemicals Division
4700 Buffalo Avenue
Niagara Falls, N.Y. 14302

2. J.T. Baker Chemical Co.
Phillipsburg, N.J. 08865

3. Mallinckrodt Chemical Works
222 West Side Avenue
Jersey City, N.J. 07304

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	3
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not Listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 299.05

13.3 **Boiling Point at 1 atm:** (est.) 347°F = 175°C = 448°K

13.4 **Freezing Point:** 37°F = 3°C = 276°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.354 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 15 dynes/cm = 0.015 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 68.9 Btu/lb = 38.3 cal/g = 1.60 × 10⁵ J/kg

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** −211.9 Btu/lb = −117.7 cal/g = −4.92 × 10⁵ J/kg

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

5. HEALTH HAZARDS (Cont'd.)

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant, causes second and third-degree burns on short contact and is very injurious to the eyes

5.10 **Odor Threshold:** Data not available

APF	ANTIMONY PENTAFLUORIDE

Common Synonyms	Liquid	Colorless	Sharp odor
	Reacts violently with water. Poisonous gas is produced on contact with water. Freezing point is 45° F		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles and self contained breathing apparatus.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
May cause fire on contact with combustibles.
POISONOUS GASES ARE PRODUCED WHEN HEATED.
DO NOT USE WATER OR FOAM ON FIRE OR ON ADJACENT FIRES.
Extinguish with dry chemicals or carbon dioxide.

Exposure

CALL FOR MEDICAL AID.

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: corrosive air contaminant
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** SbF_5
3.4 **IMCO/United Nations Numerical Designation:** N 1732

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid gas type canister mask, rubber gloves, protective clothing, safety goggles and face shield
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact of liquid with eyes or skin causes severe burns. Ingestion causes vomiting and severe burns of mouth and throat. Overexposure by any route can cause bloody stools, slow pulse, low blood pressure, coma, convulsions, cardiac arrest.
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, rinse mouth with water, give oxygen if necessary to assist breathing, get medical attention. EYES: irrigate with copious amounts of water for at least 15 min., get medical attention. SKIN: flush with copious amounts of water, wash well with soap and water. INGESTION: dilute by drinking water, if vomiting occurs, drink more water, get medical attention promptly.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ as antimony
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Antimony poisoning may result
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable (but see 7.2)
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Do not use water or foam on adjacent fires
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Gives off toxic hydrogen fluoride fumes when water is used to extinguish adjacent fire
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously to form toxic hydrogen fluoride (hydrofluoric acid)
7.2 **Reactivity with Common Materials:** When moisture is present, causes severe corrosion of metals (except steel) and glass. If confined and wet can cause explosion. May cause fire in contact with combustible material.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Ozark-Mahoning Company
Special Chemicals Division
1670 South Boulder
Tulsa, Okla. 4119

2 Ventron Corp.
Alfa Products Division
P.O. Box 159
Beverly, Mass. 01915

3 PCR, Inc.
P.O. Box 1466
Gainesville, Fla. 32602

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

VO

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 216.7
13.3 **Boiling Point at 1 atm.:** 289°F = 143°C = 416°K
13.4 **Freezing Point:** 45°F = [illegible]°C = 280°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.340 at 30°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** (est.) 179 Btu/lb = 44 cal/g = 1.8 × 10⁵ J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

APT	ANTIMONY POTASSIUM TARTRATE

Common Synonyms
Tartar emetic
Tartrated antimony
Tartarized antimony
Potassium antimonyl tartrate

Solid — White — Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear dust respirator and rubber coveralls including gloves
Notify "Incident Commander"
Take care of remove discharged material
Notify environmental health and pollution control agencies

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause dizziness, headache, coughing, or difficult breathing
[illegible]

SOLID
Will burn skin and eyes
If swallowed will cause nausea, dizziness, loss of consciousness
[illegible]
IF EYES [illegible] water
IF SKIN LOOSE [illegible] CONSCIOUS have victim drink water
[illegible]
IF SWALLOWED [illegible] NOT CONSCIOUS OR HAVING CONVULSIONS
[illegible] water

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning [illegible] water contaminant
Recover [illegible]
Dispose of flash

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Potassium antimonyl tartrate, Tartar emetic, Tartrated antimony, Tartarized antimony
3.2 **Coast Guard Compatibility Classification.** Not listed
3.3 **Chemical Formula:** $KOOC\,CHOH\,CHOH\,COONSb \cdot H_2O$
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator, rubber or plastic coated gloves, chemical goggles, tights, rubber shoes or rubber boots. Bureau of Mines approved respirator
5.2 **Symptoms Following Exposure:** Inhalation causes inflammation of membranes of nose and throat, upper respiratory irritation, headache, dizziness. Ingestion causes gastroenteritis, salivation, [illegible]. Contact with eyes or skin causes irritation. Further symptoms of [illegible] complaints of [illegible] inability, dizziness, muscular and nervous [illegible]
5.3 **Treatment for Exposure:** INHALATION [illegible] INGESTION call physician immediately, give water (plain soapy or salty) [illegible] EYES flush with water for 15 min, consult a physician. SKIN flush with water, washed with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ (as antimony)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 oral rat LD_{50} = 115 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point.** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents.** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire.**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
20 ppm* /96 hr fathead minnow TLm fresh (soft) water
12 ppm* /96 hr fathead minnow TLm fresh (hard) water
*as antimony
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential:** High

9 SELECTED MANUFACTURERS

1. Pfizer Chemicals Div
235 E 42nd St
New York, N.Y. 10017
2. The Harshaw Chemical Co
1945 E 97th St
Cleveland, Ohio 44106
3. Mallinckrodt Chemical Works
223 Westside Ave
P.O. Box 334
Jersey City, N.J. 07303

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure 99 - 100%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** ORM-A
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 434
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.60 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on page 1 and 2

NOTES

ATM

ANTIMONY TRICHLORIDE

Common Synonyms
Butter of antimony
Antimony (III) Chloride

Solid — White to pale yellow — Sharp unpleasant odor

Sinks and mixes violently with water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear dust respirator and rubber over-clothing including gloves.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and wildlife officials.

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Irritating gases may be produced when heated.
Wear goggles and self-contained breathing apparatus.
DO NOT USE WATER ON ADJACENT FIRES.

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing, or difficult breathing.
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

SOLID
Will burn skin and eyes.
If swallowed will cause nausea, vomiting or loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAS CONVULSIONS, do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — water contaminant corrosive
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Antimony butter
Antimony (III) chloride
Butter of antimony

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $SbCl_3$

3.4 **IMCO/United Nations Numerical Designation:** 9,[illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White to pale yellow

4.3 **Odor:** Sharp acrid

5. HEALTH HAZARDS

Note: *The respiratory system is the chief avenue of entrance of antimony and its compounds into the body.*

5.1 **Personal Protective Equipment:** Bu. Mines approved respirator, chemical safety goggles or face shield, leather or rubber safety shoes, rubber apron, rubber gloves.

5.2 **Symptoms Following Exposure:** Inhalation of small amounts may cause irritation of the nose, throat and air passages; large exposures result in severe air passage irritation. Ingestion causes vomiting, purging with bloody stools, slow pulse and low blood pressure, slow, shallow breathing, coma and convulsions, sometimes followed by death. Contact with eyes causes severe eye burns or at least severe eye irritation. Contact of dry chemical with skin may result in deep chemical burns.

5.3 **Treatment for Exposure:** INHALATION: move victim at once to fresh air and keep him warm but not hot; call a physician immediately. Nasal passages may be irrigated from a gentle flowing hose. INGESTION: induce vomiting by giving large quantities of warm salt water; have a physician see the patient at once. EYES: flush with copious amounts of water for at least 15 min.; call physician at once. SKIN: flush with large quantities of flowing water followed by washing of skin surfaces with soap and water; remove all contaminated clothing promptly.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ (as antimony)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 675 mg/kg

(Continued on page 4)

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires

6.5 **Special Hazards of Combustion Products:** Toxic and irritating antimony oxide and hydrogen chloride may form in fires

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously to form a strong solution of hydrochloric acid

7.2 **Reactivity with Common Materials:** Corrodes most metals in presence of moisture. Flammable hydrogen gas may collect in enclosed spaces

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Large amounts of water followed by sodium bicarbonate or soda ash solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
17 ppm* 96 hr fathead minnow TLm fresh (hard) water
9 ppm* 96 hr fathead minnow TLm fresh (soft) water
*as antimony

8.2 **Waterborne Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** High

9. SELECTED MANUFACTURERS

1. J. T. Baker Chemical Co
Phillipsburg, N. J. 08865
2. Stauffer Chemical Company
Specialty Chemical Division
Westport, Conn. 06880
3. Gallard-Schlesinger Chemical Mfg. Co
524 Minola Ave
Carle Place, N. Y. 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 99+%
Analytical, Anhydrous

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Padded

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

RR

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive solid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not rated

12.3 **NFPA Hazard Classifications:** Not rated

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 228

13.3 **Boiling Point at 1 atm:** 423°F = 223°C = 496°K

13.4 **Freezing Point:** 163°F = 73°C = 346°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 3.14 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** −70 Btu/lb = −39 cal/g = −1.6 x 10⁵ J/kg

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 3 and 4)

5. HEALTH HAZARDS (Cont'd)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

ATT	ANTIMONY TRIFLUORIDE

Common Properties	Solid crystals — White — Odorless Sinks in water

As of contact with S.T.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire	No, flammable
Exposure	CALL FOR MEDICAL AID **SOLID** **Irritating to skin and eyes.** **Harmful if swallowed** Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold open eyelids and flush with plenty of water. IF SWALLOWED, do not induce vomiting. Give victim drink water only if conscious.
Water Pollution	**HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS** **Floating to shoreline.** **May be dangerous if it enters water intakes.** Notify public health and wildlife officials. Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** SbF_3
3.4 **IMCO United Nations Numerical Designation:** 6.1 1549

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved respirator, rubber gloves
5.2 **Symptoms Following Exposure:** Resemble those of lead and arsenic poisoning. ACUTE POISONING: irritation of the mouth, nose, stomach and intestines, vomiting, purging with bloody stools, slow pulse and low blood pressure, slow, shallow breathing, coma and convulsions, sometimes followed by death from cardiac and respiratory exhaustion. CHRONIC POISONING: dryness of throat, pain on swallowing, occasional vomiting and persistent nausea, susceptibility to fainting, diarrhea, loss of appetite and weight, giddiness, dermatitis, either pustular or ulcerative, anemia
5.3 **Treatment for Exposure:** If any symptoms, however slight, are noticed, the affected individual should be removed from contact with the chemical and placed under the care of a physician, who is versed in the treatment necessary.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Grade 3 LD50 50 to 500 mg/kg (guinea pig)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 200 ppm (24 hr, Tilapia vulgaris) (salt) killed (fresh water)
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp.
Specialty Chemicals Div.
Wilmington Turnpike
Marcus Hook, Pa. 19061
2. Ozark Mahoning Co.
1870 South Boulder Ave.
Tulsa, Oklahoma 74119

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99%
10.2 **Storage Temperature:** Data not available
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 178.75
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** 558°F = 292°C = 565°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 4.38 at 21°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

REVISED 1978

ATX	ANTIMONY TRIOXIDE

Common Synonyms			
Diantimony trioxide Senarmontite Valentinite Exitelite Weissspiessglanz	Solid Sinks in water	White	Odorless

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear dust respirator and rubber overclothing including gloves
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing, difficult breathing or loss of consciousness.
If in eyes hold eyelids open and flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
If swallowed will cause dizziness, nausea, vomiting or loss of consciousness
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - persons
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diantimony trioxide
Exitelite, Flowers of antimony
Senarmontite, Valentinite
Weissspiessglanz

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** Sb_2O_3

3.4 **IMCO/United Nations Numerical Designation:** 6.1, 1549

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, safety goggles, dust mask

5.2 **Symptoms Following Exposure:** Inhalation causes inflammation of upper and lower respiratory tract including pneumonitis. Ingestion causes irritation of the mouth, nose, stomach and intestines, vomiting, purging with bloody stools, slow pulse and low blood pressure, slow shallow breathing, coma and convulsions, sometimes followed by death. Contact with eyes causes conjunctivitis. Contact with skin causes dermatitis and rhinitis.

5.3 **Treatment for Exposure:** *If any of the symptoms of poisoning, even slight, are noticed, the affected individual should be removed from contact with the chemical and placed under care of a physician.* INGESTION: induce vomiting. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ (as antimony)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 0 oral rat LD_{50} = 20,000 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
> 80 ppm* 96 hr. LC50 in bluegill minnow, 11 hard or soft fresh water
*[illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** High

9. SELECTED MANUFACTURERS

1. J. T. Baker Chemical Co
Phillipsburg, N.J. 08865
2. McGean Chemical Co
1250 Terminal Tower
Cleveland, Ohio 44113
3. Gallard-Schlesinger Chemical Mfg. Co
584 Mineola Ave
Carle Place, N.Y. 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, 99.9%
Optical grade

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

1*

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 291.52

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 5.2 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

ASA	# ARSENIC ACID

Common Synonyms			
Orthoarsenic acid Arsenic pentoxide	Solid crystals or solution	White or colorless	Odorless
	Sinks and mixes with water. Freezing point is 95° F		

AVOID CONTACT WITH SOLUTION, SOLID AND DUST
KEEP PEOPLE AWAY
Wear rubber over-clothing, including shoes
Notify Incident Commander
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move victim to fresh air
If in eyes, hold eyelids open and flush with plenty of water
Breathing difficult: give oxygen
SOLUTION OR SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: potable water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Arsenic pentoxide
Orthoarsenic acid

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** As_2O_5 or H_3AsO_4, $2H_2O$

3.4 **IMCO/United Nations Numerical Designation:** 1.1 1553

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid, a concentrated water solution is sometimes shipped

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Calamine lotion and zinc oxide powder on burns and other skin areas; rubber gloves; U. S. Bureau of Mines approved dust respirator

5.2 **Symptoms Following Exposure:** Ingestion causes irritations, stomach, intestinal and other gastrointestinal symptoms. Overdose can cause arsenic poisoning. Not symptoms are delayed

5.3 **Treatment for Exposure:** Get medical attention after all exposures to this compound. Be alert for arsenic poisoning symptoms. SKIN: wash well with soap and water. INGESTION: induce vomiting, drink fresh lime water, milk or raw egg, give antidotes

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ as arsenic

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 48 mg/kg (rodents)

5.7 **Late Toxicity:** Arsenic compounds may be carcinogenic

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Will corrode metal and may give off toxic arsine gas

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. J. T. Baker Chemical Co
Phillipsburg, N. J. 08865
2. Gallard-Schlesinger Chemical Manufacturing Corp
584 Mineola Avenue
Carle Place, N. Y. 11514
3. Ceres, Inc
13460 W. Silver Spring Rd
Menomonee Falls, Wis. 53051

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

NS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisons, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 229.9

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.2 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** 3.1 Btu/lb = 1.7 cal/g = 0.071 × 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

ARD

ARSENIC DISULFIDE

Common Synonyms
Realgar
Red arsenic glass
Red arsenic sulfide
Red orpiment
Ruby arsenic

Solid — Red brown — Odorless

Sinks in water

AVOID CONTACT OR INHALATION [illegible]

Fire

Not Flammable

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Harmful to skin

SOLID
POISONOUS IF SWALLOWED
Will burn eyes and skin

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Realgar, Red arsenic glass, Red arsenic sulfide, Red orpiment, Ruby arsenic
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** As_2S_2
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Red brown
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved respirator, goggles, rubber gloves, clean protective clothing
5.2 **Symptoms Following Exposure:** Acute and sub-acute poisoning are not common. Repeated inhalation causes irritation of nose, laryngitis, mild bronchitis. Ingestion causes weakness, loss of appetite, gastrointestinal disturbances, peripheral neuritis, occasional hepatitis. Contact with eyes causes irritation. Irritates skin, especially where moist, if not treated, may cause ulceration
5.3 **Treatment for Exposure:** *Consult physician after all correspondence to this compound.* INHALATION: move to fresh air. INGESTION: induce vomiting by giving warm salt water repeat until vomit is clear. EYES: flush with water for at least 15 min. SKIN: wash well with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ (as arsenic)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 4 LD₅₀ < 50 mg/kg
5.7 **Late Toxicity:** Possible skin and lung cancer
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Poisonous fumes of the compound may be formed in fires. If ignited, will form sulfur dioxide gas
6.6 **Behavior in Fire:** May [illegible] at vers with temperatures
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. Gallard-Schlesinger Chemical Mfg. Co.
584 Mineola Ave.
Carle Place, N.Y. [illegible]
2. Electronic Space Products Inc.
[illegible] S. Robertson Blvd.
Los Angeles, Calif. 90035
3. Research Organic/Inorganic Chemical Corp.
Sun Valley, Calif. 91352

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+% Technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 214
13.3 **Boiling Point at 1 atm:** 1,049°F = 565°C = 838°K
13.4 **Freezing Point:** 565°F = 307°C = 580°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.5 at 27°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

AST

ARSENIC TRICHLORIDE

Common Synonyms
Fuming liquid arsenic
Arsenic (III) trichloride
Arsenic chloride
Arsenous chloride
Caustic arsenic chloride

Liquid — Colorless — Unpleasant odor

Sinks and reacts in water. Poisonous visible vapor cloud is produced

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY
Wear goggles and self contained breathing apparatus
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not Flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED
Move victim to fresh air
If breathing is difficult, give oxygen
LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have vomiting induced
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing (not even give victim water)

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify health, wildlife officials
Notify persons downstream of water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning: poison, water contaminant, corrosive
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Arsenic (III) trichloride, Arsenic chloride, Arsenous chloride, Arsenious chloride, Butter of arsenic, Caustic arsenic chloride, Caustic oil of arsenic, Fuming liquid arsenic

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula** $AsCl_3$

3 4 **IMCO/United Nations Numerical Designation** 6 1 (1560)

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Acrid

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Safety goggles and face shield, acid type canister gas mask, rubber gloves, protective clothing

5 2 **Symptoms Following Exposure.** Inhalation causes irritation of nose and throat. Contact of liquid with eyes or skin causes severe irritation. Ingestion causes weakness and severe irritation of mouth and stomach. Overdose can cause arsenic poisoning, but symptoms are delayed

5 3 **Treatment for Exposure** Get medical attention after all exposures to the compound. Be alert for arsenic poisoning symptoms. INHALATION: remove to fresh air, give artificial respiration if needed. EYES: flush with water for at least 15 min. SKIN: flush with water. INGESTION: give large amounts of water, then induce vomiting, give lime water, milk, or raw egg, give a cathartic

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.5 mg/m³ as arsenic

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 3, oral rat LD_{50} = 1.8 mg/kg, fatal human dose 70-180 mg depending on weight

5 7 **Late Toxicity:** Arsenic compounds may be carcinogenic

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Avoid water on adjacent fires

6 5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride formed when involved in fire

6 6 **Behavior in Fire** Becomes gaseous and causes irritation. Forms hydrogen chloride (hydrochloric acid) by reaction with water used on adjacent fires

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts with water to generate hydrogen chloride (hydrochloric acid)

7 2 **Reactivity with Common Materials:** Corrodes metal

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Cerac, Inc.
1360 W. Silver Spring Rd.
Menomonee Falls, Wis. 53051

2 Ventron Corporation
Alfa Products
P.O. Box 159
Beverly, Mass. 01915

3 Gallard-Schlesinger Chemical Manufacturing Co.
584 Mineola Avenue
Carle Place, N.Y. 11514

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Poisonous, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 181.3

13 3 **Boiling Point at 1 atm:** 266.4°F = 130.2°C = 403.4°K

13 4 **Freezing Point:** 9°F = −12.8°C = 260°K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.156 at 25°C (liquid)

13 8 **Liquid Surface Tension** (est.) 20 dynes/cm = 0.020 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** 88.31 Btu/lb = 49.0 cal/g = 2.054×10^5 J/kg

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** (est.) −18 Btu/lb = −10 cal/g = -0.42×10^5 J/kg

13 16 **Heat of Polymerization** Not pertinent

(Continued on page 5 and 6)

NOTES

ATO	ARSENIC TRIOXIDE

Common Synonyms

Arsenous acid
Arsenous acid anhydride
Arsenous oxide
Arsenic sesquioxide
White arsenic

Solid crystals or powder — White — Odorless

Sinks and mixes slowly with water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Stay upwind. Use water spray to knock down dust
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move victim to fresh air
If in eyes, hold eyelids open and flush with plenty of water
If breathing is difficult, give oxygen

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Arsenous acid, Arsenous acid anhydride, Arsenous oxide, Arsenic sesquioxide, White arsenic

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula.** As_2O_3

3.4 **IMCO/United Nations Numerical Designation** 6.1/1561

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid

4.2 **Color:** White

4.3 **Odor:** Like garlic, none

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Bureau of Mines approved respirator, protective gloves, eye protection, full protective coveralls

5.2 **Symptoms Following Exposure:** Ingestion causes irritation of mucous membrane, weakness, loss of appetite, gastrointestinal disturbances. Overdose can cause arsenic poisoning, but symptoms are delayed

5.3 **Treatment for Exposure:** Get medical attention after all exposures to this compound. Be alert for arsenic poisoning symptoms. SKIN: wash thoroughly with soap and water; remove contaminated clothing and shower with soap and water irritations except for rudder cases which disappear in a day or two, should have medical attention. INGESTION: vomiting, gastric lavage and a physician should be called at once; drink freely of fresh water, sweet milk or raw eggs, followed by castor oil or any brisk cathartic

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 0.5 mg/m³ as arsenic

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion:** Grade 4, oral mouse LD_{50} = 45 mg/kg

5.7 **Late Toxicity:** Arsenic compounds may be carcinogenic

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air.** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Toxic fumes of arsenic trioxide and arsine may be formed in fire situations

6.6 **Behavior in Fire** May volatilize and form toxic fumes of arsenic trioxide

6.7 **Ignition Temperature.** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Flush with water

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 5.3 mg/l, 96 hrs, salmon/harmful *
*Type of water not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. American Smelting and Refining Company
120 Broadway
New York, N.Y. 10005
2. Gallard-Schlesinger Chemical Manufacturing Co
584 Mineola Avenue
Carle Place, N.Y. 11514
3. Ventron Corp
Alfa Products
P.O. Box 159
Beverly, Mass. 01915

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Refined 99%, Crude 95%

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

HSS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** 197.8

13.3 **Boiling Point at 1 atm** 855°F = 457°C = 730°K

13.4 **Freezing Point** 599°F = 315°C = 588°K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity.** 3.7 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion.** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

ART

ARSENIC TRISULFIDE

Common Synonyms
Arsenic yellow
King's gold
King's yellow
Orpiment
Yellow arsenic sulfide

Solid — Yellow orange — Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
Wear chemical protective suit with self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED
Harmful to skin
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
SOLID
POISONOUS IF SWALLOWED
Will burn eyes and skin
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have vomiting induced.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting or give anything to drink.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of downstream water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2 LABEL

POISON

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Arsenic yellow, King's gold, King's yellow, Orpiment, Yellow arsenic sulfide
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** As_2S_3
3 4 **IMCO/United Nations Numerical Designation.** 6 1/1557

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Yellow orange
4 3 **Odor.** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus, goggles, rubber gloves, clean protective clothing
5 2 **Symptoms Following Exposure:** (Acute and sub-acute poisoning are not common.) Repeated inhalation causes irritation of nose, laryngitis, mild bronchitis. Ingestion causes weakness, loss of appetite, gastrointestinal disturbances, peripheral neuritis, occasional hepatitis. Contact with eyes causes irritation. Irritates skin, especially where moist, if not treated, may cause ulceration.
5 3 **Treatment for Exposure:** *Consult physician after all overexposures to this compound.* INHALATION: move to fresh air. INGESTION: induce vomiting by giving warm salt water repeat until vomit is clear. EYES: flush with water for at least 15 min. SKIN: wash well with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value).** 0.5 mg/m³ (as arsenic)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 4 LD_{50} < 50 mg/kg
5 7 **Late Toxicity:** Possible skin and lung cancer
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6 1 **Flash Point:** Not pertinent
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Water
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products:** Poisonous fumes of the compound may be formed in fires
6 6 **Behavior in Fire:** May ignite at very high temperatures
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Gallard Schlesinger Chemical Mfg. Co
584 Mineola Ave
Carle Place, N.Y. 11514

2 Cerac, Inc
13460 W. Silver Spring Rd
Mequonomee Falls, Wis. 53051

3 Varlacoid Chemical Co
666 S. Front Street
Elizabeth, N.J. 07202

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical Pure 99.4%, Optical grade 99.99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 445-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Poisonous solid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight:** 246
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** 572°F = 300°C = 573°K
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 3.43 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

ASP	ASPHALT

Common Synonyms
Asphaltic bitumen
Bitumen
Petroleum asphalt

Thick liquid (generally heated) Dark Brown to black Tar odor

May float or sink in water Rubbery solid is produced when cooled

Stop discharge if possible
Avoid contact with liquid
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible

Extinguish with water [illegible] foam [illegible] carbon dioxide
Cool exposed containers with water

Exposure

LIQUID
Will burn skin and eyes

Flush affected areas with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
FOULING TO SL RELINE
May be dangerous if it enters water intakes

Notify local health and pollution control agencies
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Mechanical containment
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Asphalt cements
Asphaltic bitumen
Bitumen
Petroleum asphalts

3 2 **Coast Guard Compatibility Classification:**
Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not pertinent

3 4 **IMCO/United Nations Numerical Designation:** [illegible] 3 2 1999 3 3/1999

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Dark brown to black

4 3 **Odor:** Tarry

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective clothing face and eye protection when handling hot material

5 2 **Symptoms Following Exposure:** Contact with skin may cause dermatitis Inhalation of vapors may cause moderate irritation of nose and throat Hot liquid burns skin

5 3 **Treatment for Exposure:** Severe burns may result from contact with hot asphalt If molten asphalt strikes the exposed skin cool the skin immediately by quenching with cold water A burn should be covered with a sterile dressing and the patient should be taken immediately to a hospital

5 4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD_{50} 5 to 15 [illegible] kg

5 7 **Late Toxicity:** None observed

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns on short exposure It may cause secondary burns on long exposure

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 300°F 550°F O C

6 2 **Flammable Limits in Air:**
Not pertinent

6 3 **Fire Extinguishing Agents:** Water spray dry chemical foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**
Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:**
Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 400°F 600°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):**
Data not available

8 4 **Food Chain Concentration Potential**
Data not available

9. SELECTED MANUFACTURERS

1 Johns Manville Co
Greenwood Plaza
Denver Colo 80217

2 Sun Oil Co
1608 Walnut St
Philadelphia Pa 19103

3 Witco Chemical Corp
Pioneer Division
277 Park Ave
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Each of the following is available in several grades asphalt cement rapid curing liquid asphalt medium-curing liquid asphalt slow curing liquid asphalt (road oil) emulsified asphalt inverted asphaltic emulsion oxidized (air blown) asphalt

10 2 **Storage Temperature:** Elevated

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-2)

A-T-U-X-Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Combustible liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	4
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight.** Not pertinent

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point.** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity** (est) 1 00 at 20°C (liquid)

13 8 **Liquid Surface Tension**
Data not available

13 9 **Liquid-Water Interfacial Tension:**
70 dynes/cm = 0 07 N/m at 77 °C

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion:**
Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 4 and 5

NOTES

REVISED 1978

ARF — ASPHALT BLENDING STOCKS: ROOFERS FLUX

Common Synonyms
Liquid asphalt
Asphaltum
Flux oil
Road oil
Petroleum tailings
Dust-laying oil

Oily liquid (generally heated) Dark brown to black Tar odor

May float or sink in water Rubbery solid is produced when cooled

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with water, dry chemical, foam, carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes
Harmful if swallowed
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
FOULING TO SHORELINE
May be dangerous if it enters water intakes.
Notify local health and pollution control officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Asphaltum oil
Flux oil
Petroleum tailings
Residual oil
Road oil

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not pertinent

3 4 **IMCO/United Nations Numerical Designation** 3 2/1999 3 3/1999

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Brown to black

4 3 **Odor:** Tarry

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective clothing, face and eye protection

5 2 **Symptoms Following Exposure:** Inhalation of vapors from semi-solid materials causes moderate irritation of nasal and upper respiratory tract passages. Aspiration causes slow onset and low degree of chemical pneumonitis with clinical symptoms of lower respiratory tract irritation. Ingestion produces irritation of gastrointestinal tract

5 3 **Treatment for Exposure:** INHALATION OR ASPIRATION: treatment usually unnecessary. INGESTION: do NOT induce vomiting; do NOT lavage, administer 2-4 oz of olive oil and 1-2 oz of activated charcoal. EYES: wash with plenty of water. SKIN: wipe off material and wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 0.5 to 5 g/kg

5 7 **Late Toxicity:** None observed

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause irritation of eyes or respiratory system if present in high concentrations. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; cause secondary burns on long exposure

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 300-550°F C.C.

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Water, foam, dry chemical, or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 400-700°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not availalbe

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Johns Manville Co
Greenwood Plaza
Denver, Colo 80217

2 Sun Oil Co
1608 Walnut St
Philadelphia, Pa 19103

3 Witco Chemical Corp
Pioneer Division
277 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Elevated

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T-L

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not Listed

12 2 **HAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	4
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** 20 to 110°F = −7 to 43°C = 266 to 316°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** (est.) 1.11 at 50°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

ASR — ASPHALT BLENDING STOCKS STRAIGHT RUN RESIDUE

Common Synonyms
Petroleum residue
Road binder
Seal-coating material
Residual asphalt
Petroleum asphalt
Petroleum pitch

Oily liquid (generally heated) Black Tar odor

May float or sink in water Rubbery solid is produced when cooled

Avoid contact with liquid
Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible

Extinguish with water dry chemical foam or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
LIQUID
Will burn skin and eyes

Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
FOULING TO SHORELINE
May be dangerous if it enters water intakes

Notify local health and pollution control officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Carpeting medium Petroleum asphalt Petroleum pitch Petroleum residue Residual asphalt Road binder Seal coating material

2 2 **Coast Guard Compatibility Classification** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not pertinent

3 4 **IMCO/United Nations Numerical Designation:** 3 2 1999 3 3 1999

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Black

4 3 **Odor:** Tarry

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Protective clothing eye and face protection

5 2 **Symptoms Following Exposure:** Inhalation may cause moderate irritation of nose and throat Skin contact may cause dermatitis

5 3 **Treatment for Exposure:** Severe burns may result from contact with hot asphalt If molten asphalt strikes the exposed skin cool the skin immediately by quenching with cold water A burn should be covered with a sterile dressing and the patient should be taken immediately to a hospital

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 1 LD$_{50}$ 5 to 15 g/kg

5 7 **Late Toxicity:** None observed

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns on short exposure may cause secondary burns on long exposure

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 400 600 F O C

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Water foam carbon dioxide or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used.** Water or foam may cause froth ing

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 450 700 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate.** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

1 Johns Manville Co
Greenwood Plaza
Denver Colo 80217

2 Sun Oil Co
1608 Walnut St
Philadelphia Pa 19103

3 Witco Chemical Corp
Pioneer Division
277 Park Ave
New York N Y 1001

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature** Elevated

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not Listed

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	4
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight.** Not pertinent

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point.** 50 to 225°F = 76 to 107°C = 299 to 380°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** Data not available

13 8 **Liquid Surface Tension** Data not available

13 9 **Liquid-Water Interfacial Tension** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

ATZ	ATRAZINE

Common Synonyms:
2-Chloro-4-ethylamino-6-isopropylamino-s-triazine
Aatrex Herbicide

Solid crystals — White

Sinks in water

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear goggles and self-contained breathing apparatus
Stay upwind. Use water spray to keep down dust
[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move victim to fresh air
If in eyes hold eyelids open and flush with plenty of water
If breathing is difficult give oxygen
[illegible]

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If skin contaminated remove clothing shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim CONSCIOUS have victim drink water
[illegible] milk and have [illegible] induce vomiting
IF SWALLOWED and victim UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify [illegible]
Notify operators [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contamination
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2 Chloro-4-ethylamino-6 isopropylamino S-triazine, Aatrex herbicide

3 2 **Coast Guard Compatibility Classification:** To be developed

3 3 **Chemical Formula.** $C_8H_{14}N_5Cl$

3 4 **IMCO/United Nations Numerical Designation.** 6 1 1699

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Data not available

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles rubber gloves

5 2 **Symptoms Following Exposure** Irritates eyes and skin If ingested irritates mouth and stomach

5 3 **Treatment for Exposure.** EYES flush with copious amounts of water for 15 min SKIN wash with large amounts of water INGESTION no specific antidote induce vomiting and give a saline laxative and supportive therapy

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral rat LD_{50} = 3080 mg kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products** Irritating hydrogen chloride and toxic oxides of nitrogen may be formed

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 12 6 mg L 48 hr rainbow trout TL_m fresh water

8 2 **Waterfowl Toxicity** > 2000 mg kg LD_{50}

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

Ciba Geigy Corporation
Agricultural Division
P O Box 11422
Greensboro N C 27409

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Various grades 70 80% Mixtures with sodium chlorate and sodium metaborate

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not Listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	2
Poisons	0
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight** 215 7

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** 34°°F = 175°C = 348°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity** (est) 1 2 at 20 C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** (est) −9 500 Btu lb = −5 300 cal g = −220 × 10 J kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on page 5 and 6)

NOTES

AZM	# AZINPHOSMETHYL

Common Synonyms		
0, 0-Dimethyl S-[(4-oxo-1,2 3-benzotriazine-3-(4H)-yl) methyl] phosphorodithioate Guthion insecticide Gusathion insecticide	Solid	Brown
	Sinks in water	

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear goggles and suitable organic respiratory apparatus.
Stop spread. Use water spray to knock down dust.
Isolate and remove discharged material.
Notify health and pollution control agencies.

Fire

Not flammable.
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Move victim to fresh air.
If eyes hold eyelids open and flush with plenty of water.
If breathing is difficult give oxygen.

SOLID
POISONOUS IF SWALLOWED.
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not give anything by mouth.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** O O Dimethyl S [(4-oxo 1 2,3 benzotriazine-3(4H)-yl)methyl] phosphorodithioate Guthion insecticide Gusathion insecticide

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_4H_{12}N_3O_3PS_2$

3 4 **IMCO/United Nations Numerical Designation:** 6 1/1615

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Brown

4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask protective goggles rubber gloves

5 2 **Symptoms Following Exposure:** Dust irritates eyes Inhalation or ingestion causes sweating constriction of pupils of eyes asthmatic symptoms cramps, weakness convulsions collapse

5 3 **Treatment for Exposure:** INHALATION remove to fresh air keep warm call doctor EYES flush with water for at least 15 min SKIN flush with water wash with soap and water INGESTION get medical attention at once, give water slurry of charcoal, do NOT give milk or alcohol

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 2 mg m

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4, oral rat LD_{50} = 11 15 5 mg kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Oxides of sulfur and phosphorus may be formed when in fire situation

6 6 **Behavior in Fire:** Data not available

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 0 005 mg/l 96 hr bluegill/TL m/fresh water

8 2 **Waterfowl Toxicity:** 136 mg/kg LD_{50}

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

Baychem Corporation
Chemagro Division
Box 4913
Kansas City, Mo 64120

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, 50% wettable powder, water emulsions

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 317

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** 163°F = 73°C = 346°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 4 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est) = 8 600 Btu lb = −4,800 cal/g = −200 X 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

BRC	BARIUM CARBONATE

Common Synonyms	Solid crystals or powder	White	Odorless
	Sinks in water		

[illegible]

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID **SOLID** **If swallowed, will cause nausea and vomiting** IF SWALLOWED and victim is CONSCIOUS [illegible] drink water [illegible]
Water Pollution	**HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS** **Fouling to shoreline** **May be dangerous if it enters water intakes** Notify local health and wildlife officials Notify operators of affected water intake

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $BaCO_3$
3 4 **IMCO United Nations Numerical Designation:** 6 1 1564

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator
5 2 **Symptoms Following Exposure:** (INGESTION ONLY) excessive salivation vomiting severe abdominal pain and violent purging with watery and bloody stools a slow and often irregular pulse and a transient elevation in arterial blood pressure tinnitus giddiness and vertigo muscle twitchings progressing to convulsions and/or paralysis dilated pupils with impaired accommodation confusion and increasing somnolence without coma collapse and death from respiratory failure and cardiac arrest
5 3 **Treatment for Exposure:** Rapid oral administration of a soluble sulfate in water such as magnesium or sodium sulfate (2 oz) alum (4 gm) or very dilute sulfuric acid (30 ml of a 10% solution diluted to 1 qt) These agents precipitate barium as the insoluble sulfate Gastric lavage or induced emesis Seek medical attention
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 to 5 g/kg (rabbit rat guinea pig)
5 7 **Late Toxicity:** None observed
5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics:** None
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential.** Data not available

9 SELECTED MANUFACTURERS

1 Chemical Products Corp
Cartersville Georgia 30120
2 FMC Corp
Inorganic Chemicals Div
633 Third Ave
New York N Y 10017
3 Sherwin Williams Co
Sherwin Williams Chemicals Div
P O Box 5658
Cleveland Ohio 44101

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent grade 99 0+ Ceramic grade 98 1+ Ceramic and chemical grade 99 3+ Glass grade 98 8% Electronic ceramic grade 99 6+
10 2 **Storage Temperature:** Data not available
10 3 **Inert Atmosphere:** Data not available
10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

11

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 197 35
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 4 3 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

NOTES

BCR	# BARIUM CHLORATE

Common Synonyms	Solid	White	Odorless
	Sinks and mixes with water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear goggles, self-contained breathing apparatus, and rubber gloves.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
May cause fire on contact with combustibles
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Combat fires from safe distance, especially if [illegible]
Flood discharge area with water.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move victim to fresh air.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing is difficult, give oxygen.

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, give 2 glasses of water or milk and have vomiting induced.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify appropriate health and pollution control agencies.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Issue warning: oxidizing material, water contaminant
Should be removed
Chemical and physical treatment
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Barium chlorate monohydrate
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $Ba(ClO_3)_2 \cdot H_2O$
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, dust respirator (U.S. Bureau of Mines approved), rubberized shoes and gloves, coveralls or other suitable outer clothing.

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of upper respiratory system. Contact with eyes or skin causes irritation. Ingestion causes abdominal pain, nausea and vomiting, diarrhea, pallor, blueness, shortness of breath, excessive salivation, convulsive tremors, slow, hard pulse, elevated blood pressure, unconsciousness. Hemorrhages may occur in the stomach, intestines and kidneys. Muscular paralysis may follow.

5.3 **Treatment for Exposure:** Get medical attention. Alert doctor to possibility of barium poisoning, particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with copious quantities of water for at least 15 min., get medical attention. SKIN: flush with water. INGESTION: induce vomiting and call a physician; have victim drink aqueous 10% solution of magnesium or sodium sulfate for severe intoxication. Calcium or a magnesium salt may have to be given I.V. with caution. Treatment otherwise is supportive and symptomatic.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Barium poisoning
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable (but see 7.2)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Data not available
6.5 **Special Hazards of Combustion Products:** Yields toxic fumes when involved in fire
6.6 **Behavior in Fire:** May cause an explosion when involved in a fire
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Can form explosive mixtures with combustible materials such as oil and wood; these can be ignited by friction.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Barium and Chemicals, Inc.
   P.O. Box 218
   Steubenville, Ohio 43952
2. Ceras, Inc.
   13460 W. Silver Spring Road
   Menomonee Falls, Wis. 53051
3. Gallard-Schlesinger Chemical Manufacturing Co.
   584 Mineola Avenue
   Carle Place, N.Y. 11514

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical Reagent
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment handbook, CG-446-3)

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	0	1
Flammability (Red)	0	0
Reactivity (Yellow)	2	2
	OXY	OXY

*First column refers to entire situation.

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 332 (monohydrate)
13.3 **Boiling Point at 1 atm.:** Not pertinent
13.4 **Freezing Point:** [illegible] = [illegible] °C = [illegible] °K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.18 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** 36 Btu/lb = 20 cal/g = 0.84 × 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

BNT	# BARIUM NITRATE

Common Synonyms

Solid White Odorless

Sinks and mixes with water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY

Fire

Not flammable
May cause fire on contact with combustibles
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: oxidizing material in water contaminant
Should be removed
Chemical and physical treatment
Disperse and flush

2. LABEL

OXIDIZER

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $Ba(NO_3)_2$
3.4 **IMCO/United Nations Numerical Designation:** UN 1446

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles, face shield, dust respirator, rubber gloves and shoes, suitable coveralls
5.2 **Symptoms Following Exposure:** Inhalation or contact with eyes or skin causes irritation. Ingestion causes excessive salivation, vomiting, colic, diarrhea, convulsive tremors, slow, hard pulse, elevated blood pressure. Hemorrhages may occur in the stomach, intestines and kidneys. Muscular paralysis may follow.
5.3 **Treatment for Exposure:** Get medical attention. Alert doctor to possibility of barium poisoning, particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with water for at least 15 min. SKIN: flush with water. INGESTION: oral administration of an aqueous 10% solution of magnesium or sodium sulfate in severe poisoning; oral administration of a magnesium salt may have to be given IV with caution. Treatment otherwise is supportive and symptomatic.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 oral rat LD_{50} = 355 mg/kg
5.7 **Late Toxicity:** Barium poisoning
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable (but see 7.2)
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Yields toxic gaseous oxides of nitrogen when involved in fire
5.6 **Behavior in Fire:** Mixtures with combustible materials are readily ignited and may burn fiercely. Containers may explode.
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Contact with combustible material may cause fire
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 500 ppm/168 hr stickleback average survival fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. J. T. Baker Chemical Co.
Phillipsburg, N.J. 08865
Barium and Chemicals Inc.
P.O. Box 2?8
Steubenville, Ohio 43952
3. Newton Corp.
Alta Products
P.O. Box 150
Beverly, Mass. 01915

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical Reagent
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0
	OX

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 261.35
13.3 **Boiling Point at 1 atm:** Decomposes
13.4 **Freezing Point:** 592°C = 865°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.24 at 23°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** 16 Btu/lb = 20 cal/g = 0.84 × 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 4

NOTES

BPC	# BARIUM PERCHLORATE

Common Synonyms	Solid	White	Odorless
	Sinks and mixes with water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear rubber [illegible]
[illegible] may be discharged [illegible]
[illegible]

Fire

Not flammable
May explode on contact with combustibles.
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Containers may explode in fire
Combat fires [illegible]
Flood discharge at [illegible] water
Cool exposed [illegible] water

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
[illegible]
[illegible]
[illegible]

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
[illegible]
Flush affected areas with plenty of water
IF IN EYES: hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is conscious: have victim drink water [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: oxidizing material
water contaminant
Should be removed
Chemical and physical treatment
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Barium perchlorate trihydrate
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $Ba(ClO_4)_2 \cdot 3H_2O$
3.4 **IMCO/United Nations Numerical Designation:** 1.144*

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, dust respirator, rubber gloves and shoes, suitable coveralls
5.2 **Symptoms Following Exposure:** Inhalation or contact with eyes or skin causes irritation. Ingestion causes excessive salivation, vomiting, coma, diarrhea, convulsive tremors, slow, hard pulse, and elevated blood pressure, hemorrhages may occur in the stomach, intestines, and kidneys, muscular paralysis may follow.
5.3 **Treatment for Exposure:** Get medical attention. Alert doctor to possibility of barium poisoning particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with water for at least 15 min. SKIN: flush with water. INGESTION: oral administration of an aqueous 10% solution of magnesium or sodium sulfate, for severe intoxication, caution or a magnesium salt may have to be given IV with caution, treatment otherwise is supportive and symptomatic.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Lethe Toxicity:** Barium poisoning
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable (but see 7.2)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Increases the intensity of fire. Containers may explode
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** When mixed with combustible material or finely divided metals, can cause explosions
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Barium and Chemicals, Inc
P. O. Box 210
Steubenville, Ohio 43952
2. Cerac, Inc
13460 W. Silver Spring Rd
Menomonee Falls, Wis. 53051
3. Gallard Schlesinger Chemical Manufacturing Co
584 Mineola Ave
Carle Place, N. Y. 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, Reagent
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing materials
12.2 **NAS Haze: 1 Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 390.35
13.3 **Boiling Point at 1 atm:** Decomposes
13.4 **Freezing Point:** 941°F = 505°C = 778°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.2 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** 9.2 cal/g = 0.2 × 10⁶ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 3 and 4

NOTES

BPM	BARIUM PERMANGANATE

Common Synonyms	Solid	Dark purple to black	Odorless
	Sinks and mixes with water		

[illegible]

Fire

Not flammable
May cause fire on contact with combustibles
Containers may explode in fire
[illegible]

Exposure

[illegible]

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
[illegible]

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-7)

Issue warning - oxidizing material, water contaminant
Should be removed
Chemical and physical treatment
Disperse and flush

2. LABEL

OXIDIZER

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $Ba(MnO_4)_2$
3.4 **IMCO/United Nations Numerical Designation:** 5.1 1448

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Dark purple to black
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, dust respirator, rubber gloves and shoes
5.2 **Symptoms Following Exposure:** Inhalation or contact with eyes or skin causes irritation. Ingestion causes abdominal pain, nausea, vomiting, pallor, shortness of breath
5.3 **Treatment for Exposure:** Get medical attention. Alert doctor to possibility of barium poisoning particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with copious amounts of water for 15 min. SKIN: wash with copious amounts of water. INGESTION: induce vomiting, give a 10% water solution of Epsom salt
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Barium poisoning
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Can increase the intensity of fire
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** When mixed with combustible material can ignite by friction or acids may be spontaneously combustible
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
2.2 to 4.1 mg/l of Mn 8 to 18 hr fish killed
*Type of water not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Cerac Inc.
13460 W. Silver Spring Rd.
Menomonee Falls, Wis. 53051
2. Ventron Corp.
Alfa Products
P. O. Box 159
Beverly, Mass. 01915

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 375
13.3 **Boiling Point at 1 atm:** Decomposes
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.7° at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heat of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

BPO	# BARIUM PEROXIDE

Common Synonyms

Barium dioxide
Barium superoxide
Barium binoxide

Solid — Light gray to tan — Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.
Wear rubber aprons, chemical goggles, including gloves.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
May cause fire on contact with combustibles
Containers may explode in fire
Combat fires from safe distance or protected location.
Flood discharge area with water.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move victim to fresh air.
If in eyes, hold eyelids open and flush with pints of water.
If breathing is difficult, give oxygen.

SOLID
POISONOUS IF SWALLOWED
Will burn skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with pints of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning. Oxidizing material.
Water contaminant.
Should be removed.
Chemical and physical treatment.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Barium dioxide
Barium superoxide
Barium binoxide

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** BaO_2

3.4 **IMCO/United Nations Numerical Designation:** No. 1449

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Light grayish tan, grayish white

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible] approved dust respirator, liquid proof PVC gloves, chemical safety goggles, full cover clothing

5.2 **Symptoms Following Exposure:** Inhalation causes irritation to mucous membranes, throat, and nose. Contact with eyes or skin causes severe burns. Ingestion causes excessive salivation, vomiting, diarrhea, convulsions, tremors, weak, hard pulse, and elevated blood pressure. Severe burns occur in the stomach, intestines, and esophagus. Muscular paralysis may follow.

5.3 **Treatment for Exposure:** Get medical attention. Alert doctor to ingestion of barium peroxide. If solution of compound was swallowed: INHALATION: remove to fresh air. EYES: flush with water for [illegible] min. SKIN: flush with water. INGESTION: [illegible] solution of magnesium or sodium sulfate. In severe intoxication, can give a magnesium salt. May have to be given IV with caution. Treatment: shock, supportive and symptomatic.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Barium poisoning

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable, but may cause fire on contact with combustibles

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Flood with water, dry powder (e.g. graphite powder), limestone

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

5.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Can increase intensity of fire

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Decomposes slowly. The reaction is not hazardous.

7.2 **Reactivity with Common Materials:** Corrodes metal slowly. If mixed with combustible material or finely divided metals, can cause spontaneous ignition.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. FMC Corporation
Industrial Chemicals Division
633 Third Avenue
New York, N.Y. 10017

2. J. T. Baker Chemical Co.
Phillipsburg, N.J. 08865

3. Barium and Chemicals, Inc.
P.O. Box 2-A
Steubenville, Ohio 43952

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 91-92%, high purity reagent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

11

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Decomposes

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** [illegible]

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

BZD — BENZALDEHYDE

Common Synonyms
Oil of bitter almond
Benzoic aldehyde

Watery liquid — Colorless to pale yellow — Bitter almond odor

May float or sink in water

Stop discharge if possible. Keep people away.
Avoid contact with liquid.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with CO2, dry chem, foam or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have vomiting induced.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and pollution control official.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contaminant
Should be removed

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Benzoic aldehyde
Oil of bitter almond

3.2 **Coast Guard Compatibility Classification**
Not applicable

3.3 **Chemical Formula:** C_6H_5CHO

3.4 **IMCO/United Nations Numerical Designation** 1/1990

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale yellow

4.3 **Odor:** Like almonds

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles and protective clothing

5.2 **Symptoms Following Exposure** Inhalation of concentrated vapor may irritate eyes, nose and throat. Liquid is irritating to the eyes. Prolonged contact with the skin may cause irritation.

5.3 **Treatment for Exposure:** SKIN EYE CONTACT: move victim to fresh air. Call physician immediately. Wash contaminated skin area with water. Flush eyes with plenty of water for at least 15 min. INGESTION: induce vomiting. Call a physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 0.5 to 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.042 ppm

6. FIRE HAZARDS

6.1 **Flash Point** 148°F (C.C.), 165°F (O.C.)

6.2 **Flammable Limits in Air:**
Data not available

6.3 **Fire Extinguishing Agents** Water spray, foam, carbon dioxide, or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6.5 **Special Hazards of Combustion Products.**
Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature:** 378°F

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** 3.8 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization.**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD).**
50% 10 days
150% 5 days

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. Fritzsche Dodge and Olcott Inc.
Clifton, N.J. 07015
2. Stauffer Chemical Co.
Specialty Chemicals Division
Edison, N.J. 08817
3. Tenneco Inc.
Tenneco Chemicals Inc.
280 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical grade 98.0%
NF (FCC) grade 98.0%

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere.** Inerted

10.4 **Venting** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification:
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** 106.12

13.3 **Boiling Point at 1 atm.**
354°F = 179°C = 452°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:**
666°F = 352°C = 625°K

13.6 **Critical Pressure:**
316 psia = 21.5 atm = 2.18 MN/m²

13.7 **Specific Gravity.** 1.046 at 20°C (liquid)

13.8 **Liquid Surface Tension.**
40.9 dynes/cm = 0.040 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
15.5 dynes/cm = 0.0155 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.1

13.12 **Latent Heat of Vaporization.**
156 Btu/lb = 86.5 cal/g = 3.62 × 10³ J/kg

13.13 **Heat of Combustion.** −13,730 Btu/lb
= −7630 cal/g = −319.5 × 10³ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

BNZ	BENZENE

Common Synonyms
Benzol
Benzole

Watery liquid — Colorless — Gasoline-like odor

Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F

Avoid contact with liquid and vapor. Keep people away.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and downwater; prevent knockdown of vapor.
Isolate and retrieve discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause headache, difficult breathing, or loss of consciousness
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Restrict access.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Benzol, Benzole
3.2 **Coast Guard Compatibility Classification:** Aromatic hydrocarbon
3.3 **Chemical Formula** C_6H_6
3.4 **IMCO/United Nations Numerical Designation:** 3.2, 1114

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Aromatic, rather pleasant aromatic odor, characteristic odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Hydrocarbon vapor canister, supplied air or a hose mask, hydrocarbon insoluble rubber or plastic gloves, chemical goggles or face splash shield, hydrocarbon insoluble apron such as neoprene.
5.2 **Symptoms Following Exposure:** Dizziness, excitation, pallor followed by flushing, weakness, headache, breathlessness, chest constriction, coma and possible death.
5.3 **Treatment for Exposure:** SKIN: flush with water followed by soap and water, remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subside. INHALATION: remove from exposure immediately. Call a physician. If breathing is irregular or stopped, start resuscitation, administer oxygen.
5.4 **Toxicity by Inhalation (Threshold Limit Value).** 25 ppm
5.5 **Short-Term Inhalation Limits.** 75 ppm for 30 min
5.6 **Toxicity by Ingestion.** Grade 3. LD_{50} 501 to 500 mg/kg
5.7 **Late Toxicity.** Leukemia
5.8 **Vapor (Gas) Irritant Characteristics.** If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 4.68 ppm

6. FIRE HAZARDS

6.1 **Flash Point** 12°F C.C.
6.2 **Flammable Limits in Air:** 1.4% - 7.9%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 1097°F
6.8 **Electrical Hazard.** Class I, Group D
6.9 **Burning Rate:** 6.0 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity**
5 ppm/6 hr/minnow/lethal/distilled water
20 ppm/24 hr/sunfish/TLm/tap water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 1.2 lb/lb/10 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Commonwealth Oil Refining Co. Inc.
Commonwealth Petrochemicals Co.
Penuelas, Puerto Rico 00724
2. Phillips Petroleum Co.
Phillips Puerto Rico Corp. Inc.
Banco Popular Center
Hato Rey, P.R. 00936
3. Shell Chemical Co.
Petrochemicals Div.
P.O. Box 2463
Houston, Texas 77001

10. SHIPPING INFORMATION

10.1 **Grades of Purity**

Industrial	99+%
Thiophene free	99+%
Nitration	99+%
Industrial 90%	85+%
Reagent	99+%

10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T-U-A-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight.** 78.11
13.3 **Boiling Point at 1 atm:** 176°F = 80.1°C = 353.3°K
13.4 **Freezing Point:** 42.0°F = 5.5°C = 278.7°K
13.5 **Critical Temperature:** 552.0°F = 288.9°C = 562.1°K
13.6 **Critical Pressure:** 710 psia = 48.3 atm = 4.89 MN/m²
13.7 **Specific Gravity:** 0.879 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 28.9 dynes/cm = 0.0289 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 35.0 dynes/cm = 0.035 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 2.7
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.061
13.12 **Latent Heat of Vaporization:** 169 Btu/lb = 94 Cal/g = 3.94 × 10⁵ J/kg
13.13 **Heat of Combustion:** −17,460 Btu/lb = −9698 cal/g = −406.0 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

BHC	BENZENE HEXACHLORIDE

Common Synonyms
1,2,3,4,5,6-Hexachlorocyclohexane
Lindane
BHC
Gammexane
Tri-6

Solid crystals or powder, or solution — Solid is light to dark brown — Musty odor

Solid sinks in water. Solution generally floats on water

Avoid contact with liquid and solid. Keep people away.
Wear goggles and self contained breathing apparatus.
Stop discharge if possible.
Call fire department.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control officer.

Fire

Solid not flammable, but usually dissolved in combustible liquid
POISONOUS GASES ARE PRODUCED WHEN SOLID IS HEATED OR WHEN SOLUTION BURNS
Wear goggles and self contained breathing apparatus.
Extinguish with foam, dry chemical, or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

SOLID OR SOLUTION
POISONOUS IF SWALLOWED
Irritating to skin and eyes
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and pollution control officers.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contaminant poison.
Should be removed.
Chemical and physical treatment.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
BHC
Gammexane
1,2,3,4,5,6-Hexachlorocyclohexane
Lindane

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C_6H_6Cl_6$

3.4 **IMCO United Nations Numerical Designation:** 6.1/1618

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid

4.2 **Color:** Light tan to dark brown

4.3 **Odor:** Characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Data not available

5.2 **Symptoms Following Exposure:** Hyperirritability and central nervous excitation, notable vomiting, restlessness, muscle spasms, ataxia, and clonic and tonic convulsions. Subsequent central nervous depression leading to respiratory failure. Occasional dermatitis and urticaria.

5.3 **Treatment for Exposure.** Gastric lavage and saline cathartics (not oil laxatives because they promote absorption). Sedatives, pentobarbital or phenobarbital in amounts adequate to control convulsions. Calcium gluconate intravenously may be used in conjunction with sedatives to control convulsions. Rest and quiet. Do NOT use epinephrine because ventricular fibrillation may result.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 0.5 mg/m³

5.5 **Short-Term Inhalation Limits.** 1 mg/m³ for 30 min

5.6 **Toxicity by Ingestion:** Gamma isomer (Lindane) Grade 3 LD_{50} 50 to 500 mg/kg (rat). Technical mixture, Grade 2 LD_{50} 0.5 to 5 g/kg

5.7 **Late Toxicity:** Mutagen to human lymphocytes

5.8 **Vapor (Gas) Irritant Characteristics:** Moderately irritating. Personnel will not usually tolerate moderate or high concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6.1 **Flash Point.** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic gases are generated when solid is heated or when solution burns.

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.77 ppm 96hr bluegill TL_m fresh water
0.138 ppm 96hr guppy TL_m fresh water
0.014 ppm 10hr coho salmon 100% lethal salt water

8.2 **Waterfowl Toxicity.** 2000 mg/kg

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** High

9. SELECTED MANUFACTURERS

Hooker Chemical Corp.
Industrial Chemicals Div.
Niagara Falls, N.Y. 14302

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
Fortified grade: 40-45% gamma isomer
Lindane: pure gamma isomer

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting.** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

11

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	2	2
Flammability (Red)	0	1
Reactivity (Yellow)	0	0

*First column refers to non fire situation

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 290.83

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.891 at 19°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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BPD	BENZENE PHOSPHORUS DICHLORIDE

Common Synonyms			
Phenylphosphorus dichloride	Liquid	Colorless	Unpleasant odor
	Reacts violently with water Poisonous visible vapor cloud is produced		

[illegible]

Fire

Fire data not available

Exposure

CALL FOR MEDICAL AID

GAS PRODUCED IN REACTION WITH WATER
POISONOUS IF INHALED
Irritating to eyes, nose and throat
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
IF EYES [illegible]
IF SWALLOWED [illegible] CONSCIOUS [illegible] water milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning corrosive
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Phenyl phosphonous dichloride
Phenylphosphine dichloride
Dichlorophenylphosphine

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula** $C_6H_5PCl_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor** Acrid pungent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus acid type canister mask goggles and face shield rubber gloves protective clothing

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat pulmonary edema may develop following severe exposures Contact with skin or eyes causes severe burns Ingestion causes severe burns of mouth and stomach

5 3 **Treatment for Exposure:** Get medical attention following all exposures to this compound INHALATION remove to fresh air if breathing has stopped start mouth to mouth resuscitation EYES flush with water for at least 15 min do not use oils or ointments SKIN flush with water wash with soap and water INGESTION give large amounts of milk or water do NOT induce vomiting if vomiting does occur give milk or beaten eggs at one hour intervals

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

[illegible] Flash point 2[illegible] F O C May be lower because of presence of dissolved phosphorus

Flammable Limits in Air: Not pertinent

6 3 **Fire Extinguishing Agents:** Large amounts of water

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic fumes include oxides of phosphorus and hydrogen chloride

6 6 **Behavior in Fire:** Containers may rupture [illegible] liquid is spontaneously flammable because of presence of dissolved phosphorus

6 7 **Ignition Temperature.** 419°F

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** Reacts vigorously to form hydrogen chloride (hydrochloric acid)

7 2 **Reactivity with Common Materials** Corrodes metal except 316 stainless steel nickel or Hastelloy

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Flush with water rinse with sodium bicarbonate or lime solution

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 PCR Inc
P O Box 1466
Gainesville Fla 32602

2 Aldrich Chemical Co
940 West St Paul Ave
Milwaukee Wis 53233

3 Stauffer Chemical Co
Agricultural Chemical Division
Westport Conn 06880

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Corrosive

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight.** 179 0

13 3 **Boiling Point at 1 atm.** 430°F = 221°C = 494°K

13 4 **Freezing Point** −60 F = −51 C = 222 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 1 140 at 25°C (liquid)

13 8 **Liquid Surface Tension.** (est) 25 dynes/cm = 0 025 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** (est) −8 200 Btu/lb = −4 500 cal/g = −190 × 10 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** −72 Btu/lb = −40 cal/g = −1 7 × 10 J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

BPT	BENZENE PHOSPHORUS THIODICHLORIDE

Common Synonyms

Benzenethiophosphonyl chloride
Phenylphosphonothioic dichloride
Phenylphosphine thiodichloride

Liquid | Colorless | Unpleasant odor

Sinks and reacts in water. Poisonous visible vapor cloud is produced

[illegible]

Fire

Fire data not available

Exposure

CALL FOR MEDICAL AID
VAPOR PRODUCED IN REACTION WITH WATER

POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move to fresh air
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated [illegible]
Flush affected areas with [illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible] milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Benzenethiophosphonyl chloride
Phenylphosphonothioic dichloride
Phenylphosphine thiodichloride

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula.** $C_6H_5PSCl_2$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to light yellow

4 3 **Odor:** Acid pungent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Self contained breathing apparatus and type canister mask goggles and face shield rubber gloves protective clothing

5 2 **Symptoms Following Exposure:** Inhalation of vapor irritates nose and throat pulmonary edema may result Contact with eyes or skin causes severe irritation Ingestion causes severe irritation of mouth and stomach

5 3 **Treatment for Exposure** Get medical attention following all exposures to this compound INHALATION remove to fresh air EYES flush with water for at least 15 min do not use oils or ointments SKIN flush with water wash with soap and water INGESTION give large amounts of water or milk induce vomiting give milk eggs or olive oil

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** 252°F O C

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents:** Water

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic fumes include oxides of phosphorus and sulfur and hydrogen chloride

6 6 **Behavior in Fire.** Containers may rupture

6 7 **Ignition Temperature:** 330 F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Forms hydrogen chloride fumes (hydrochloric acid) The reaction is slow unless water is hot

7 2 **Reactivity with Common Materials:** Corrodes metal slowly

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Flush with water rinse with sodium bicarbonate or lime solution

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 West St Paul Ave
Milwaukee Wis 53233

2 PCR Inc
P O Box 1466
Gainesville Fla 32602

3 Stauffer Chemical Co
Agricultural Chemical Division
Westport Conn 06880

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 211

13 3 **Boiling Point at 1 atm**
[illegible] 270°C = 543 K

13 4 **Freezing Point.**
−11.2 F = −24.0 C = 249.2 K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.378 at 20°C (liquid)

13 8 **Liquid Surface Tension**
(est) 28 dyne/cm = 0.028 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion** (est) −7,700 Btu/lb
= −4,300 cal/g = −180 × 10 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** (est) −9 Btu/lb
= −5 cal/g = −0.2 × 10 J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

BZA	BENZOIC ACID

Common Synonyms Benzenecarboxylic acid Carboxybenzene	Solid crystals or powder — White — Faint pleasant odor Sinks in water
[illegible]	
Fire	Combustible Vapor may explode if ignited in an enclosed area Dust may form explosive mixture with air Extinguish with water, dry chemical, carbon dioxide, foam, or halon
Exposure	CALL FOR MEDICAL AID **DUST** Irritating to nose and throat if inhaled Move to fresh air **SOLID** Irritating to skin and eyes Flush affected areas with plenty of water IF IN EYES hold lids open and flush with plenty of water
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Notify Local Health and Wildlife officials Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Benzenecarboxylic acid
Carboxybenzene
Diacyclic acid

3 2 **Coast Guard Compatibility Classification**
Not applicable

3 3 **Chemical Formula:** C_6H_5COOH

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** White

4 3 **Odor:** Faint pleasant slight aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Bureau of Mines dust respirator when melted material present use eye protection and organic respirator for fumes

5 2 **Symptoms Following Exposure:** Dust may be irritating to nose and eyes At elevated temperatures fumes may cause irritation of eyes respiratory system and skin

5 3 **Treatment for Exposure** Remove patient to fresh air EYE CONTACT flush eyes with water

5 4 **Toxicity by Inhalation, (Threshold Limit Value).** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion** Grade 2 LD_{50} 0 [illegible] g/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin Dust may irritate nose and eyes

5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point** 250°F C C

6 2 **Flammable Limits in Air:** Not pertinent

6 5 **Fire Extinguishing Agents** Dry powder chemical foam water fog carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** None

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Vapor from molten benzoic acid may form explosive mixtures with air Concentrated dust may form explosive mixture

6 7 **Ignition Temperature:** 1063 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
200 ppm/7 hr goldfish/lethal fresh water
500 ppm/48 hr sunfish/lethal fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
1650 mg/g/5 days

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Monsanto Co
Monsanto Industrial Chemicals Co
800 North Lindbergh Blvd
St Louis Mo 63166

2 Northwest Industries Inc
Velsicol Chemical Corp
341 E Ohio St
Chicago Ill 60611

3 Tenneco Chemicals Inc
Tenneco Intermediates Div
5 Turner Place
Piscataway N J 08854

10 SHIPPING INFORMATION

10 1 **Grades or Purity:**
USP FCC grade 99 5% 100 5%

10 2 **Storage Temperature:**
Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3

H

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 122 12

13 3 **Boiling Point at 1 atm:**
480 to 51 = 249 2°C = 522 4°K

13 4 **Freezing Point:** 252 1°F = 122 3°C = 395 5°K

13 5 **Critical Temperature:**
894°F = 479°C = 752°K

13 6 **Critical Pressure:**
660 psia = 45 atm = 4 6 MN/m

13 7 **Specific Gravity:** 1 316 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6

NOTES

BZN	# BENZONITRILE

Common Synonyms			
Phenylcyanide Cyanobenzene Benzoic acid nitrile	Liquid	Colorless	Almond-like odor
	May float or sink in water		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY
[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]
Water may be ineffective in fire
[illegible]

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, difficult breathing or loss of consciousness.
[illegible]
LIQUID
Irritating to skin and eyes
If swallowed will cause headache, nausea, vomiting or loss of consciousness.
[illegible]
IF IN EYES [illegible] plenty of water
IF SWALLOWED [illegible] CONSCIOUS [illegible] water [illegible] tank
IF SWALLOWED [illegible] NO CONSCIOUSNESS OR HAVING CONVULSIONS [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Benzoic acid nitrile, Cyanobenzene, Phenylcyanide
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula.** C_6H_5CN
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Almond like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, splash proof goggles, rubber boots or rubber overshoes, impervious clothing for splash protection, cartridge, gas mask, or other protection against vapor must be worn for working in poorly ventilated areas or where poisoning by inhalation may be possible

5.2 **Symptoms Following Exposure:** Benzonitrile may enter the human body by ingestion, absorption through the skin, or inhalation. The earliest symptoms of cyano compound intoxication may be weakness, headaches, confusion, and occasionally nausea and vomiting. The respiratory rate and depth will usually be increased at the beginning and at later stages become slow and gasping. Blood pressure is usually normal, especially in the mild or moderately severe cases, although the pulse rate is usually more rapid than normal.

5.3 **Treatment for Exposure:** INHALATION: remove patient to fresh air, get immediate medical attention. INGESTION: *Call physician immediately.* Until physician arrives, take the following steps: a. Provide for inhalation of amyl nitrite vapor from ampules crushed in a handkerchief and held to the nose of the victim. b. Induce vomiting unless patient is unconscious. (Gastric lavage should be employed by, or under the supervision of, a physician.) c. Keep patient warm and quiet until medical attention arrives. EYES: immediately flush with large volumes of water for at least 15 min. SKIN: wash thoroughly at once, without scrubbing, with large amounts of soap and water. OTHER: exposed personnel should be checked periodically for chronic toxic effects.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 800 mg/kg

(Continued on page 4)

6. FIRE HAZARDS

(Material is combustible but burns with difficulty)

6.1 **Flash Point:** 167°F C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products.** Toxic hydrogen cyanide and oxides of nitrogen may form in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature.** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Difficult to burn

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.** Will attack some plastics
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
5 ppm/24 hr/rainbow trout/no effect/fresh water
135 ppm/96 hr/fathead minnow/TLm/soft fresh water
78 ppm/96 hr/fathead minnow/TLm/hard fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** 60% (theo.) 18 days
8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1. Velsicol Chemical Corp.
341 E. Ohio Street
Chicago, Ill. 60611
2. Eastman Organic Chemicals
Rochester, N.Y. 14650
3. Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Ventilated (natural)
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A T X

12. HAZARD CLASSIFICATIONS

12.1 ***Code of Federal Regulations.*** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 103.12
13.3 **Boiling Point at 1 atm.** 376°F = 191°C = 464°K
13.4 **Freezing Point:** 9.0°F = −12.8°C = 260.4°K
13.5 **Critical Temperature:** 799.2°F = 426.2°C = 699.4°K
13.6 **Critical Pressure:** 611 psia = 41.6 atm = 4.22 MN/m²
13.7 **Specific Gravity:** 1.01 at 25°C (liquid)
13.8 **Liquid Surface Tension.** 34.7 dynes/cm = 0.0347 N/m at 25°C
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** 3.6
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.091
13.12 **Latent Heat of Vaporization:** 155.7 Btu/lb = 87.6 cal/g = 3.67 × 10⁵ J/kg
13.13 **Heat of Combustion:** −15,100 Btu/lb = −8,400 cal/g = −351 × 10³ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

5. HEALTH HAZARDS (Cont'd.)

5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

BZP	BENZOPHENONE

Common Synonyms			
Benzoyl benzene Diphenyl ketone Diphenyl methanone Alpha-oxodiphenylmethane Alpha-oxodiene	Liquid or solid	White	Flowers odor
	May float or sink in water		

Fire	Combustible
Exposure	AVOID CONTACT WITH LIQUID OR SOLID **LIQUID OR SOLID** Irritating to skin and eyes. If swallowed will cause nausea, or vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Benzoylbenzene
Diphenylketone Diphenylmethanone
alpha Oxodiphenylmethane
alpha Oxodiene

3 2 **Coast Guard Compatibility Classification**
Not listed

3 3 **Chemical Formula:** $C_6H_5COC_6H_5$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):**
Liquid or solid

4 2 **Color:** White

4 3 **Odor:** Characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion causes gastrointestinal disturbances Contact causes eye irritation and if prolonged irritation of skin

5 3 **Treatment for Exposure:** INHALATION remove to fresh air INGESTION get medical attention EYES flush with water for at least 15 min get medical attention if irritation persists SKIN flush with water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 1 acute oral rat LD_{50} = 10 000 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

(Material is combustible)

6 1 **Flash Point:** Data not available

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Will attack some plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1 Eastman Organic Chemical
Rochester N Y 14650

2 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99+

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T X or H

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**
Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Solid

13 2 **Molecular Weight:** 182

13 3 **Boiling Point at 1 atm:**
581.9°F = 305.5°C = 578.7°K

13 4 **Freezing Point:**
116.2°F = 47.9°C = 321.1°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.085 at 50°C (liquid)

13 8 **Liquid Surface Tension:**
42 dynes/cm = 0.042 N/m at 50°C

13 9 **Liquid-Water Interfacial Tension:**
Data not available

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization:** 26.5 Btu/lb
= 700 cal/g = 2.93 x 10⁶ J/kg

13 13 **Heat of Combustion** −15 400 Btu/lb
= −8 550 cal/g = −35.8 x 10⁶ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on pages 3 and 4

NOTES

BZC	# BENZOYL CHLORIDE

Common Synonyms	
Benzenecarbonyl chloride	Watery liquid Colorless to slightly brown Sinks and reacts slowly with water producing a poisonous gas.

Avoid contact with liquid and vapor
Wear goggles and self-contained breathing apparatus
Keep people away. Evacuate area in case of large discharge
Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED
Wear goggles and self-contained breathing apparatus
DO NOT USE WATER
Extinguish with foam, dry chemical, carbon dioxide

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes.
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids apart and flush with plenty of water
IF SWALLOWED and victim CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Isolate spilled material
Recover usable
Chemically neutralize remnant

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Benzoyl chloride, benzoic acid chloride
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** C_6H_5COCl
3.4 **IMCO United Nations Numerical Designation:** None

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless; may become slightly brownish on standing
4.3 **Odor:** Pungent characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full protective clothing, including full face respirator for acid gases and organic vapors (yellow GMC canister), close fitting goggles, nonslip rubber gloves, plastic apron, face shield
5.2 **Symptoms Following Exposure:** INHALATION may irritate eyes, nose and throat. INGESTION causes acute discomfort. SKIN causes irritation and burning
5.3 **Treatment for Exposure:** INHALATION remove to fresh air, administer oxygen, watch patient in sitting position. INGESTION give water, call physician, induce vomiting. EYES flush with water for 15 min., get medical attention. SKIN wash with plenty of soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injuries. They cannot be tolerated even at low concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on skin contact and is very irritating to the eyes
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 162°F (72°C)
6.2 **Flammable Limits in Air:** Not applicable
6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical, water fog
6.4 **Fire Extinguishing Agents Not to be Used:** Water streams. Do not allow water to enter containers
6.5 **Special Hazards of Combustion Products:** Highly poisonous phosgene gas may be formed in fire
6.6 **Behavior in Fire:** Vapor expansion; boilover; violent reaction with water or steam
6.7 **Ignition Temperature:** 556°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Slow reaction with water to produce hydrochloric acid fumes. Reaction much faster with steam
7.2 **Reactivity with Common Materials:** Slow corrosion of metals, but no immediate hazard
7.3 **Stability During Transport:** Not pertinent
7.4 **Neutralizing Agents for Acids and Caustics:** Soda ash and water, lime
7.5 **Polymerization:** Does not occur
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
300 ppm TLC goldfish, lethal, fresh water
500 ppm TLC sunfish, lethal, fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 16% 5 days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Northwest Industries, Inc.
Velsicol Chemical Corp.
5511 Oakton
Chicago, Illinois
2. Occidental Petroleum Corp.
Hooker Chemical Corp.
Industrial Chemicals Division
Niagara Falls, N.Y. 14302
3. Stauffer Chemical Co.
Specialty Chemicals Division
Green Farms Rd.
Westport, Conn. 06880

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+% special grade
10.2 **Storage Temperature:** Store in cool, dry area
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

X X 3 0

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	1
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 140.57
13.3 **Boding Point at 1 atm:** 197°F = 197°C = 470.5°K
13.4 **Freezing Point:** 30°F = −0.6°C = 272.6°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.211 at 25°C (liquid)
13.8 **Liquid Surface Tension:** 36 dynes/cm = 0.036 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Data not available
13.13 **Heat of Combustion:** −10,030 Btu/lb = −5570 cal/g = −233.2 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

BAL	# BENZYL ALCOHOL

Common Synonyms
Phenylcarbinol
Benzenecarbinol
Alpha-hydroxytoluene
Phenylmethanol
Phenylmethyl alcohol

Liquid | Colorless | Mild, pleasant odor

May float or sink in water

AVOID CONTACT LIQUID AND VAPOR KEEP PEOPLE AWAY
[illegible]

Fire

Combustible
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, coughing, or difficult breathing
[illegible]

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting
MAY BE READILY ABSORBED THROUGH THE SKIN
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intake
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Benzenecarbinol
alpha Hydroxytoluene Phenylcarbinol
Phenylmethanol Phenylmethyl alcohol

3 2 **Coast Guard Compatibility Classification:** Not Listed

3 3 **Chemical Formula.** $C_6H_5CH_2OH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild pleasant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves chemical safety goggles

5 2 **Symptoms Following Exposure:** Inhalation of vapor may cause irritation of upper respiratory tract Prolonged or excessive inhalation may result in headache nausea vomiting and diarrhea In severe cases respiratory stimulation followed by respiratory and muscular paralysis convulsions narcosis and death may result Ingestion may produce severe irritation of the gastrointestinal tract followed by nausea vomiting cramps and diarrhea Tissue ulceration may result Contact with eyes causes local irritation Material can be absorbed through skin with anesthetic or irritant effect

5 3 **Treatment for Exposure:** INHALATION remove victim from contaminated atmosphere call physician immediately INGESTION induce vomiting and contact a physician EYES flush with plenty of water for 15 min and contact a physician SKIN flush with water wash with soap and water obtain medical attention in case of irritation or central nervous system depression

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral rat LD_{50} = 1 230 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** 4 5 ppm

6. FIRE HAZARDS

6 1 **Flash Point:** 220°F O C 213°F C C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Alcohol foam dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** 817 F

6 8 **Electrical Hazards:** [illegible]

6 9 **Burning Rate:** 1 74 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Will attack some plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
360 ppm/48 hr daphnia magna TLm *
* water type not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 1552 5 days

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Velsicol Chemical Corp
341 E Ohio St
Chicago Ill 60611

2 Stauffer Chemical Company
Specialty Chemical Div
Meadow Road
Edison N J 08817

3 Givaudan Corporation
125 Delawanna Avenue
Clifton N J 07014

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** NF Photographic, Technical Textile

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P-T-X

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 108 13

13 3 **Boiling Point at 1 atm:** 401°F = 205°C = 478°K

13 4 **Freezing Point:** 4 5°F = −15 3°C = 257 9°K

13 5 **Critical Temperature:** 757°F = 403°C = 676°K

13 6 **Critical Pressure:** 663 psia = 45 0 atm = 4 57 MN/m²

13 7 **Specific Gravity:** 1 050 at 15 15°C (liquid)

13 8 **Liquid Surface Tension:** 39 0 dynes/cm = 0 0390 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 3 73

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 070

13 12 **Latent Heat of Vaporization:** 197 Btu/lb = 107 cal/g = 4 48 × 10⁵ J/kg

13 13 **Heat of Combustion:** −14 550 Btu/lb = −8 260 cal/g = −34 5 × 10⁶ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

BZM	BENZYLAMINE

Common Synonyms
Alpha-aminotoluene
Phenylmethylamine

Liquid Colorless to light yellow Strong ammonia odor

Floats and mixes with water

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE.

Exposure

CAUTION MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause dizziness, headache, or difficult breathing

LIQUID
Will burn skin and eyes
Harmful if Swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning air contaminant, water contaminant
Restrict access
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** *alpha* Aminotoluene
Phenylmethylamine

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_6H_5CH_2NH_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to light yellow

4 3 **Odor:** Strong ammonia

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation of vapor causes irritation of the mucous membranes of the nose and throat and impairment with respiratory distress and cough. Headache nausea faintness and anxiety can occur. Exposure to vapor produces eye irritation with lachrymation conjunctivitis and corneal edema resulting in halos around lights. Direct local contact with liquid is known to produce severe and sometimes permanent eye damage and skin burns. Vapors may also produce primary skin irritation and dermatitis

5 3 **Treatment for Exposure:** INHALATION remove victim from exposure if breathing is difficult administer oxygen if breathing has stopped begin artificial respiration EYES or SKIN wash with copious amounts of water for 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 168°F C C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Alcohol foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Toxic nitrogen oxides may form in a fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** [illegible]

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 4 13 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** In presence of moisture may weakly corrode some metals. Liquid will attack some plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
60 ppm 48 hr Daphnia Fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Miles Laboratories Inc
Sumner Division
Elkhart Ind 46514

2 The Ames Laboratories Inc
200 Roca Lane
Milford Conn 06460

3 Eastman Organic Chemicals
Rochester N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99 5+

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** Ventilated (natural)

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P-Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 107 16

13 3 **Boiling Point at 1 atm:**
364 1°F = 184 5°C = 457 7°K

13 4 **Freezing Point:** (approx)
−51°F = −46°C = 227°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 98 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
39 5 dynes/cm = 0 039 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 3.70

13 11 **Ratio of Specific Heats of Vapor (Gas):** (est) 1 070

13 12 **Latent Heat of Vaporization:** (est)
164 Btu/lb = 91 cal/g
= 3 8 × 10⁵ J/kg

13 13 **Heat of Combustion:** −16 260 Btu/lb
= −9 040 cal/g = −3 78 × 10⁷ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** −43 Btu/lb
= −24 cal/g = −1 0 × 10⁵ J/kg

13 16 **Heat of Polymerization.** Not pertinent

Continued on page [illegible]

NOTES

BBR	BENZYL BROMIDE

Common Synonyms		
alpha-Bromotoluene omega-Bromotoluene Bromotoluene alpha	Liquid Sinks in water	Colorless to yellow — Sharp irritating odor

	[illegible]
Fire	Combustible Irritating gases are produced when heated [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes. Harmful if swallowed [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — evacuate
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** alpha-Bromotoluene
omega-Bromotoluene
Bromotoluene alpha

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_6H_5CH_2Br$

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to yellow

4.3 **Odor:** Very sharp, pungent, like tear gas

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus, goggles, rubber gloves, protective clothing

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat; severe exposure may cause pulmonary edema. Vapors cause severe eye irritation, liquid can burn eyes. Skin contact causes irritation. Ingestion causes irritation of mouth and stomach.

5.3 **Treatment for Exposure:** INHALATION: remove to open air. EYES: irrigate immediately with plenty of water for 15 min. SKIN: flush with water, wash with soap and water. INGESTION: do NOT induce vomiting, give large amounts of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating hydrogen bromide gas may be [illegible]

6.6 **Behavior in Fire:** [illegible] that [illegible] powerful tear gas

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly to generate hydrogen bromide (hydrobromic acid)

7.2 **Reactivity with Common Materials:** Decomposes rapidly in the presence of all common metals except nickel and lead, liberating heat and hydrogen bromide

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Polymerizes with evolution of heat and hydrogen bromide when in contact with all common metals except nickel and lead

7.6 **Inhibitor of Polymerization:** None used

8. WATER POLLUTION

8.1 **Aquatic Toxicity**
0.05 mg/L * marine fish no reaction response, salt water
[illegible] mg/L* marine fish violent irritant activity, salt water
*Time period not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. White Chemical Corporation
East 22nd Street
P.O. Box [illegible]
Bayonne, N.J. 07002

2. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. [illegible]

3. Aldrich Chemical Co.
940 West St. Paul Avenue
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

XOXY

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:**
[illegible]°F = [illegible]°C = [illegible]°K

13.4 **Freezing Point:** [illegible]°F = [illegible]°C = [illegible]°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.438 at 22°C (liquid)

13.8 **Liquid Surface Tension:**
[illegible] dynes/cm = [illegible] N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
[illegible] dynes/cm = [illegible] N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available

13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg

13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on back cover)

NOTES

BBP	BENZYL n-BUTYL PHTHALATE

Common Synonyms			
Butyl benzyl phthalate Phthalic acid, benzyl butyl ester	Liquid	Colorless	Slight odor
	Sinks in water		

Fire	Combustible Irritating gases may be produced when heated
Exposure	LIQUID Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

No guide for this material

Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Butyl benzyl phthalate
Phthalic acid, benzyl butyl ester

3 2 **Coast Guard Compatibility Classification:** Ester

3 3 **Chemical Formula:** $C_{19}H_{20}O_4$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Slight odor

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective gloves and goggles

5 2 **Symptoms Following Exposure:** Prolonged contact with liquid causes irritation of eyes and skin

5 3 **Treatment for Exposure:** EYES: Flush with water for 15 min. SKIN: wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limit:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 (Oral LD50 [illegible] g/kg)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard practically harmless to skin

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not [illegible] °C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, foam

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Irritating vapors of unburned chemical may be produced

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Monsanto Co
[illegible] Lindbergh Blvd
St Louis, Mo 63166

2 Pfaltz and Bauer Inc
[illegible] Northern Blvd
Flushing, N Y 11354

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-5

X X

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	[illegible]
Poisons	[illegible]
Water Pollution	
Human Toxicity	[illegible]
Aquatic Toxicity	[illegible]
Aesthetic Effect	[illegible]
Reactivity	
Other Chemicals	
Water	0
Self Reactive	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at 1 atm:** [illegible] °F = 380°C = [illegible] K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 [illegible] at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

BCL	# BENZYL CHLORIDE

Common Synonyms			
alpha-Chlorotoluene omega-Chlorotoluene	Water: liquid	Colorless to yellow	Sharp irritating odor
	Sinks in water		

	[illegible]
Fire	Combustible Irritating gases are produced when heated [illegible]
Exposure	LIQUID Will burn skin and eyes If swallowed will cause nausea and vomiting [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Isolate water: corrosive
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** alpha-Chlorotoluene
omega-Chlorotoluene
Chlorotoluene, alpha

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_6H_5CH_2Cl$

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale yellow

4.3 **Odor:** Pungent, irritating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles or face shield; self-contained breathing apparatus; positive pressure hose mask; air line mask; industrial canister type gas mask or chemical cartridge respirator; rubber gloves; protective clothing

5.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory tract with coughing, burning of the throat, headache, dizziness and weakness; lung damage and pulmonary edema may occur after severe exposure; chronic irritation of the upper respiratory tract may occur after prolonged and repeated exposure to vapors. Immediate and severe eye irritation may result from contact with the liquid or vapors; prolonged or permanent eye damage may result. Vapors irritate skin and liquid may cause severe burns. Ingestion may cause immediate and severe burns of the mouth, throat and gastrointestinal tract; nausea, vomiting, cramps and diarrhea may follow; gastrointestinal damage and systemic effects may result.

5.3 **Treatment for Exposure:** INHALATION: remove from contaminated atmosphere. If nothing has ceased, start mouth-to-mouth resuscitation; oxygen, if available, should be administered only by an experienced person when authorized by a physician; keep patient warm and comfortable; call a physician immediately. EYES: immediately flush with large quantities of running water for a minimum of 15 min; hold eyelids apart during irrigation to ensure flushing of the entire surface of the eye and lids with water; do not attempt to neutralize with chemical agents; obtain medical attention as soon as possible; salves or ointments should not be used unless directed by a physician; continue irrigation for an additional 15 min if physician is not available. SKIN: immediately flush affected areas with water; remove contaminated clothing under shower; continue washing with water; do not attempt to neutralize with chemical agents; obtain medical attention if irritation persists. INGESTION: give large amounts of water; do NOT induce vomiting.

Cont. on page 4

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, and carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride gas is produced

6.6 **Behavior in Fire:** Forms vapor that is powerful tear gas

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Hydrolyzes slowly to benzyl alcohol and hydrochloric acid

7.2 **Reactivity with Common Materials:** Decomposes rapidly in the presence of common metals with the exceptions of lead and lead-lined steel and hydrogen chloride

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Reacts with sodium bicarbonate or lime solution

7.5 **Polymerization:** Polymerizes with evolution of heat and hydrogen chloride when in contact with all common metals except lead and steel

7.6 **Inhibitor of Polymerization:** Triethylamine, propylene oxide, or sodium carbonate

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.05 mg/l* marine fish toxic (irritant response) salt water
0.1 mg/l* marine fish toxic (irritant activity) salt water
*Time period not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Stauffer Chemical Company
Specialty Chemical Division
Westport, Connecticut

Velsicol Chemical Corporation
341 East Ohio Street
Chicago, Illinois

Monsanto Company
Monsanto Industrial Chemicals
[illegible] North Lindbergh Boulevard
St. Louis, Missouri

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.5% [illegible] stabilized

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Not required

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-7)

X O X Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	2
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 126.6

13.3 **Boiling Point at 1 atm:**
354.9°F = 179.4°C = 452.5°K

13.4 **Freezing Point:**
-16.5°F = -36.2°C = 236.9°K

13.5 **Critical Temperature:**
[illegible]°F = 417°C = 690°K

13.6 **Critical Pressure:**
[illegible] psia = [illegible] atm = [illegible] MN/m²

13.7 **Specific Gravity:** 1.10 at 25°C (liquid)

13.8 **Liquid Surface Tension:**
[illegible] dynes/cm = 0.03[illegible] N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
[illegible] dynes/cm = 0.03[illegible] N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 4.36

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0889

13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = 2.9 × 10³ J/kg

13.13 **Heat of Combustion:** -12,000 Btu/lb = -6,700 cal/g = -280 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

5. HEALTH HAZARDS (Cont'd.)

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; oral rat LD_{50} = 1,231 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

5.10 **Odor Threshold:** 0.04 ppm

BCF

BENZYL CHLOROFORMATE

Common Synonyms

Carbobenzoxy chloride
Chloroformic acid, benzyl ester
Benzylcarbonyl chloride
Benzyl chlorocarbonate

Liquid | Colorless | Sharp, irritating odor

Sinks in water. Reacts with water

Call fire department
Avoid contact with liquid. Keep people away
Stop discharge if possible
Isolate and remove discharged material
Notify authority if pollution [illegible]

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire
Water may be ineffective; use only with extreme care [illegible] applications
Explosion hazard with dry chemicals [illegible]

Exposure

[illegible] material

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Rinse [illegible] with plenty of water
FIRE EXTINGUISHER: Use dry chemical, foam, water
IF SWALLOWED [illegible] CONSCIOUS [illegible] drink water [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify authorities if liquid contaminates [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Should be removed
Chemical and physical treatment

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Carbobenzoxy chloride
Chloroformic acid, benzyl ester
Benzylcarbonyl chloride
Benzyl chlorocarbonate

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula:** $C_6H_5CH_2OCOCl$

3.4 **IMCO/United Nations Numerical Designation** 8 1739

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Irritating, sharp, penetrating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus or acid type canister mask, goggles or face shield, rubber gloves, protective clothing

5.2 **Symptoms Following Exposure:** Inhalation causes mucous membrane irritation. Eyes are irritated by excessive exposure to vapor. Liquid causes severe irritation of eyes and irritates skin. Ingestion causes irritation of mouth and stomach

5.3 **Treatment for Exposure.** INHALATION: remove from exposure, support respiration, call physician. EYES: irrigate with copious amounts of water for 15 min. SKIN: flush with large quantities of water, wash with soap and water. INGESTION: give large amounts of water, do NOT induce vomiting

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion:** Grade 3 LD 50 to 500 mg/kg

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics** Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 176°F O.C., 227°F C.C.
Vigorous decomposition occurs at these temperatures, thus these values are anomalous due to the effect of the decomp products (benzyl chloride and CO_2)

6.2 **Flammable Limits in Air** Not pertinent

6.3 **Fire Extinguishing Agents:** Dry chemical, foam and carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Data not available

6.5 **Special Hazards of Combustion Products.** Toxic phosgene, hydrogen chloride, and benzyl chloride vapors may form

6.6 **Behavior in Fire:** Containers may explode

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate.** 4.0 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Forms hydrogen chloride (hydrochloric acid). The reaction is not very vigorous in cold water

7.2 **Reactivity with Common Materials** Slow corrosion of metal

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Flush with water, rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Chemetron Corporation
Organic Chemicals Division
393 Seventh Avenue
New York, N.Y. 10001
2. Aldrich Chemical Co.
940 West St. Paul Avenue
Milwaukee, Wis. 53233
3. PCR, Inc.
P.O. Box 1466
Gainesville, Fla. 32602

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 97+%

10.2 **Storage Temperature:** Ambient, in cool place

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-5)

A O X-Y

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Corrosive

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	3
Self Reaction	3

12.3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 170.6

13.3 **Boiling Point at 1 atm** (decomposes) 306°F = 152°C = 425°K

13.4 **Freezing Point** Not pertinent

13.5 **Critical Temperature.** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.22 at 20°C (liquid)

13.8 **Liquid Surface Tension.** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** (est.) 90 Btu/lb = 50 cal/g = 2.1×10^5 J/kg

13.13 **Heat of Combustion.** (est.) −10 000 Btu/lb = −5 700 cal/g = -240×10^5 J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

BZO — BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE

Common Synonyms			
Stearyldimethylbenzyl-ammonium chloride Tallow benzyl dimethyl ammonium chloride Benzyldimethylstearyl-ammonium chloride	Solid or thick liquid Sinks and mixes with water	White	Mild odor

Stop discharge if possible. Keep people away.
Avoid contact with liquid and solid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with water.

Exposure

CALL FOR MEDICAL AID
LIQUID OR SOLID
Irritating to skin and eyes.
If swallowed will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected area with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing. Keep victim warm.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of affected water intakes.

1 RESPONSE TO DISCHARGE

(See Response Method, Handbook CG 446-4)

Issue warning — water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Benzyldimethylstearylammonium chloride, Dimethylbenzyloctadecylammonium chloride, Dimethyloctadecylbenzylammonium chloride, Octadecyl dimethylbenzylammonium chloride

3 2 **Coast Guard Compatibility Classification:** Not listed

(Continued on page 4)

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid or viscous liquid

4 2 **Color:** White

4 3 **Odor.** Mild

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion causes gastrointestinal disturbances. Contact with chemical irritates eyes and skin and may damage eyes.

5 3 **Treatment for Exposure:** INGESTION do NOT induce vomiting, give large quantities of fluid and call physician immediately. EYES flush with plenty of water for at least 15 min, call a physician. SKIN remove contaminated clothing, flush skin with plenty of water.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 4 000 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not pertinent

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen and hydrochloric acid fumes may form in fires

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 5 ppm/48 hr, australoboris snails/80% kid/fresh water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Finc Organics Inc
205 Main Street
Lodi, N J 07644

2 Lonza Inc
Fair Lawn, N J 07410

3 Ashland Chemical Company
P O Box 2219
Columbus, Ohio 43216

10. SHIPPING INFORMATION

10 1 **Grades or Purity.** Pure 95+%
24 26% solution in water

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 411

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes at 120°C)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** > 1 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

3 CHEMICAL DESIGNATIONS (Cont'd)

3 3 **Chemical Formula:** $(C_6H_5CH_2)(CH_3)_2N(C_{18}H_{37})NCl$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

BMA	BENZYLTRIMETHYLAMMONIUM CHLORIDE

Common Synonyms			
BTMAC Trimethylbenzylammonium chloride	Liquid	Light yellow	Mild almond odor
	May float or sink in water		

Stop discharge if possible. Keep people away.
Avoid contact with liquid.
Locate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemicals, foam, carbon dioxide.
Water may be ineffective on fire.

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
If swallowed will cause nausea or vomiting
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES: Hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do not induce vomiting. Keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** BTMAC
Trimethylbenzylammonium chloride

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula**
$C_6H_5CH_2N(CH_3)_3ClH_2O$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Light yellow

4 3 **Odor:** Mild almond

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles and rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion causes gastrointestinal disturbances. Contact with liquid irritates eyes and may irritate skin

5 3 **Treatment for Exposure:** INGESTION: give large amount of water, get medical attention
EYES: flush with water for at least 15 min., if irritation continues, get medical attention
SKIN: flush well with water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion.** Grade 3 LD_{50} 50-500 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents**
Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products**
Toxic oxides of nitrogen and hydrochloric acid fumes may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Tanatex Chemical Company
Page and Schuyler Avenues
Lyndhurst, N J 07071

2 Sun Chemical Co
P O Box 70
Chester, S C 29706

3 Ashland Chemical Company
P O Box 2219
Columbus, Ohio 43216

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 50 - 60% solution in water

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Liquid

13 2 **Molecular Weight:** 172 (solute)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.07 at 20°C (Liquid)

13 8 **Liquid Surface Tension:**
Data not available

13 9 **Liquid-Water Interfacial Tension.**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

BIC

BERYLLIUM CHLORIDE

Common Synonyms

Solid | White to green | Sharp odor

Sinks and mixes violently with water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear dust respirator and rubber overclothing including gloves
Stop the flange if possible
Isolate the area and discharged material
Notify local health and pollution control agencies

Fire

Not flammable
Irritating gases may be produced when heated

Wear goggles and self-contained breathing apparatus
DO NOT USE WATER ON ADJACENT FIRES

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing, difficult breathing, or loss of consciousness.

If in eyes hold lids open and flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn skin and eyes
If swallowed will cause nausea, coughing, or loss of consciousness.
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold lids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS give water to drink
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not give anything by mouth

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

Notify downstream users of spill
Notify public health and pollution control agencies

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, corrosive
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $BeCl_2$
3.4 **IMCO/United Nations Numerical Designation.** 6.1/1566

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White to green
4.3 **Odor:** Sharp acrid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirators, protection gloves, freshly laundered clothing, chemical safety goggles
5.2 **Symptoms Following Exposure:** Inhalation causes pneumonitis, nasopharyngitis, tracheobronchitis, dyspnea, chronic cough. Ingestion causes irritation of mouth and stomach. Contact with dust causes conjunctival inflammation of eyes and irritation of skin. Any dramatic, unexplained weight loss should be considered as a possible first indication of beryllium disease
5.3 **Treatment for Exposure.** INHALATION: chest x-ray should be taken immediately for evidence of pneumonitis. EYES: flush with water for at least 15 min; if irritation persists, get medical attention. SKIN: cuts or puncture wounds in which beryllium may be embedded under the skin should be thoroughly cleansed immediately by a physician
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.002 mg/m³ (as beryllium)
5.5 **Short-Term Inhalation Limits:** 0.025 mg/m³ less than 30 min
5.6 **Toxicity by Ingestion.** Grade 3 oral rat LD_{50} = 86 mg/kg
5.7 **Late Toxicity:** Be produces a chronic systemic disease that primarily affects the lung but also can involve other organs such as lymph nodes, liver, bones, and kidney
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents.** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires
6.5 **Special Hazards of Combustion Products:** Toxic and irritating beryllium oxide fumes and hydrogen chloride may form in fires
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously with evolution of heat. Forms beryllium oxide and hydrochloric acid solution
7.2 **Reactivity with Common Materials:** Corrodes most metals in presence of moisture. Flammable and explosive hydrogen gas may collect in enclosed spaces
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.15 ppm*/96 hr/fathead minnow/TLm/soft fresh water
15 ppm*/96 hr/fathead minnow/TLm/hard fresh water
*as beryllium
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)**
None

(Continued on page 4)

9. SELECTED MANUFACTURERS

1. Kawecki Berylco Industries, Inc
Hazleton, Pa. 18201
2. Varlacoid Chemical Co
666 South Front St
Elizabeth, N.J. 07202
3. Research Organic/Inorganic Chemical Corp
11686 Sheldon
Sun Valley, Calif. 91352

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

RR

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 79.9
13.3 **Boiling Point at 1 atm:** (sublimes) 958°F = 520°C = 793°K
13.4 **Freezing Point:** 824°F = 440°C = 713°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.90 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution.** −1 000 Btu/lb = −557 cal/g = −2.33 × 10⁶ J/kg
13.16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

8 WATER POLLUTION (Cont'd.)

8.4 **Food Chain Concentration Potential:** Bioconcentration of 100-fold can occur under constant exposure. Not significant in spill conditions

BEF — BERYLLIUM FLUORIDE

Common Synonyms	Solid	White	Odorless
	Sinks and mixes with water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST

POISONOUS IF INHALED, IF SWALLOWED, OR IF SKIN IS EXPOSED

Will burn eyes

SOLID

POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

Will burn eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS

May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant

Restrict access

Should be removed

Chemical and physical treatment

2 LABEL

POISON

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula.** BeF

3 4 **IMCC/United Nations Numerical Designation:** 6 1,1566

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Respiratory protection, gloves, goggles

5 2 **Symptoms Following Exposure:** Any dramatic weight loss should be considered as possible first indication of beryllium disease. Inhalation causes irritation of nose, throat, and lungs, severe pneumonitis, and/or pulmonary edema. Ingestion causes fatigue, weakness, loss of appetite. Contact with eyes causes severe irritation and burns. Contact with skin causes dermatitis and non-healing ulcers.

5 3 **Treatment for Exposure:** INHALATION: move to fresh air, chest x-ray should be taken immediately to detect pneumonitis if exposure has been severe. INGESTION: induce vomiting, get medical attention. EYES: flush with water for at least 15 min., get medical attention. SKIN: flush with water, get medical attention if skin has been broken.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.002 mg/m³ (as beryllium)

5 5 **Short-Term Inhalation Limits:** 0.025 mg/m³ less than 30 min

5 6 **Toxicity by Ingestion.** Grade 3, oral LD_{50} = 100 mg/kg (mouse)

5 7 **Late Toxicity:** Berylliosis of lungs may occur from 3 months to 15 years after exposure. Chronic systemic diseases of the liver, spleen, lymph nodes, bone, kidney, and other organs may also occur.

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products** Toxic and irritating vapor of unburned material may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.**

0.15 ppm*/96 hr/fathead minnow TL_m fresh (soft) water

15 ppm*/96 hr/fathead minnow TL_m fresh (hard) water

*As beryllium

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential** Bioconcentration of 100 fold under constant exposure only. Not significant under spill conditions

9. SELECTED MANUFACTURERS

1 Kawecki Berylco Industries, Inc.
P. O. Box 429
Hazleton, Pa. 18201

2 Brush Wellman, Inc.
South River Road
Elmore, Ohio 43416

3 Gallard Schlesinger Chemical Mfg. Co.
564 Mineola Ave.
Carle Place, N. Y. 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Purified 99.9%, Chemically pure 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 47

13 3 **Boiling Point at 1 atm** Not pertinent (sublimes at 800°C)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.99 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** 180 Btu/lb = 98 cal/g = 4.1×10^5 J/kg

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

BEM	BERYLLIUM METALLIC

Common Synonyms

Solid — Silver color — Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear dust respirator and rubber or vinyl clothing, including gloves
Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Dust cloud may explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus
Extinguish with dry graphite, soda ash or other inert powder
DO NOT USE WATER ON FIRE

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing
If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, give victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except give water

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of affected water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** No common synonyms
3.2 **Coast Guard Compatibility Classification** Not listed
3.3 **Chemical Formula:** Be
3.4 **IMCO/United Nations Numerical Designation:** A/1567

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Bu Mines approved respirator, clean work clothes, dust gloves, eye protection

5.2 **Symptoms Following Exposure:** Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Dust is extremely toxic when inhaled; symptoms include coughing, shortness of breath, and acute or chronic lung disease. There is no recorded illness from ingestion of beryllium. Contact with dust causes conjunctival inflammation of eyes and dermatitis.

5.3 **Treatment for Exposure.** INHALATION: acute disease may require hospitalization with administration of oxygen; chest x-ray should be taken immediately. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water; all cuts, scratches or other injuries should receive prompt medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 0.002 mg/m³

5.5 **Short-Term Inhalation Limits:** 0.025 mg/m³ 5 min

5.6 **Toxicity by Ingestion.** Grade 3 LD50 50-500 mg/kg

5.7 **Late Toxicity:** Beryllium disease may occur in lungs, lymph nodes, liver, spleen, kidney, and other organs

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents** Graphite, soda ash, or any other inert dry powder

6.4 **Fire Extinguishing Agents Not to be Used:** Water

6.5 **Special Hazards of Combustion Products.** Combustion yields beryllium oxide fume which is toxic if inhaled

6.6 **Behavior in Fire:** Powder may form explosive mixture with air

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1. Varlacoid Chemical Co
666 South Front St
Elizabeth, N.J. 07202
2. Gallard Schlesinger Chemical Mfg. Co
584 Mineola Avenue
Carle Place, N.Y. 11514
3. Pfaltz and Bauer, Inc
126-04 Northern Blvd
Flushing, N.Y. 11368

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Grade AA 99.96+, Grade A 99.8%+, Nuclear grade

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere.** No requirement

10.4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	4
Flammability (Red)	1
Reactivity (Yellow)	1

* Applies to dust or powder

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 9.01

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.85 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion** −28,000 Btu/lb = −15,560 cal/g = −65.2 X10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

BEN	# BERYLLIUM NITRATE

Common Synonyms	Solid	White	Odorless
Beryllium nitrate trihydrate	Sinks and mixes with water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear full respirator and rubber coveralls, long cuff rubber gloves
Stop discharge if possible
Isolate and remove discharge immediately
Notify local health and pollution control agencies

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and self-contained breathing apparatus
Flush fire area with water

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing
If exposed to dust, flush skin and clothes with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
If swallowed will cause nausea, vomiting or loss of consciousness
If skin contact, remove clothing and shoes
Immediately flush area with plenty of water
IF IN EYES: Lift lids and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS: Give drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: Do nothing except keep warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify adjacent and downstream water users
Notify operators of public water supplies

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: Poison Water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Beryllium nitrate trihydrate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $BeNO_3 \cdot 3H_2O$
3.4 **IMCO/United Nations Numerical Designation:** 6.1 1566

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respiratory protection, gloves, freshly laundered clothing, chemical safety goggles
5.2 **Symptoms Following Exposure:** Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Inhalation causes pneumonitis, nasopharyngitis, tracheobronchitis, dyspnea, chronic cough. Ingestion causes anorexia, fatigue, weakness, malaise. Contact with eyes causes conjunctival inflammation. Contact with skin causes dermatitis and non-healing ulcers.
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, take chest x-ray immediately to check for pneumonitis. INGESTION: induce vomiting, get medical attention. EYES: flush with water for at least 15 min, get medical attention. SKIN: cut or puncture wounds in which beryllium may be embedded under the skin should be thoroughly cleaned immediately by a physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.002 mg/m³ as beryllium
5.5 **Short-Term Inhalation Limits:** 0.025 mg/m³ less than 30 min
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** May cause chronic systemic disease of the lungs as well as other organs such as liver, spleen, lymph nodes, bone and kidney
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not combustible
6.2 **Flammable Limits in Air:** Not combustible
6.3 **Fire Extinguishing Agents:** Water
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating beryllium oxide and oxides of nitrogen may form in fire
6.6 **Behavior in Fire:** May increase intensity of fire when in contact with combustible material
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts to form weak solution of nitric acid; the reaction is not hazardous
7.2 **Reactivity with Common Materials:** In presence of moisture will damage wood and corrode most metals
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
0.15 ppm/96 hr fathead minnow, 11 m soft water
20 ppm/96 hr fathead minnow, 11 m hard water
*as beryllium
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** Bioconcentration of 100 fold can occur under constant exposure. Not significant in spill conditions

9 SELECTED MANUFACTURERS

1. Kawecki Berylco Industries, Inc., Hazleton, Pa. 18201
2. Nat'l Lead Chemical Co., 666 South Front St., Elizabeth, N.J. 07202
3. Gallard Schlesinger Chemical Mfg. Co., 584 Mineola Avenue, Carle Place, N.Y. 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Purified
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Poisonous solid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 205.1
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.56 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1-46A

NOTES

BEO — BERYLLIUM OXIDE

Common Synonyms
Beryllia
Bromellite

Solid | White | Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear Dust respirator and rubber [illegible]
Stop discharge if possible
Isolate and remove discharged material
Notify [illegible] health and pollution [illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and self-contained [illegible]

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
If inhaled will cause coughing and difficult breathing
[illegible]

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
[illegible]
IF EYES [illegible] water
IF SWALLOWED [illegible] water [illegible]
IF SWALLOWED [illegible] CONSCIOUS OR HAVING CONVULSIONS [illegible] warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Pollution Methods Handbook CG 446-4)

Issue warning [illegible] water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Beryllia, Bromellite
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** BeO
3.4 **IMCO/United Nations Numerical Designation:** 6.1 1566

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator protection, gloves, freshly laundered clothing, chemical safety goggles
5.2 **Symptoms Following Exposure:** Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Other symptoms include anorexia, fatigue, weakness, malaise. Inhalation causes pneumonitis, nasopharyngitis, tracheobronchitis, dyspnea, chronic cough. Contact with dust causes conjunctival inflammation of eyes and irritation of skin.
5.3 **Treatment for Exposure:** INHALATION: take chest x-ray immediately, check for pneumonitis. INGESTION: induce vomiting, get medical attention. EYES: flush with water for 15 min, get medical attention. SKIN: [illegible] wounds in which beryllium may be embedded, under the skin, should be thoroughly cleansed immediately by a physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.002 mg/m³ as beryllium
5.5 **Short-Term Inhalation Limits:** 0.025 mg/m³ less than 30 min
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Beryllium disease may occur in lymph nodes, liver, spleen, and bones, as well as lung
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic beryllium oxide fume may form in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** Bioconcentration of 100-fold can occur under constant exposure. Not significant in pH conditions

9. SELECTED MANUFACTURERS

1. Varlacoid Chemical Co
666 South Front St
Elizabeth, N.J. 07202
2. Gallard-Schlesinger Chemical Mfg. Co
584 Mineola Avenue
Carle Place, N.Y. 11514
3. Ventron Corporation
P.O. Box 159
Beverly, Mass. 01915

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, Nuclear
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 25
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.0 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 5

NOTES

BES	# BERYLLIUM SULFATE

Common Synonyms			
Beryllium sulfate tetrahydrate	Solid	White	Odorless
	Sinks and mixes with water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing.

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - poison water
contaminant
Restrict access
Should be removed
Chemical and physical treatment.

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Beryllium sulfate tetrahydrate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $BeSO_4 \cdot 4H_2O$

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirators protection, gloves, fresh laundered clothing, chemical safety goggles

5.2 **Symptoms Following Exposure:** Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Other symptoms include anorexia, fatigue, weakness, malaise. Inhalation causes pneumonitis, nasopharyngitis, tracheobronchitis, dyspnea, anoxia, cough. Contact with eyes causes conjunctival inflammation. Contact with skin causes dermatitis. Exposure to irritant or sensitization agent causes ulcer formation when in contact with cuts.

5.3 **Treatment for Exposure:** INHALATION: take chest x-ray immediately to check for evidence of pneumonitis. INGESTION: induce vomiting, get medical attention. EYES: flush with water for at least 15 min, get medical attention. SKIN: cuts or puncture wounds in which beryllium may be embedded under the skin should be thoroughly cleaned immediately by a physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.002 mg/m³ as beryllium

5.5 **Short-Term Inhalation Limits:** 0.025 mg/m³ less than 30 min

5.6 **Toxicity by Ingestion:** Grade 3 oral rat LD_{50} = 82 mg/kg

5.7 **Late Toxicity:** Beryllium disease may occur in the lymph nodes, liver, spleen, kidneys, etc., as well as lung

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic beryllium oxide and sulfuric acid fumes may form in fire

6.6 **Behavior in Fire**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
11 ppm/96 hr fathead minnow TL_m hard fresh water
0.2 ppm/96 hr fathead minnow TL_m soft fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Bioconcentration of 100-fold can occur under constant exposure. Not significant in spill conditions

9 SELECTED MANUFACTURERS

1. Brush Wellman Inc
Elmore, Ohio 43416
2. Kawecki Berylco Industries Inc
Hazleton, Pa 18201
3. Nuclear Chemical Co
666 South Front St
Elizabeth, N J 07202

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** High purity
Analytical grade

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XX

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Poisonous solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.**
Solid

13.2 **Molecular Weight:** 177.14

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.71 at 15°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

BOC	BISMUTH OXYCHLORIDE

Common Synonyms			
Bismuth chloride oxide Basic bismuth chloride Bismuthyl chloride Bismuth subchloride	Solid Sinks in water	White	Odorless

Stop discharge if possible. Keep people away.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
Irritating gases may be produced when heated
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
Harmful if inhaled
If in eyes: Hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES: Hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim CONSCIOUS: Have victim drink water or milk.
IF SWALLOWED and victim UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.

Water Pollution:

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of affected water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard labels required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Basic bismuth chloride, Bismuth chloride oxide, Bismuth subchloride, Bismuthyl chloride, Pearl white
3.2 **Coast Guard Compatibility Classification.** Not listed
3.3 **Chemical Formula:** BiOCl
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, protective gloves, [illegible]
5.2 **Symptoms Following Exposure:** Contact with dust causes irritation of eyes, nose and throat and can cause skin rashes.
5.3 **Treatment for Exposure:** EYES: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available.
5.5 **Short-Term Inhalation Limits:** Data not available.
5.6 **Toxicity by Ingestion:** Grade 0 LD50 > 2 [illegible] rats.
5.7 **Late Toxicity:** Data not available.
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available.
5.9 **Liquid or Solid Irritant Characteristics:** Data not available.
5.10 **Odor Threshold:** Data not available.

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable.
6.2 **Flammable Limits in Air:** Not flammable.
6.3 **Fire Extinguishing Agents:** Not pertinent.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride gas may form in fire.
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent.
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** Not pertinent.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport.** Stable.
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
7.5 **Polymerization:** Not pertinent.
7.6 **Inhibitor of Polymerization.** Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.
8.2 **Waterfowl Toxicity:** Data not available.
8.3 **Biological Oxygen Demand (BOD):** None.
8.4 **Food Chain Concentration Potential.** Data not available.

9. SELECTED MANUFACTURERS

1. The Mearl Corp.
41 East 42nd St.
New York, N.Y. 10017
2. Mallinckrodt Chemical Works
222 Westside Ave.
P.O. Box 384
Jersey City, N.J. 07303
3. Whittaker Corporation
Rona Pearl Company Division
East 21st Street
Bayonne, N.J. 07002

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Dry powder, 100%; aqueous concentrates, slurries or solid in mineral oil or castor oil.
10.2 **Storage Temperature:** Ambient.
10.3 **Inert Atmosphere:** No requirement.
10.4 **Venting:** Open.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed.
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.
12.3 **NFPA Hazard Classifications:** Not listed.

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid.
13.2 **Molecular Weight:** 260.4
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes).
13.4 **Freezing Point:** Not pertinent.
13.5 **Critical Temperature:** Not pertinent.
13.6 **Critical Pressure:** Not pertinent.
13.7 **Specific Gravity:** [illegible] at 20°C (solid).
13.8 **Liquid Surface Tension.** Not pertinent.
13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
13.12 **Latent Heat of Vaporization.** Not pertinent.
13.13 **Heat of Combustion:** Not pertinent.
13.14 **Heat of Decomposition:** Not pertinent.
13.15 **Heat of Solution.** Not pertinent.
13.15 **Heat of Polymerization:** Not pertinent.

Continued on page [illegible]

NOTES

BPA	BISPHENOL A

Common Synonyms			
4,4'-Isopropylidenediphenol; p,p'-Dihydroxydiphenylmethylmethane; 2,2-Bis(4-hydroxyphenyl)-propane	Solid flakes or powder Sinks in water	White to light brown	Weak medicine odor

Avoid contact with solid and dust. Keep out of reach of children.
Call fire department.
Isolate and remove discarded material.
Notify health and pollution control officials.

Fire	**Combustible** Extinguish with foam, chemical foam, carbon dioxide. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID **DUST** Irritating to nose and throat if inhaled. Move to fresh air. **SOLID** Irritating to skin and eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED and victim CONSCIOUS: have victim drink water or milk and induce vomiting. IF SWALLOWED and victim UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except rinse out mouth.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify health and pollution control officials. Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Should be removed.

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
2,2-Bis(4-hydroxyphenyl)propane;
p,p'-Dihydroxydiphenylmethylmethane;
4,4'-Isopropylidenediphenol;
Dianol 22; HP

3.2 **Coast Guard Compatibility Classification.**
Not applicable

3.3 **Chemical Formula:**
$(HOC_6H_4)_2C(CH_3)_2$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White to tan

4.3 **Odor:** Very faint phenolic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved dust mask and rubber boots; cover exposed skin; wash immediately if contaminated; use respiratory protection if dust fumes or mists; Safety glasses with side shields.

5.2 **Symptoms Following Exposure:** Dust irritating to upper respiratory passages; may cause sneezing.

5.3 **Treatment for Exposure:** SKIN: Wash thoroughly with soap and water. Remove contaminated clothing. EYES: Promptly flush with plenty of water. Seek medical attention. Notify physician. INGESTION: Induce vomiting only if victim conscious. Seek medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not present

5.5 **Short-Term Inhalation Limits:** Not present

5.6 **Toxicity by Ingestion:** Grade 2 LD50 (rat) 3.25 g/kg

5.7 **Late Toxicity:** Lowered hemoglobin and erythrocyte (red blood cell) counts below normal in rats

5.8 **Vapor (Gas) Irritant Characteristics.** Not present

5.9 **Liquid or Solid Irritant Characteristics.** Moderate hazard. Repeated contact may cause irritation and dermatitis.

5.10 **Odor Threshold.** Not present

6 FIRE HAZARDS

6.1 **Flash Point** 315°F (157°C)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Data not available

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential.** Data not available

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Michigan 48640
2. General Electric Co.
Pittsfield, Mass. 01201
3. Shell Chemical Co.
Polymers Div.
P.O. Box 2463
Houston, Texas 77001

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, high purity

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** 228.29

13.3 **Boiling Point at 1 atm:** Not present

13.4 **Freezing Point:** 315°F (157°C) (400 K)

13.5 **Critical Temperature:** Not present

13.6 **Critical Pressure:** Not present

13.7 **Specific Gravity:** 1.195 (25°C/25°C)

13.8 **Liquid Surface Tension:** Not present

13.9 **Liquid-Water Interfacial Tension:** Not present

13.10 **Vapor (Gas) Specific Gravity:** Not present

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not present

13.12 **Latent Heat of Vaporization:** Not present

13.13 **Heat of Combustion:** Not present

13.14 **Heat of Decomposition:** Not present

13.15 **Heat of Solution:** Not present

13.16 **Heat of Polymerization:** Not present

(Continued on next page)

NOTES

REVISED 1978

BDE	BISPHENOL A DIGLYCIDYL ETHER

Common Synonyms		
4,4 Isopropylidenediphenol-epichlorohydrin resin Bisphenol A - epichlorohydrin condensate 2,2-Bis(p-hydroxyphenyl) propane, diglycidyl ether	Liquid Sinks in water	Yellowish brown

Stay upwind and avoid possible. Keep people away.
Call fire department.
Avoid contact with liquid.
Avoid release to environment.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with water, dry chemicals, carbon dioxide, foam.

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES: Hold eyelids apart and flush with plenty of water.
IF SWALLOWED: Induce VOMITING. Give one glass of water or milk.
IF SWALLOWED: Give water or milk. DO NOT INDUCE VOMITING OR HAVE VOMITING.
Get immediate medical attention.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 4,4 Isopropylidenediphenol-epicalorohydrin resin, Bisphenol A epichlorohydrin condensate, 2,2 Bis (p-hydroxy benzyl) propane diglycidyl ether

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_{21}H_{24}O_4$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Amber

4.3 **Odor:** Data not available

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles, protective clothing and protective creams. Good personal hygiene is necessary, with instruction of personnel and adequate cleaning facilities.

5.2 **Symptoms Following Exposure:** Contact with liquid irritates eyes. Prolonged or repeated contact with skin causes irritation and dermatitis.

5.3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: remove chemical with water or waterless skin cleaner.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 LD_{50} = [illegible] g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.

5.10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6.1 **Flash Point:** 175°F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Shell Chemical Co.
1 Shell Plaza
Houston, Texas 77002

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

X X

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 340

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.16 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Data not available

13.13 **Heat of Combustion:** (est.) = 14,900 Btu/lb = −8,300 cal/g = [illegible] J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Data not available

Continued on pages 3 and 4

NOTES

BCP	BOILER COMPOUND, LIQUID

Common Synonyms

Liquid Colorless to brown Odorless or mild odor

Sinks and mixes with water

Fire

Not flammable
Flammable gas may be produced on contact with metals.

Exposure

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning corrosive water contaminant
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Alkanas liquid alkaline detergent
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** Not pertinent
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to brown
4.3 **Odor:** None to mild

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield rubber gloves protective clothing
5.2 **Symptoms Following Exposure:** Contact of liquid with eyes causes severe caustic burns. Also causes caustic burns of skin if not washed off immediately. Ingestion causes caustic burns of mouth and stomach
5.3 **Treatment for Exposure:** Basic treatment is identical with that for caustic soda or caustic potash solutions. EYES flush with water for at least 15 min call a doctor. SKIN flush with water wash with soap and water. INGESTION give large amounts of water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 2 mg/m
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Not pertinent
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Flies burst container
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Attacks aluminum and zinc; reaction may form flammable hydrogen gas
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. BASF Wyandotte Corp
   Chemical Specialties Division
   Wyandotte, Mich 48192
2. Nalco Chemical Co
   180 N. Michigan Ave
   Chicago, Ill 60601
3. Olin Water Services
   3355 Fiberglas Road
   Kansas City, Kan 66115

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Various commercial grades, some of which contain chelating and complexing agents for metals
10.2 **Storage Temperature:** Ambient preferable 40-100 F
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classification:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** >220°F = >104°C = >377°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.45 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

BAC	BORIC ACID

Common Synonyms			
Orthoboric acid Boracic acid	Solid	White	Odorless
	Sinks and mixes with water		

[illegible]

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID **SOLID** **Irritating to skin and eyes.** **If swallowed will cause nausea or vomiting**
Water Pollution	**Dangerous to aquatic life in high concentrations** **May be dangerous if it enters water intakes**

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required in Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Boracic acid, Orthoboric acid

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** H_3BO_3

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles

5.2 **Symptoms Following Exposure:** Although no adverse effects have been reported from chronic use, boric acid is absorbed through mucous membranes. Ingestion of 5 grams or more may irritate gastrointestinal tract and affect central nervous system. Contact with dust or aqueous solutions may irritate eyes and skin. Adverse effects have been recognized but continued contact should be avoided. Dust and solutions are absorbed through burns and open wounds but not through unbroken skin.

5.3 **Treatment for Exposure:** INHALATION: remove from contaminated atmosphere. INGESTION: obtain medical attention as soon as possible. If the patient is conscious, induce vomiting by giving warm salty water (2 tablespoons of table salt to a pint of water) or warm soapy water. If this measure is unsuccessful, vomiting may be induced by tickling the back of the patient's throat with a finger. Vomiting should be encouraged about three times or until the vomitus is clear. Additional water may be given to wash out the stomach. EYES: immediately flush the eyes with large quantities of running water for a minimum of [illegible] and hold the eyelids open during the irrigation to ensure flushing of the entire surface of the eye and eyelids with water. Obtain medical attention as soon as possible. Continue the irrigation for an additional [illegible] if the physician not available. SKIN: immediately flush affected area with water. Remove contaminated clothing under the shower. Continue washing with water. Do not attempt to react chemically with chemical agents. Obtain medical attention as soon as possible.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³ (as boron trioxide)

5.5 **Short-Term Inhalation Limits:** Data not available

Continued on next page

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 1400 ppm 24 hr minnows/fish TL_m fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Kerr-McGee Chemical Corp
Kerr-McGee Bldg
Oklahoma City, Okla 73102

U.S. Borax and Chemical Co
3075 Wilshire Blvd
Los Angeles, Calif 90010

Stauffer Chemical Co
Industrial Chemicals Div
Westport, Conn 06880

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Radio 99.9%
Technical 99.9% N.F. 99.9%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

NN-11

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **PAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] g/cm³ (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible] kcal/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

5 HEALTH HAZARDS (Con'd)

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** [illegible]

6TB BORON TRIBROMIDE

Common Synonyms	Liquid	Colorless	Sharp odor
	Reacts violently with water Poisonous vapor is produced		

[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]
DO NOT USE WATER ON ADJACENT FIRES

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning corrosive, air contaminant
Restrict access
Disperse and flush with care

2 LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** BBr_3
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Sharp irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical safety glasses or face mask, rubber gloves and respiratory protection
5 2 **Symptoms Following Exposure.** Inhalation causes severe irritation of mucous membranes. Ingestion causes burns of mouth and stomach. Contact with eyes or skin causes severe burns.
5 3 **Treatment for Exposure** *Get medical attention for all exposures to this chemical.* INHALATION remove from exposure, support respiration. INGESTION give large amounts of water. EYES flush with water for at least 15 min. SKIN wash thoroughly with water. launder clothing before reuse.
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 1 ppm
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Do not use water or foam on adjacent fires
6 5 **Special Hazards of Combustion Products:** Toxic fumes of the chemical or hydrogen bromide may form in fires
6 6 **Behavior in Fire:**
5 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently to form hydrobromic acid solution and fumes
7 2 **Reactivity with Common Materials:** Strongly attacks metals and wood. Flammable hydrogen gas may collect in enclosed spaces
7 3 **Stability during Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Eagle-Picher Industries Inc
Miami Research Laboratories
Miami, Okla 74354

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place N Y 11514

3 Vertron Corporation
P O Box 159
Beverly, Mass 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Epitaxial 99 999+%
Pure 99 99 %, Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Padded
10 **Venting.** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight:** 250 5
13 3 **Boiling Point at 1 atm:** 196°F = 91°C = 364°K
13 4 **Freezing Point:** −51°F = −46°C = 227°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2 645 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 29 1 dynes/cm = 0 0291 N/m at 22°C
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 8 64
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 140
13 12 **Latent Heat of Vaporization.** 52 Btu/lb = 29 cal/g = 1 2 × 10⁵ J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

(Continued on Page Sand 6)

NOTES

BRT	# BORON TRICHLORIDE

Common Synonyms	Liquid	Colorless	Irritating odor
	Reacts violently with water Irritating visible vapor cloud is produced Boiling point is 54° F		

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED Cool exposed containers with water
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing Move victim to fresh air If breathing has stopped give artificial respiration If breathing is difficult give oxygen LIQUID POISONOUS IF SWALLOWED Will burn skin and eyes Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes No data on wildlife available No special precautions for water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning corrosive air contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Boron chloride

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** BCl_3

3 4 **IMCO/United Nations Numerical Designation:** 2/1741

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Acrid and irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Chemical goggles rubber protective clothing and gloves self contained breathing apparatus

5 2 **Symptoms Following Exposure:** Inhalation causes edema and severe irritation of the upper respiratory system Contact with liquid causes acid burns of eyes and severe burns of skin Ingestion causes severe burns of mouth and stomach

5 3 **Treatment for Exposure:** INHALATION remove to fresh air, give oxygen or apply artificial respiration Keep warm, call a doctor at once observe for pulmonary edema EYES wash with plenty of water for 15 min consult an eye specialist SKIN wash off with plenty of water INGESTION do NOT induce vomiting give large amount of water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 2, LD_{50} 0 5 to 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eyes and throat and can cause eye or lung injury They cannot be tolerated even at low concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant Causes second and third degree burns on short contact and is very injurious to the eyes

5 10 **Odor Threshold:** Decomposes in moist air, releasing hydrochloric acid and decomposition products Hydrochloric acid 1 ppm

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** Toxic fumes of hydrogen chloride are given off upon contact with water applied to adjacent fires

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously to liberate heat and forms hydrogen chloride fumes (hydrochloric acid) and boric acid

7 2 **Reactivity with Common Materials:** Vigorously attacks elastomers and packing materials Viton Tygon, Saran or silastic elastomers and natural and synthetic rubbers are not recommended for service Lead and graphite impregnated asbestos are to be avoided In the presence of moisture highly corrosive to most metals

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water rinse with sodium bicarbonate or solution

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Kerr McGee Chemical Corp
Kerr McGee Building
Oklahoma City Okla 73 01

2 Matheson Gas Products Co
East Rutherford N J 07073

3 Union Carbide Corp
Linde Division
270 Park Avenue
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** C P (99 9+%)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A C-O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight:** 117 2

13 3 **Boiling Point at 1 atm:** 54 3°F = 12 4°C = 285 6°K

13 4 **Freezing Point:** −161°F = −107°C = 166°K

13 5 **Critical Temperature:** 352°F = 178°C = 451°K

13 6 **Critical Pressure.** 566 psia = 38 atm = 3 90 MN/m^2

13 7 **Specific Gravity:** 1 35 at 11°C (liquid)

13 8 **Liquid Surface Tension.** 16 7 dynes/cm = 0 0167 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 4

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 1470

13 12 **Latent Heat of Vaporization** 68 8 Btu/lb = 38 2 cal/g = 1 60 × 10 J/kg

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** −13 000 Btu/lb = −7 200 cal/g = −300 × 10³ J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

BRX	# BROMINE

Common Synonyms	Watery liquid	Reddish-brown	Sharp irritating odor
	Sinks in water. Irritating brown vapor is produced		

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber gloves (including gloves). Stop gas if safe to do so. Neutralize spill. Notify authorities. Use water spray to protect personnel. Do not allow water to enter container.

Fire

Not flammable
May cause fire or contact with combustibles
POISONOUS GASES ARE PRODUCED IN FIRE
Use water spray to cool exposed containers. Keep fire away from water. Wear goggles, self-contained breathing apparatus, and rubber gloves (including gloves).

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause coughing, difficult breathing, or loss of consciousness
Move to fresh air.
If breathing has stopped, give artificial respiration. Do NOT mouth to mouth.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify Coast Guard and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison, air contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Halogen
3.3 **Chemical Formula:** Br_2
3.4 **IMCO/United Nations Numerical Designation:** 8 0/1744

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Dark red, red brown
4.3 **Odor:** Sharp, harsh, penetrating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles, face shield, self-contained air line, canister mask, rubber suit
5.2 **Symptoms Following Exposure:** SKIN: contact with liquid or vapor may cause acne and slow healing ulcers. INHALATION: induces severe irritation of the respiratory passages and pulmonary edema. Probable lethal oral dose for an adult is 1 ml. A brief exposure to 1000 ppm may be fatal.
5.3 **Treatment for Exposure:** SKIN AND EYES: wash well with water and sodium bicarbonate solution. RESPIRATORY SYSTEM: if there is obstruction to breathing establish airways by pulling tongue forward, inserting an airway tube, or doing a tracheostomy, begin artificial respiration. If difficulty in breathing is a result of pulmonary edema, treatment should be carried out with the patient in the sitting position. Administration of oxygen is most important. INGESTION: do not induce vomiting. If conscious, drink water and milk.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 ppm
5.5 **Short-Term Inhalation Limits:** 0.4 ppm for 30 min
5.6 **Toxicity by Ingestion:** Not pertinent
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Causes severe eye or throat irritations which can cause eye or lung injury; cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact; very injurious to the eyes.
5.10 **Odor Threshold:** 3.5 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Use water spray to cool exposed containers and to wash away spills.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated when heated or in fires.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Reacts violently with aluminum. May cause fire in contact with wood, cotton, straw. Iron, steel, stainless steel, and copper are corroded by bromine and are especially subject to attack by wet bromine. Of the plastics, only those which are highly fluorinated resist bromine attack.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
30 ppm/10 hr/Gadophora killed fresh water
10 ppm*/fish irritant/salt water
*Time period not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Not pertinent
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Arkansas Chemicals Inc, El Dorado, Arkansas 71730
2. Bromet Co, Magnolia, Arkansas 71753
3. Dow Chemical Co, Midland, Michigan 48640

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, technical
10.2 **Storage Temperature:** Cool but above 20°F to prevent freezing
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A P-X

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	4
Water	1
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	0
	OXY

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid
13.2 **Molecular Weight:** 159.81
13.3 **Boiling Point at 1 atm.** 138°F = 58.8°C = 332°K
13.4 **Freezing Point:** 19°F = −7.2°C = 266°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.12 at 20°C (Liquid)
13.8 **Liquid Surface Tension** 41 dynes/cm = .041 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** 5.5 at 20°C
13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.3
13.12 **Latent Heat of Vaporization:** 80.6 Btu/lb = 44.7 cal/g = 1.88 × 10⁵ J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

BPF	# BROMINE PENTAFLUORIDE

Common Synonym	Liquefied gas Colorless Irritating odor Reacts violently with water Poisonous vapor is produced
	No ignition hazard if possible keep people away Avoid contact with liquid and vapor Isolate and remove discharged material Notify local health and pollution control agencies
Fire	Not flammable May cause fire on contact with combustibles Will increase the intensity of a fire POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire Wear goggles and self contained breathing apparatus DO NOT USE WATER OR FOAM ON FIRE
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes nose and throat If inhaled will cause coughing or difficult breathing If in eyes hold eyelids open and flush with plenty of water If breathing has stopped give artificial respiration If breathing is difficult give oxygen LIQUID Will burn skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS give two glasses of water or milk IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep warm
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and pollution control agencies Notify operators of downstream water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning corrosive air contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification** Not listed
3 3 **Chemical Formula:** BrF_5
3 4 **IMCO/United Nations Numerical Designation:** 8/1745

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied gas
4 2 **Color:** Colorless
4 3 **Odor:** Highly irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus rubber suit and gloves
5 2 **Symptoms Following Exposure:** Chemical is highly corrosive and toxic Inhalation causes severe burns of mucous membrane Ingestion causes severe burns of mouth Contact with eyes or skin causes severe burns
5 3 **Treatment for Exposure:** *Get medical attention IMMEDIATELY for any exposure to this chemical even if no adverse effects are evident* INHALATION remove victim from area apply artificial respiration if breathing has ceased INGESTION give large amount of water EYES wash with copious amounts of water for 15 min SKIN wash with large amounts of water and follow with lime water remove contaminated clothing
5 4 **Toxicity by Inhalation (Threshold Limit Value).** 0 1 ppm
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

Chemical is strong oxidizer and may cause fire in contact with organic materials such as wood cotton or straw

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Do not use water or foam on adjacent fires
6 5 **Special Hazards of Combustion Products** Toxic and irritating fumes of hydrogen fluoride and bromine may form in fires
6 6 **Behavior in Fire** Containers may burst when exposed to heat of fire
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently with water evolving hydrogen fluoride an extremely irritating and corrosive gas
7 2 **Reactivity with Common Materials** Reacts violently with many metals and materials of construction such as wood glass some plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Union Carbide Corp
Linde Division
270 Park Avenue
New York N Y 10017

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place N Y 11514

3 Pfaltz and Bauer Inc
126 04 Northern Blvd
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 98 0+
Pure 99 9%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** Padded
10 4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O Z

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizer
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	3
Special	W OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight** 174 9
13 3 **Boiling Point at 1 atm.** 106°F = 41 C = 314 K
13 4 **Freezing Point:** −76°F = −60 C = 213°K
13 5 **Critical Temperature** 387°F = 19 °C = 470°K
13 6 **Critical Pressure** Data not available
13 7 **Specific Gravity:** 2 48 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 6 03
13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 059 at 25°C
13 12 **Latent Heat of Vaporization** 76 8 Btu/lb = 42 7 cal/g = 1 79 × 10 J/kg
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

BTF	# BROMINE TRIFLUORIDE

Common Synonyms	Liquid Colorless Extremely irritating odor Reacts violently with water Poisonous gas is produced on contact with water Freezing point is 28° F
	AVOID CONTACT WITH LIQUID AND VAPOR STOP LEAK AWAY [illegible]
Fire	Not flammable May cause fire on contact with combustibles POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire [illegible] Extinguish with dry chemicals carbon dioxide DO NOT USE WATER OR FOAM ON FIRE
Exposure	CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat Move victim to fresh air [illegible] LIQUID POISONOUS IF SWALLOWED Will burn skin and eyes Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning corrosive, air contaminant
Restrict access
Evacuate area
Disperse and flush

2 LABELS

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** BrF_3
3 4 **IMCO/United Nations Numerical Designation.** 9/1746

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Colorless to gray-yellow
4 3 **Odor:** Extremely irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus complete protective clothing safety glasses face shield
5 2 **Symptoms Following Exposure** Inhalation causes severe irritation of upper respiratory system Contact with liquid or vapor causes severe burns of eyes and can cause ulcers and blindness Contact with skin causes severe burns Ingestion causes severe burns of mucous membranes
5 3 **Treatment for Exposure:** Get immediate medical attention for all exposures INHALATION remove from exposure support respiration EYES irrigate with copious amounts of water for at least 15 min SKIN wash with large amounts of water for at least 15 min then rinse with sodium bicarbonate or lime solution
5 4 **Toxicity by Inhalation (Threshold Limit Value).** 0 1 ppm (suggested)
5 5 **Short-Term Inhalation Limits:** 50 ppm 30 min 100 ppm 5 min
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** Not flammable but may cause fire on contact with combustibles
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Dry chemical carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water, foam
6 5 **Special Hazards of Combustion Products** Data not available
6 6 **Behavior in Fire:** Forms very toxic and irritating fume
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously to generate toxic hydrogen fluoride gas (hydrofluoric acid)
7 2 **Reactivity with Common Materials:** Will cause severe corrosion of common metals and glass May cause fire in contact with organic materials such as wood cotton or straw
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Flush with water rinse with sodium bicarbonate or lime solution
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Matheson Gas Products Co
East Rutherford, N J 07073
2 Union Carbide Corp
Linde Division
270 Park Avenue
New York N Y 10017
3 Air Products and Chemicals Inc
Specialty Gas Department
P O Box 538
Allentown Pa 18105

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 98+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook [illegible])

X O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Oxidizer
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 136 9
13 3 **Boiling Point at 1 atm:** 258 4°F = 125 8°C = 399 0°K
13 4 **Freezing Point:** 47 8°F = 8 8°C = 282 0°K
13 5 **Critical Temperature.** test 1621°F = 327°C = 600°K
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2 81 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 36 3 dynes/cm = 0 0363 N/m at 23°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 4 7
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 1428
13 12 **Latent Heat of Vaporization:** 130 Btu/lb = 74 cal/g = 3 1 X 10⁵ J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

BBZ	BROMOBENZENE

Common Synonyms			
Monobromobenzene Phenyl bromide Bromobenzol	Liquid Sinks in water	Colorless	Pleasant odor

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes. Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Monobromobenzene
Phenyl bromide
Bromobenzol

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** C_6H_5Br

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pleasant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield rubber gloves and apron

5 2 **Symptoms Following Exposure:** Contact with liquid causes irritation of eyes and mild irritation of skin Ingestion causes mild irritation of mouth and stomach

5 3 **Treatment for Exposure:** EYES flush with water for at least 15 min SKIN wipe off wash with soap and water INGESTION induce vomiting consult a doctor

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 124°F C C

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Water, dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Irritating hydrogen bromide and other gases may be produced in fire

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature:** 1 049°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 3 8 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland Mich 48640

2 Great Lakes Chemical Corp
P O Box 2200
West Lafayette, Ind 47906

3 Michigan Chemical Corp
351 East Ohio Street
Chicago Ill 60611

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X X Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** *Combustible Liquid*

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 157

13 3 **Boiling Point at 1 atm:** 313°F = 156°C = 429°K

13 4 **Freezing Point:** −23 1°F = −30 6°C = 242 6°K

13 5 **Critical Temperature:** 747°F = 397°C = 670°K

13 6 **Critical Pressure:** 655 psia = 44 6 atm = 4 52 MN/m

13 7 **Specific Gravity:** 1 49 at 25°C (liquid)

13 8 **Liquid Surface Tension.** 36 dynes/cm = 0 036 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est) 30 dynes/cm = 0 030 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 5 4

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 0931

13 12 **Latent Heat of Vaporization:** 104 Btu/lb = 58 cal/g = 2 4 × 10⁵ J/kg

13 13 **Heat of Combustion:** 8 510 Btu/lb = 4,730 cal/g = 198 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

BRU	**BRUCINE**

Common Synonyms
10 1 Dimethoxystrychnine
( ) Brucine dihydrate

Solid White Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
[illegible]

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
If swallowed will cause nausea and vomiting
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible] CONSCIOUS [illegible] water [illegible]
IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Brucine dihydrate
10 11 Dimethoxystrychnine

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_{23}H_{26}N_2O_4$ or $C_{23}H_{26}N_2O_4 \cdot 2H_2O$

3 4 **IMCO/United Nations Numerical Designation:** 6 1/1570

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Chemical is toxic if inhaled swallowed or absorbed through skin Inhalation produces intense bitter taste Ingestion causes nausea vomiting restlessness excitement twitching and (rarely) convulsions Contact with dust irritates eyes

5 3 **Treatment for Exposure:** INHALATION remove victim from exposure INGESTION induce vomiting, get medical attention at once EYES flush with water for 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4 oral rat LD_{50} = 1 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** Possible bioaccumulation problem for the duration of 1 week

9. SELECTED MANUFACTURERS

1 Gallard Schlesinger Chemical Mfg Co
984 Mineola Ave
Carle Place N Y 11514

2 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

3 Norse Laboratories Inc
2038 Alameda Padre Serra
Santa Barbara Calif 93103

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

11

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight.** 394 4

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 352°F = 178 C = 451°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** > 1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** −13 400 Btu/lb = −7 440 cal/g = −311 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page C and D

NOTES

BDI	# BUTADIENE, INHIBITED

Common Synonyms
Divinyl
Vinylethylene
1,3-Butadiene

Liquefied compressed gas — Colorless — Gasoline-like odor

Floats and boils on water. Flammable vapor cloud is produced.

Avoid contact with liquid and gas. Keep people away. [illegible] Stay upwind. [illegible] Ventilate area. [illegible] Isolate area until gas has dispersed. [illegible]

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
[illegible]

LIQUID
Irritating to skin and eyes
[illegible]

Water Pollution

Not harmful to aquatic life
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning. Isolate area. Evacuate area.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Biethylene
1,3-Butadiene
Bivinyl
Divinyl
Vinylethylene

3.2 **Coast Guard Compatibility Classification:** Olefin

3.3 **Chemical Formula:** $CH_2{=}CH{-}CH{=}CH_2$

*4 **IMCO United Nations Numerical Designation:** 2.0 [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Gas

4.2 **Color:** Colorless

4.3 **Odor:** Mildly aromatic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles, rubber boots and gloves. [illegible] Enter contaminated area only in enclosed storage space hazmat suit with respirator, or vapor-proof clothing with self-contained breathing apparatus (rubber [illegible]).

5.2 **Symptoms Following Exposure:** Slight anesthetic effect at high concentrations. [illegible] Irritant at slight concentrations, except in [illegible] high concentrations.

5.3 **Treatment for Exposure:** Remove victim from exposure immediately. Call a physician. INHALATION: If breathing is irregular or stopped, start resuscitation, administer oxygen. SKIN CONTACT: Remove contaminated clothing and wash affected skin area. EYE CONTACT: Irrigate with water [illegible].

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting [illegible] present in high concentrations. The effect [illegible] temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If pulled [illegible] may be painful and redden [illegible] of the skin because [illegible] solvent.

5.10 **Odor Threshold:** 4 mg/m³

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] F (C.C.)

6.2 **Flammable Limits in Air:** 2.0 [illegible]

6.3 **Fire Extinguishing Agents:** Stop flow of gas

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Vapors heavier than air and may travel a considerable distance to source of ignition and flash back. Containers may explode in a fire due to polymerization.

6.7 **Ignition Temperature:** [illegible] F

6.8 **Electrical Hazard:** Class I, Group B

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Explosive decomposition when contaminated with peroxides formed by reaction with air

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Stable when inhibitors present

7.6 **Inhibitor of Polymerization:** tert-Butylcatechol (0.02 [illegible])

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Not pertinent

8.2 **Waterfowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** Not pertinent

8.4 **Food Chain Concentration Potential:** Not pertinent

9. SELECTED MANUFACTURERS

1. Neches Butane Products Co., Port Neches, Texas 77651
2. Petro-Tex Chemical Corp., Houston, Texas 77017
3. Phillips Petroleum Co., Bartlesville, Oklahoma 74004

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**

Research grade	99.5% min
Special purity	99.5% min
Rubber grade	99.0% min
Commercial	98%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A B C D E F G Z

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	1
Liquid or Solid Irritant	
Poison	
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 54.09

13.3 **Boiling Point at 1 atm:** 24.1°F = −4.4°C = 268.8°K

13.4 **Freezing Point:** −164°F = −108.9°C = 164.1°K

13.5 **Critical Temperature:** 306°F = 152°C = 425°K

13.6 **Critical Pressure:** 628 psia = 42.7 atm = 4.32 MN/m²

13.7 **Specific Gravity:** 0.62 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 1.4 dynes/cm = 0.0014 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 45 dynes/cm = 0.045 N/m at 22°C

13.10 **Vapor (Gas) Specific Gravity:** 1.9 at 20°C

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** 190 Btu/lb = 100 cal/g = 4.19 × 10⁵ J/kg

13.13 **Heat of Combustion:** −19,000 Btu/lb = −10,[illegible] cal/g = −44.2 × 10⁶ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization.** −549 Btu/lb = −305 cal/g = −12.8 × 10⁶ J/kg

Continued on page [illegible]

NOTES

REVISED 1978

BUT	BUTANE

Common Synonyms n-Butane	Liquefied compressed gas Colorless Gasoline-like odor Floats and boils on water Flammable, visible vapor cloud is formed

[illegible]

Fire	**FLAMMABLE** Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area [illegible]
Exposure	[illegible] **VAPOR** If inhaled, will cause dizziness or difficult breathing Not irritating to eyes nose or throat [illegible] **LIQUID** Will cause frostbite [illegible]
Water Pollution	Not harmful to aquatic life May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

[illegible] high flammability

[illegible]

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** n-Butane

3.2 **Coast Guard Compatibility Classification:** Paraffin

3.3 **Chemical Formula:** [illegible]

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Compressed gas

4.2 **Color:** Colorless

4.3 **Odor:** Like gasoline

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** ORAL AND ASPIRATION [illegible] INHALATION [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** None

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Class I Group D

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Neches Butane Product Co. Port Neches, Texas [illegible]
2. Petro-Tex Chemical Corp. Houston, Texas [illegible]
3. Phillips Petroleum Co. Bartlesville, Oklahoma [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Research [illegible] Pure [illegible] Technical [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A B C D E F G

12 HAZARD CLASSIFICATIONS

12.1 ***Code of Federal Regulations:*** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	0
Liquid or Solid Irritant	[illegible]
Poisons	[illegible]
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	0
Water	[illegible]
Self Reactive	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Gas

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.** [illegible]

13.4 **Freezing Point.** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension.** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

REVISED 1978

BDO	1,4-BUTANEDIOL

Common Synonyms 1,4-dihydroxybutane Tetramethylene glycol	Thick liquid	Colorless	Odorless
	Sinks and mixes with water. Freezing point is 68° F		

[illegible]

Fire	**Combustible** [illegible] Water may be [illegible]
Exposure	CALL FOR MEDICAL AID **LIQUID OR SOLID** **Irritating to skin or eyes.** **Harmful if swallowed** Flush affected areas with plenty of water IF SWALLOWED and [illegible] ONSCIOUS [illegible] drink water or milk
Water Pollution	**Effect of low concentrations on aquatic life is unknown** **May be dangerous if it enters water intakes.** [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,4-Dihydroxybutane, Tetramethylene glycol

3.2 **Coast Guard Compatibility Classification:** Alcohols

3.3 **Chemical Formula:** HOCH$_2$CH$_2$CH$_2$CH$_2$OH

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Odorless

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Fire protection

5.2 **Symptoms Following Exposure:** Ingestion of large amounts needed to produce any symptoms

5.3 **Treatment for Exposure:** SKIN OR EYES, wash off immediately with plenty of water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 2 [illegible]

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** None

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** >250°F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

GAF Corporation
Chemical Division
Calvert City, Kentucky 42029

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Regular grade 99%; Anhydrous grade 99.3%

10.2 **Storage Temperature:** 75°–100°F

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 90.12

13.3 **Boiling Point at 1 atm:** 442°F = 228°C = 501°K

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** 716°F = 380°C = 653°K

13.6 **Critical Pressure:** 720 psia = 49 atm = 5 GMN/m²

13.7 **Specific Gravity:** 1.017 at 20°C liquid

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

BUD	1,4-BUTENEDIOL

Common Synonyms
2-Butene-1,4-diol
1,4-Dihydroxy 2-butene

Thick liquid — Light yellow — Odorless

Sinks and mixes with water. Freezing point is 45° F

Fire

Combustible
Extinguish [illegible] water may be ineffective [illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed.*
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
No data [illegible] positive [illegible] Fish
No data general toxicity [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Dispersal and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
cis 2 Butene 1,4 diol
1,4 Dihydroxy 2 butene

3.2 **Coast Guard Compatibility Classification:**
Not applicable

3.3 **Chemical Formula**
HOCH2CH=CHCH2OH

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Pale yellow

4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Eye protection

5.2 **Symptoms Following Exposure:** Data not available

5.3 **Treatment for Exposure:** SKIN OR EYE CONTACT: Immediately flush [illegible] water [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 2 [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Moderate. Not a skin irritant but prolonged or repeated contact may cause irritation or dermatitis.

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** 265°F C.O.C.

6.2 **Flammable Limits in Air:**
Not pertinent

6.3 **Fire Extinguishing Agents:** Water, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**
Water if water is cause [illegible]

6.5 **Special Hazards of Combustion Products:**
Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Stable

7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):**
Data not available

8.4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

GAF Corporation
Chemical Division
Calvert City, Kentucky 42029

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** Above 45°F

10.3 **Inert Atmosphere:** Inerted

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classification:**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.**
[illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 25°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).**
Not pertinent

13.12 **Latent Heat of Vaporization:**
Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:**
[illegible]

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

BCN	n-BUTYL ACETATE

Common Synonyms Acetic acid n-butyl ester Butyl acetate Butyl ethanoate	Watery liquid Colorless Pleasant fruity odor Floats on water Flammable irritating vapor is produced

[illegible]

Fire	**FLAMMABLE** Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area [illegible]
Exposure	CALL FOR MEDICAL AID **VAPOR** Irritating to eyes, nose and throat If inhaled will cause nausea, dizziness, headache or difficult breathing [illegible] **LIQUID** Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

[illegible]

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
[illegible]

3.2 **Coast Guard Compatibility Classification:** [illegible]

3.3 **Chemical Formula:** [illegible]

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** SKIN [illegible] INHALATION [illegible]

5.3 **Treatment for Exposure:** EYES [illegible] INHALATION [illegible] INGESTION [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits.** [illegible]

5.6 **Toxicity by Ingestion** [illegible]

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** [illegible] chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** [illegible]

6.5 **Special Hazards of Combustion Products.** [illegible]

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** [illegible]

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials.** [illegible]

7.3 **Stability During Transport:** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics.** [illegible]

7.5 **Polymerization.** [illegible]

7.6 **Inhibitor of Polymerization:** [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD)** [illegible]

8.4 **Food Chain Concentration Potential.** [illegible]

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poison	[illegible]
Water Pollution	
Human Toxicity	
Aquatic Toxicity	[illegible]
Aesthetic Effect	[illegible]
Reactivity	
Other Chemicals	
Water	
Self Reaction	

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** 14.5 dynes/cm = 0.0145 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas)** [illegible]

13.12 **Latent Heat of Vaporization.** [illegible]

13.13 **Heat of Combustion.** [illegible]

13.14 **Heat of Decomposition:** [illegible]

13.15 **Heat of Solution.** [illegible]

13.16 **Heat of Polymerization:** [illegible]

[illegible]

NOTES

REVISED 1978

BTA	sec-BUTYL ACETATE

Common Synonyms
Acetic acid
Sec-butyl ester

Watery liquid — Colorless — Pleasant, fruity odor

Floats on water. Flammable, irritating vapor is produced

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea, headache or difficult breathing
[illegible]

LIQUID
Irritating to skin and eyes
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook [illegible]

[illegible]

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible]
3.2 Coast Guard Compatibility Classification: [illegible]
3.3 Chemical Formula: [illegible]
3.4 IMCO United Nations Numerical Designation: [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): [illegible]
4.2 Color: [illegible]
4.3 Odor: [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]
5.2 Symptoms Following Exposure: [illegible]
5.3 Treatment for Exposure: INHALATION [illegible] EYES [illegible]
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: [illegible]
5.6 Toxicity by Ingestion: [illegible]
5.7 Late Toxicity: [illegible]
5.8 Vapor (Gas) Irritant Characteristics: [illegible]
5.9 Liquid or Solid Irritant Characteristics: [illegible]
5.10 Odor Threshold: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: [illegible]
6.2 Flammable Limits in Air: [illegible]
6.3 Fire Extinguishing Agents: [illegible]
6.4 Fire Extinguishing Agents Not to be Used: [illegible]
6.5 Special Hazards of Combustion Products: [illegible]
6.6 Behavior in Fire: [illegible]
6.7 Ignition Temperature: [illegible]
6.8 Electrical Hazard: [illegible]
6.9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: [illegible]
7.2 Reactivity with Common Materials: [illegible]
7.3 Stability During Transport: [illegible]
7.4 Neutralizing Agents for Acids and Caustics: [illegible]
7.5 Polymerization: [illegible]
7.6 Inhibitor of Polymerization: [illegible]

8 WATER POLLUTION

8.1 Aquatic Toxicity: [illegible]
8.2 Waterfowl Toxicity: [illegible]
8.3 Biological Oxygen Demand (BOD): [illegible]
8.4 Food Chain Concentration Potential: [illegible]

9 SELECTED MANUFACTURERS

[illegible]

10. SHIPPING INFORMATION

10.1 Grades or Purity: Technical and Pure
10.2 Storage Temperature: [illegible]
10.3 Inert Atmosphere: [illegible]
10.4 Venting: [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook [illegible]

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: [illegible]
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
[illegible]	

12.3 NFPA Hazard Classifications:

Category	Classification
[illegible]	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: [illegible]
13.2 Molecular Weight: [illegible]
13.3 Boiling Point at 1 atm: [illegible]
13.4 Freezing Point: [illegible]
13.5 Critical Temperature: [illegible]
13.6 Critical Pressure: [illegible]
13.7 Specific Gravity: [illegible]
13.8 Liquid Surface Tension: [illegible]
13.9 Liquid-Water Interfacial Tension: [illegible]
13.10 Vapor (Gas) Specific Gravity: [illegible]
13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]
13.12 Latent Heat of Vaporization: [illegible]
13.13 Heat of Combustion: [illegible]
13.14 Heat of Decomposition: [illegible]
13.15 Heat of Solution: [illegible]
13.16 Heat of Polymerization: [illegible]

[illegible]

NOTES

REVISED 1978

BAI

iso-BUTYL ACRYLATE

Common Synonyms: Isobutyl Propenoate; Acrylic acid, isobutyl ester

Watery liquid — Colorless — Sharp fragrant odor

Floats on water. Irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Floating to shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:

3.2 Coast Guard Compatibility Classification: Acrylate

3.3 Chemical Formula: $CH_2=CHCOOCH_2CH(CH_3)_2$

3.4 IMCO United Nations Numerical Designation: Data not available

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid

4.2 Color: Colorless

4.3 Odor: Sharp fragrant odor

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:

5.2 Symptoms Following Exposure:

5.3 Treatment for Exposure: INHALATION ... INGESTION ... SKIN ...

5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available

5.5 Short-Term Inhalation Limits: Data not available

5.6 Toxicity by Ingestion: Data not available

5.7 Late Toxicity: No evidence

5.8 Vapor (Gas) Irritant Characteristics: ... The vapor causes ...

5.9 Liquid or Solid Irritant Characteristics: ...

5.10 Odor Threshold: Data not available

6 FIRE HAZARDS

6.1 Flash Point: 94°F (34°C)

6.2 Flammable Limits in Air:

6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide, water

6.4 Fire Extinguishing Agents Not to be Used: No evidence

6.5 Special Hazards of Combustion Products: No evidence

6.6 Behavior in Fire: No evidence

6.7 Ignition Temperature: 441°F

6.8 Electrical Hazard: No evidence

6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction

7.2 Reactivity with Common Materials: No reaction

7.3 Stability During Transport: Stable

7.4 Neutralizing Agents for Acids and Caustics: No evidence

7.5 Polymerization: Will polymerize violently if heated above boiling point or in presence of catalyst

7.6 Inhibitor of Polymerization: Many inhibitors are used, including hydroquinone, hydroquinone monomethyl ether, phenothiazine

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD): Data not available

8.4 Food Chain Concentration Potential: Data not available

9 SELECTED MANUFACTURERS

Celanese Corp.
Chemical Products Div.
40 Rector St.
New York, New York

Rohm and Haas Co.
Independence Mall West
Philadelphia, Pa.

Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, New York

10 SHIPPING INFORMATION

10.1 Grades or Purity: 99+%

10.2 Storage Temperature: Ambient

10.3 Inert Atmosphere: No requirement

10.4 Venting: Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-5

A T U Z

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Combustible Liquid

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	2
Health	
Vapor Toxicity	1
Liquid and Solid Toxicity	1
Irritant	2
Water Pollution	
Toxicity	1
Aquatic Toxicity	1
Reactivity	
Rate of Reaction	1
Water	1
Self Reaction	1

12.3 NFPA Hazard Classifications: No data

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid

13.2 Molecular Weight: 128.17

13.3 Boiling Point at 1 atm: 293°F (145°C) = 418°K

13.4 Freezing Point: -75°F (-59°C) = 214°K

13.5 Critical Temperature: 575°F (302°C) = 575°K

13.6 Critical Pressure: 33 atm = 485 psia = 33 MPa

13.7 Specific Gravity: 0.8966 at 20°/4°C; 0.8966 at 20°/20°C

13.8 Liquid Surface Tension: 24.7 dyne/cm = 24.7 N/m at 20°C

13.9 Liquid-Water Interfacial Tension: 8.0 dyne/cm = 8.0 N/m at 20°C

13.10 Vapor (Gas) Specific Gravity: 4.4

13.11 Ratio of Specific Heats of Vapor (Gas): 1.04

13.12 Latent Heat of Vaporization: 150 Btu/lb = 83.3 cal/g = 348 J/g at 1 atm

13.13 Heat of Combustion: -14,000 Btu/lb = -7,780 cal/g = -32,500 J/g

13.14 Heat of Decomposition: No data

13.15 Heat of Solution: None

13.16 Heat of Polymerization: -1,000 Btu/lb = -556 cal/g = -2,320 J/g

NOTES

REVISED 1978

BTC	# n-BUTYL ACRYLATE

Common Synonyms
Butyl acrylate
n-Butyl 2-propenoate
Acrylic acid, n-butyl ester

Watery liquid — Colorless — Sharp, fragrant odor

Floats on water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Containers may explode in fire
Extinguish with dry chemical, foam or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim CONSCIOUS have victim drink water or milk
IF SWALLOWED and victim UNCONSCIOUS OR HAVING CONVULSIONS do nothing except transport to hospital

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and pollution control agencies
Notify water intake facility with nearby water intake

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Acrylic acid, butyl ester
Butyl acrylate
Butyl 2-propenoate

3.2 **Coast Guard Compatibility Classification**
Acrylate

3.3 **Chemical Formula**
$CH_2=CHCOOCH_2CH_2CH_2CH_3$

3.4 **IMCO-United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Colorless
4.3 **Odor** Characteristic acrylic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus, rubber gloves and goggles
5.2 **Symptoms Following Exposure.** Vapor is irritating, when breathed at high concentrations. Contact with liquid causes irritation of skin and burning of eyes
5.3 **Treatment for Exposure** INHALATION remove to fresh air, administer artificial respiration or oxygen if indicated, call a physician. SKIN AND EYES wash with plenty of water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits** LD_{50} 1000ppm 4 hr
5.6 **Toxicity by Ingestion** Grade 2 0.5 to 5 gm/kg (rat)
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin
5.10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 110°F O.C.
6.2 **Flammable Limits in Air:**
1.4% - 9.4%
6.3 **Fire Extinguishing Agents**
Dry chemical, foam or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used**
Not pertinent
6.5 **Special Hazards of Combustion Products**
Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature** 434°F
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** 4.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction
7.2 **Reactivity with Common Materials:**
No reaction
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization:** Will polymerize on application of heat, uncontrolled bulk polymerization can be explosive
7.6 **Inhibitor of Polymerization:**
Methyl ether of hydroquinone
15-100 ppm. Store in contact with air

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)**
Data not available
8.4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

1. Celanese Corp
Celanese Chemical Co. Division
245 Park Ave
New York, N.Y. 10017
2. Rohm and Haas Co
Independence Mall West
Philadelphia, Pa. 19105
3. Union Carbide Corp
Chemicals and Plastics Div
270 Park Ave
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity** 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T-U-Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** 128.17
13.3 **Boiling Point at 1 atm:**
299°F = 148.8°C = 422.9°K
13.4 **Freezing Point**
−83°F = −64°C = 209°K
13.5 **Critical Temperature:**
621°F = 327°C = 600°K
13.6 **Critical Pressure**
426 psia = 29 atm = 2.9 MN/m²
13.7 **Specific Gravity:** 0.899 at 20°C (liquid)
13.8 **Liquid Surface Tension:**
(est.) 20 dynes/cm = 0.020 N/m at 27°C
13.9 **Liquid-Water Interfacial Tension:**
(est.) 60 dynes/cm = 0.060 N/m at 27°C
13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.05
13.12 **Latent Heat of Vaporization.**
120 Btu/lb = 66.4 cal/g = 2.78 × 10⁵ J/kg
13.13 **Heat of Combustion** −13,660 Btu/lb
= −7,900 cal/g = −322.4 × 10³ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization.**
−259 Btu/lb = −144 cal/g
= −6.03 × 10⁵ J/kg

Continued on page 5-2-1-B

NOTES

REVISED 1978

BAN

n-BUTYL ALCOHOL

Common Synonyms

butanol
Butyl alcohol
1-Butanol
1-Hydroxybutane
n-Propylcarbinol

Watery liquid | Colorless | Alcohol odor

Floats and mixes slowly with water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away.
Call fire department.
Avoid contact with liquid and vapor.
Stay upwind and use water sprays to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical or carbon dioxide.
Water and alcohol foam may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause nausea, headache, dizziness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Restrict access.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** Butanol
Butyl alcohol
1-Butanol
1-Hydroxybutane
n-Propylcarbinol

3.2 **Coast Guard Compatibility Classification** Alcohol

3.3 **Chemical Formula** $CH_3(CH_2)_3OH$

3.4 **IMCO United Nations Numerical Designation** 3-1120

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color** Colorless

4.3 **Odor.** Alcohol-like, pungent, strong, characteristic, mildly alcoholic, non-residual

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Organic vapor protective mask, chemical goggles or face splash shield

5.2 **Symptoms Following Exposure** Anesthesia, nausea, headache, dizziness, irritation of respiratory passages. Mildly irritating to the skin and eyes.

5.3 **Treatment for Exposure:** INHALATION: remove from exposure immediately, call physician if breathing is irregular or has stopped, start resuscitation and administer oxygen. INGESTION: induce vomiting and call physician. EYES: flush with water for at least 15 minutes.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm

5.5 **Short-Term Inhalation Limits** 150 ppm (5-30 min)

5.6 **Toxicity by Ingestion:** Grade 2 (LD_{50} 0.5-5 g/kg)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system. Present in high concentrations, the effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics** Minimum hazard. If spilled on clothing and allowed to remain, may cause warming and reddening of the skin.

5.10 **Odor Threshold** 2.8 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 84°F (C.C.) 97°F (O.C.)

6.2 **Flammable Limits in Air** 1.4 - 11.2

6.3 **Fire Extinguishing Agents** Carbon dioxide, dry chemicals

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature:** 650°F

6.8 **Electrical Hazard** Class I, Group D

6.9 **Burning Rate** 3.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** 1000 ppm/24 hr goldfish died, fresh water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD):** 1.1-2.2 lb/lb (5 days), 1.87 (5 days)

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Celanese Corp.
Celanese Chemical Co. Div.
245 Park Ave.
New York, N.Y. 10017
2. Dow Badische Co.
Williamsburg, Virginia 23188
3. Union Carbide Corp.
Chemicals & Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-P-Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 74.12

13.3 **Boiling Point at 1 atm** 243.9°F = 117.7°C = 390.8°K

13.4 **Freezing Point.** 129.1°F = -89.5°C = 183.7°K

13.5 **Critical Temperature:** 553.6°F = 289.8°C = 562.9°K

13.6 **Critical Pressure.** 640.2 psia = 43.58 atm = 4.412 MN/m²

13.7 **Specific Gravity** 0.8109 (20/4°C) (liquid)

13.8 **Liquid Surface Tension** 24.6 dynes/cm = 0.0246 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.** [illegible] dynes/cm = [illegible] N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.083

13.12 **Latent Heat of Vaporization.** 256 Btu/lb = 142 cal/g = 5.94 × 10⁵ J/kg

13.13 **Heat of Combustion:** −14,230 Btu/lb = −7906 cal/g = −33.10 × 10⁶ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

REVISED 1978

BAS — sec-BUTYL ALCOHOL

Common Synonyms
2-Butanol
2-Hydroxybutane
Methylethylcarbinol

Watery liquid — Colorless — Alcohol odor

Floats and mixes slowly with water. Flammable, irritating vapor is produced

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid and vapor.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemical, carbon dioxide.
Water and alcohol foam may be ineffective for fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, dizziness or difficult breathing
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to eyes
Prior eye contact wash with plenty of water.

Water Pollution

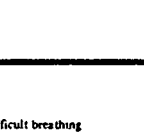
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and pollution control agencies.
Notify operators of affected water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Restrict access.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms**
2-Butanol
Butylene hydrate
2-Hydroxybutane
Methylethylcarbinol

3.2 **Coast Guard Compatibility Classification.**
Alcohol

3.3 **Chemical Formula:**
$CH_3CH(OH)CH_2CH_3$

3.4 **IMCO, United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Strong pleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Organic vapor canister or supplied mask, chemical goggles or face shield.

5.2 **Symptoms Following Exposure.** Headache, dizziness and respiratory irritation. Liquid is severely irritating to the eyes and can cause eye burn.

5.3 **Treatment for Exposure.** INHALATION: remove from exposure immediately, call a physician, if breathing is irregular or has stopped, start resuscitation and administer oxygen. INGESTION: induce vomiting and call physician. EYES: flush with water for at least 15 minutes.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 150 ppm

5.5 **Short-Term Inhalation Limits.** 200 ppm for 60 min

5.6 **Toxicity by Ingestion:** Grade 1: 5 to 15 g/kg rat, single oral dose

5.7 **Late Toxicity.** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.

5.10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6.1 **Flash Point** 75°F (C.C.)

6.2 **Flammable Limits in Air**
1.7% - 9.0%

6.3 **Fire Extinguishing Agents** Carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6.5 **Special Hazards of Combustion Products**
Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** 761°F

6.8 **Electrical Hazard.** Class I, Group D

6.9 **Burning Rate** [illegible] in/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity**
Data not available

8.2 **Waterfowl Toxicity.** Data not available

8.3 **Biological Oxygen Demand (BOD).**
Data not available

8.4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co.
Houston, Texas 77001
2. Shell Chemical Co.
Industrial Chemicals Div.
Houston, Texas 77001
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity.** 99+

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Chemical	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**
Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 74.12

13.3 **Boiling Point at 1 atm.**
211°F = 99.5°C = 372.7°K

13.4 **Freezing Point:**
−174.5°F = −114.7°C = 158.5°K

13.5 **Critical Temperature:**
505.0°F = 262.8°C = 536.0°K

13.6 **Critical Pressure**
609.4 psia = 41.39 atm = 4.193 MN/m²

13.7 **Specific Gravity.** 0.807 at 20°C (liquid)

13.8 **Liquid Surface Tension**
23.0 dynes/cm = 0.023 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension**
Data not available

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.0[illegible]

13.12 **Latent Heat of Vaporization**
243 Btu/lb = 135 cal/g = 5.65 × 10⁵ J/kg

13.13 **Heat of Combustion:** -15,500 Btu/lb
= -8600 cal/g = −360 × 10³ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:**
Data not available

13.16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

BAT — tert-BUTYL ALCOHOL

Common Synonyms
2-Methyl-2-propanol
Trimethylcarbinol

Oily liquid — Colorless — Sharp alcohol odor

Floats and mixes with water. Flammable, irritating vapor is produced. Freezing point is 78° F

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose, throat
If inhaled, will cause dizziness, difficult breathing
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
2-Methyl-2-propanol
Trimethylcarbinol

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $(CH_3)_3COH$

3.4 **IMCO, United Nations Numerical Designation** 3.3/1122

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
Sometimes freezes below 75°F

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic camphor-like pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Air pack or organic canister mask, rubber gloves, and goggles

5.2 **Symptoms Following Exposure:** Vapor is narcotic in [illegible] and irritating to respiratory passages
Liquid is irritating to skin and eyes

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure and restore breathing
SKIN, EYE CONTACT: remove liquid from skin with water. Flush eyes with water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm

5.5 **Short-Term Inhalation Limits:** 150 ppm for 30 min

5.6 **Toxicity by Ingestion.** Grade 2: 0.5 to 5.0 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 52°F (C.C.) [illegible] (O.C.)

6.2 **Flammable Limits in Air**
2.35% - 8.00%

6.3 **Fire Extinguishing Agents**
Dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6.5 **Special Hazards of Combustion Products**
Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** 896°F

6.8 **Electrical Hazard.** Class I, Group D

6.9 **Burning Rate:** 3.4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibition of Polymerization:**
Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD):**
0% - 5 days

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. Eastman Kodak Co.
Rochester, N.Y. 14650
2. Shell Chemical Co.
Industrial Chemicals Div.
Houston, Texas 77001

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open (flame arrester) or pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q-R-S

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm**
Liquid

13.2 **Molecular Weight:** 74.12

13.3 **Boiling Point at 1 atm:**
181°F = 82.6°C = 355.8°K

13.4 **Freezing Point** 78.3°F = 25.7°C = 298.9°K

13.5 **Critical Temperature**
451°F = 233°C = 506°K

13.6 **Critical Pressure:**
576 psia = 39.2 atm = 3.97 MN/m²

13.7 **Specific Gravity:** 0.78 at 20°C (liquid)

13.8 **Liquid Surface Tension**
20.7 dynes/cm = 0.020 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity** 2.6

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.080

13.12 **Latent Heat of Vaporization**
234 Btu/lb = 130 cal/g = 5.44 × 10⁵ J/kg

13.13 **Heat of Combustion:** −14 000 Btu/lb
= −7780 cal/g = −325.7 × 10⁵ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5-90A

NOTES

REVISED 1978

BAM	# n-BUTYLAMINE

Common Synonyms
1-Aminobutane
Butylamine
Mono-n-butylamine
Normalamine

Liquid — Colorless — Fishy, ammonia like odor

Mixes with water

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY

Fire

Flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause dizziness, headache, coughing or difficult breathing

LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability, air contaminant, water contaminant
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1-Aminobutane, Butylamine, Mono-n-butylamine, Normalamine
3.2 **Coast Guard Compatibility Classification:** Aliphatic amine
3.3 **Chemical Formula:** $CH_3(CH_2)_3NH_2$
3.4 **IMCO/United Nations Numerical Designation:** 3.2/1125

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Fish like, ammonia like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask, rubber gloves, coverall goggles, face shield, butyl rubber apron
5.2 **Symptoms Following Exposure:** Inhalation causes irritation, nausea, vomiting, headache, faintness, severe coughing and chest pains, can cause lung edema. Ingestion causes severe irritation of mouth and stomach. Contact with eyes causes severe irritation and edema of the cornea. Contact with skin causes burns, also [illegible]. Swallowing skin may cause nausea, vomiting and shock.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, call a physician, give oxygen if breathing is difficult, if not breathing, give artificial respiration. INGESTION: give large amounts of water, [illegible] medical attention. EYES: flush with water at least 15 min, get medical care. SKIN: remove contaminated clothing, flush skin with plenty of water at least 15 min.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5.5 **Short-Term Inhalation Limits:** 5 ppm 5 min
5.6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 500 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 30°F (0°C, 10°F C.C.)
6.2 **Flammable Limits in Air:** 1.7% - 9.8%
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flashback. Containers may explode in fire
6.7 **Ignition Temperature:** 94°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 0.79 in/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** May corrode some metals in presence of water
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 30-70 ppm 24 hr TLm fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 26.5% theo. 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Avenue
New York, N.Y. 10017
2. Virginia Chemicals, Inc.
3340 West Norfolk Rd.
Portsmouth, Va. 23703
3. Air Products and Chemicals, Inc.
U.S. Highway 90
Pace, Fla. 32502

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure 100%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

VPQRS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 73.14
13.3 **Boiling Point at 1 atm:** 172.3°F = 77.4°C = 350.6°K
13.4 **Freezing Point:** −56°F = −49°C = 224°K
13.5 **Critical Temperature:** 484°F = 251°C = 524°K
13.6 **Critical Pressure:** 603 psia = 41 atm = 4.16 MN/m²
13.7 **Specific Gravity:** 0.741 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 23.11 dynes/cm = 0.02311 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.071
13.12 **Latent Heat of Vaporization:** 191 Btu/lb = 106 cal/g = 4.2 × 10³ J/kg
13.13 **Heat of Combustion:** −17,598 Btu/lb = −9,776 cal/g = −409.0 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** 137 Btu/lb = 76.2 cal/g = 3.19 × 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

BTL	sec-BUTYLAMINE

Common Synonyms	Liquid	White	Ammonia like odor
	Mixes with water		

[illegible]

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing

[illegible]

LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

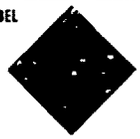
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability air contaminant water contaminant
Restrict access
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Aliphatic amine
3.3 **Chemical Formula.** $CH_3CH_2CH(CH_3)NH_2$
3.4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Ammonia like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles rubber gloves and proper respiratory protective equipment non sparking shoes
5.2 **Symptoms Following Exposure:** Inhalation causes irritation burns of the respiratory system exposure to concentrated vapors can cause asphyxiation Ingestion causes burns of mouth and stomach Contact with eyes causes lachrymation conjunctivitis burns corneal edema contact with skin causes irritation or burns dermatitis
5.3 **Treatment for Exposure:** INHALATION remove patient from exposure keep him quiet get physician INGESTION give large amount of water induce vomiting consult physician EYES Flush thoroughly with water for 15 min call physician immediately SKIN remove all contaminated clothing flood affected area with large quantities of water consult physician
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limit:** Data not available
5.6 **Toxicity by Ingestion.** Grade 3 oral LD_{50} 500 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate to high concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant Causes second and third degree burns on skin contact and severely injurious to the eyes
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 16 F C C
6.2 **Flammable Limits in Air** Data not available
6.3 **Fire Extinguishing Agents** Alcohol foam dry chemical carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen may be formed in fire
6.6 **Behavior in Fire** Vapor is heavier than air and may travel to a source of ignition and flashback Containers may explode in fire
6.7 **Ignition Temperature** 712 F
6.8 **Electrical Hazard** Data not available
6.9 **Burning Rate.** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials** May corrode some metals in presence of water
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Pennwalt Corporation
   Three Parkways
   Philadelphia Pa 19102
2. Virginia Chemicals Inc
   3366 West Norfolk Rd
   Portsmouth Va 23703
3. BASF Wyandotte Corp
   1609 Biddle Avenue
   Wyandotte MI 48192

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

VPQRS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	3
Reactivity (Yellow)	[illegible]

PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15 C and 1 atm** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** 145°F = 63 C = 336 K
13.4 **Freezing Point:** −155 F = −104°C = 169 K
13.5 **Critical Temperature:** Data not available
13.6 **Critical Pressure.** Data not available
13.7 **Specific Gravity:** 0.721 at 20 C (liquid)
13.8 **Liquid Surface Tension.** 22.42 dynes/cm = 0.02242 N/m at 20 C
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.52
13.11 **Ratio of Specific Heats of Vapor (Gas)** [illegible] at 20°C
13.12 **Latent Heat of Vaporization** [illegible] Btu/lb = 9x94 cal/g = 4.16 × 10⁴ J/kg
13.13 **Heat of Combustion** −17,600 Btu/lb = −9,780 cal/g = −409 × 10³ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

(See next page for notes)

NOTES

BUA	tert-BUTYLAMINE

Common Synonyms	Liquid	Colorless	Ammonia-like odor
2 Aminoisobutane 2 Amino 2-methylpropane 1 1 Dimethylethylamine TBA Trimethylaminomethane	Floats and mixes with water. Flammable. Irritating vapor is produced.		

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CAUTIOUS DOCTRINE
VAPOR
Irritating to eyes, nose and throat
Inhaled, will cause difficult breathing

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
air contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2 Aminoisobutane
2-Amino 2 methylpropane
1 1 Dimethylethylamine TBA
Trimethylaminomethane

3 2 **Coast Guard Compatibility Classification.** Aliphatic amine

3 3 **Chemical Formula:** $(CH_3)_3CNH_2$

3 4 **IMCO/United Nations Numerical Designation.** 3 2 1993

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Like ammonia

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose mouth and lungs Ingestion causes irritation of mouth and stomach Contact with liquid causes severe irritation of eyes and moderate irritation of skin

5 3 **Treatment for Exposure:** INHALATION move to fresh air give artificial respiration if breathing has stopped INGESTION give large amounts of water and induce vomiting EYES immediately flush with water for at least 15 min see medical attention SKIN flush with water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 180 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 10°F (-12°C)

6 2 **Flammable Limits in Air** 1.7% - 8.9% (at 212°F)

6 3 **Fire Extinguishing Agents.** Dry chemical alcohol foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** 464°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 7 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials:** Liquid will attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Monsanto Company
800 N Lindbergh Blvd
St Louis Mo 63166

2 Eastman Organic Chemicals
Rochester N Y 14650

3 Marsh Chemical Co
950 W Saint Paul Avenue
Milwaukee Wis 53233

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99+%

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A P Q R S

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 73.14

13 3 **Boiling Point at 1 atm:** 113°F = 45°C = 318°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Data not available

13 6 **Critical Pressure:** Data not available

13 7 **Specific Gravity:** 0.696 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 19 dynes/cm = 0.019 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 2.13

13 11 **Ratio of Specific Heats of Vapor (Gas):** Data not available

13 12 **Latent Heat of Vaporization:** 167.0 Btu/lb = 92 kcal/g = 3.88 × 10⁵ J/kg

13 13 **Heat of Combustion:** −17,600 Btu/lb = −9,790 cal/g = −4.10 × 10⁷ J/kg

13 14 **Heat of Decomposition:**

13 15 **Heat of Solution:** 170 Btu/lb = 96 cal/g = 4.0 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

BTN	BUTYLENE

Common Synonyms	
1 Butene	Liquefied compressed gas Colorless Fragrant gasoline-like odor Floats and boils on water Flammable, visible vapor cloud is produced.

Stop discharge if possible Keep people away
Stay upwind and keep out of low areas Detour traffic
Notify appropriate authorities
Avoid contact with liquid and gas
Notify local health and pollution control agencies

Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Stop flow of gas if possible Let fire burn
Exposure	Use Protective Clothing VAPOR If inhaled, will cause dizziness and difficult breathing Move victim to fresh air Give artificial respiration if needed Call a doctor LIQUID Will cause frostbite Thaw frostbitten areas with lukewarm water
Water Poilution	Not harmful to aquatic life May be dangerous if it enters water intakes Notify downstream users of water supply

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Evacuate area

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 Butene

3 2 **Coast Guard Compatibility Classification:** Olefin

3 3 **Chemical Formula:** $CH_3CH_2CH=CH_2$

3 4 **IMCO, United Nations Numerical Designation:** 2 0 1012

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Compressed gas

4 2 **Color:** Colorless

4 3 **Odor:** Sweetish

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical goggles gloves self contained breathing apparatus or organic canister

5 2 **Symptoms Following Exposure:** May act as an anesthetic or slight anesthetic at high vapor concentrations Vapor concentrations are not usually a hazard at room temperature except in enclosed spaces

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air and apply resuscitation Call a doctor EYES AND SKIN flush with water for at least 15 minutes

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Not pertinent

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are non irritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard Practically harmless to the skin because it is very volatile and evaporates quickly May cause frostbite

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air:** 1 6% 10%

6 3 **Fire Extinguishing Agents:** Stop flow of gas

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Containers may explode in fire Vapor is heavier than air and may travel long distance to a source of ignition and flash back

6 7 **Ignition Temperature:** 725°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** 8 8 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** None

8 2 **Waterfowl Toxicity:** None

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Air Products and Chemicals Inc
Allentown Pa 18105

2 Gulf Oil Corp
Gulf Oil Chemicals Co Division
Pittsburgh Pa 15230

3 Petro-Tex Chemical Corp
Houston Texas 77017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A B C D E F G

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Gas

13 2 **Molecular Weight:** 56 10

13 3 **Boiling Point at 1 atm.** 20 7°F = −6 3°C = 266 9°K

3 4 **Freezing Point:** −2[illegible]°F = −1[illegible]°C = 9[illegible]°K

13 5 **Critical Temperature:** 29[illegible] 5°F = 146 4°C = 41[illegible] K

13 6 **Critical Pressure:** [illegible] psia = 39 7 atm = 4 02 MN/m²

13 7 **Specific Gravity:** 0 595 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 12 5 dynes/cm = 0 0125 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** test 1[illegible] dynes/cm = 0 068 N/m at 0°C

13 10 **Vapor (Gas) Specific Gravity:** 1 9

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 104

13 12 **Latent Heat of Vaporization:** 168 Btu/lb = 9[illegible] cal/g = 3 91 × 10⁵ J/kg

13 13 **Heat of Combustion** − 9 48[illegible] Btu/lb = −10 826 cal/g = −45[illegible] 26 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

BTO	BUTYLENE OXIDE

Common Synonyms
1,2 Butylene oxide
1,2 Epoxybutane
1 Butene oxide
Alpha-butylene oxide

Liquid — Colorless — Sharp odor

Mixes with water

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.

LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability, air contaminant
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1 Butene oxide, 1,2 Butylene oxide, *alpha* Butylene oxide, 2 Epoxybutane
3.2 **Coast Guard Compatibility Classification.** Alkylene oxide
3.3 **Chemical Formula:** $C_4H_8OH_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Clean protective clothing, rubber gloves, chemical workers goggles, self contained breathing apparatus
5.2 **Symptoms Following Exposure:** Inhalation: irritation, irritable odor and irritation, respiratory injury may occur at higher levels. Ingestion: causes irritation of mouth and stomach. Contact with either liquid or vapor may cause burns of eyes. Liquid: causes frostbite type of skin burn if freeze to evaporate, if confined to skin, burns. Vapor: cause skin sensitization, not readily absorbed in toxic amounts.
5.3 **Treatment for Exposure:** INHALATION: if any ill effects occur immediately remove person to fresh air and get medical help, if breathing stops, start artificial respiration. INGESTION: induce vomiting promptly and get medical help. EYES: promptly flush with plenty of water for at least 15 min. and get medical help. SKIN: promptly flush with plenty of water, remove all contaminated clothing and wash before reuse.
5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 1,410 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** <−20°F (C.C.)
6.2 **Flammable Limits in Air:** 1.5% – 18.3%
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:** Containers may explode in fire. Use water to cool container from safe distance
6.7 **Ignition Temperature:** 959°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization.** May occur when in contact with strong acids or bases
7.6 **Inhibitor of Polymerization:** Data not available

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical U.S.A., Midland, Mich. 48640
2. Aldrich Chemical Co., 940 W. Saint Paul Ave., Milwaukee, Wis. 53233

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 99%
10.2 **Storage Temperature.** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Pressure vent

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

VPQRS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 72
13.3 **Boiling Point at 1 atm:** 145°F = 63°C = 336°K
13.4 **Freezing Point:** <−53°F = <−47°C = <226°K
13.5 **Critical Temperature.** Data not available
13.6 **Critical Pressure:** Data not available
13.7 **Specific Gravity:** 0.826 at 25°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.49
13.11 **Ratio of Specific Heats of Vapor (Gas)** Data not available
13.12 **Latent Heat of Vaporization** (est.) 180 Btu/lb = 100 cal/g = 4.2 × 10⁵ J/kg
13.13 **Heat of Combustion:** −15,200 Btu/lb = −8,470 cal/g = −354 × 10⁵ J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization** Data not available

(Continued on next page)

NOTES

BHP	tert-BUTYL HYDROPEROXIDE

Common Synonyms
Cadox TBH

Watery liquid — Colorless — Odorless

Floats and mixes slowly with water

Fire

FLAMMABLE.
May explode if subjected to heat, flame or shock.
May cause fire and explode on contact with combustibles.
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Isolate warning — high flammability
Remove ignition
Mechanical containment
Chemical and physical treatment

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cadox TBH
3.2 **Coast Guard Compatibility Classification.** Not applicable
3.3 **Chemical Formula:** C_4H_9COOH
3.4 **IMCO-United Nations Numerical Designation:** N.A. 1949

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles, well fitting gloves, barrier creams
5.2 **Symptoms Following Exposure:** Liquid causes severe burns of skin and eyes
5.3 **Treatment for Exposure:** INGESTION: induce vomiting and follow with gastric lavage. INHALATION: remove immediately to fresh air, maintain adequate atmosphere, give artificial respiration and oxygen if needed. SKIN, EYE AND MUCOUS MEMBRANE CONTACT: Immediately flush eyes with water
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 — strong irritant
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics** Vapor causes burning of the eyes, respiratory system in concentrations. The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** Powerful irritant to skin and eyes
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 100°F C.C.
6.2 **Flammable Limits in Air** Not pertinent
6.3 **Fire Extinguishing Agents** Dry chemical, foam or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products.** Not pertinent
6.6 **Behavior in Fire:** May explode in fire
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Reacts vigorously with caustic, sulfuric acid, metals (includes wood and some metals)
7.3 **Stability During Transport:** Shock and heat sensitive, self accelerating decomposition at 200°F
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Corp.
   129 Alexander St.
   Princeton, N.J. 08540
2. Pennwalt Corp.
   Buffalo, N.Y. 14240
3. Witco Chemical Corp.
   U.S. Petrolatum Division
   Marshall, Texas 75670

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 70%
10.2 **Storage Temperature:** 60-85°F
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

A P-O 7

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	*
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	
Aesthetic Effect	1
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	4

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammables (Red)	4
Reactivity (Yellow)	4
	OX

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 90.12
13.3 **Boiling Point at 1 atm.** Decomposes
13.4 **Freezing Point:** −41°F (−40°C = 233°K)
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.89 at 25°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension.** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10³ J/kg
13.14 **Heat of Decomposition.** −[illegible] Btu/lb = [illegible] cal/g = −[illegible] × 10³ J/kg
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

NOTES

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BTM

n-BUTYL MERCAPTAN

Common Synonyms
1-Butanethiol
Thiobutyl alcohol

Liquid — Colorless to yellow — Skunk like odor

Floats on water. Poisonous vapor is produced

Fire

FLAMMABLE
Irritating gases may be produced when heated
Containers (may) explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

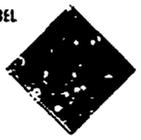
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning — high flammability
Remove sources
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms: 1-Butanethiol, Thiobutyl alcohol
3.2 Coast Guard Compatibility Classification: Not applicable
3.3 Chemical Formula: $CH_3CH_2CH_2CH_2SH$
3.4 IMCO/United Nations Numerical Designation: [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless to yellow
4.3 Odor: Skunk like

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]
5.2 Symptoms Following Exposure: Inhalation causes [illegible] and respiratory paralysis may [illegible]. Contact causes [illegible] eyes. Vapor causes slight irritation. Ingestion causes [illegible]
5.3 Treatment for Exposure: INHALATION: [illegible] fresh air. Give oxygen if breathing difficult. [illegible] EYES: Wash with plenty of water for [illegible]. SKIN: [illegible]. INGESTION: [illegible]
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade [illegible] LD_{50} [illegible] mg/kg
5.7 Late Toxicity: Data [illegible]
5.8 Vapor (Gas) Irritant Characteristics: Data [illegible]
5.9 Liquid or Solid Irritant Characteristics: Data [illegible]
5.10 Odor Threshold: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: [illegible] F (C)
6.2 Flammable Limits in Air: Data [illegible]
6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water
6.5 Special Hazards of Combustion Products: Irritating sulfur dioxide and [illegible]
6.6 Behavior in Fire: Vapor may catch fire [illegible] and may travel along surface [illegible] ignition and flashback
6.7 Ignition Temperature: Data [illegible]
6.8 Electrical Hazard: Data [illegible]
6.9 Burning Rate: [illegible]

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: [illegible]
8.2 Waterborne Toxicity: Data [illegible]
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: [illegible]

9 SELECTED MANUFACTURERS

Pennsylvania [illegible]
Industrial Chemical Department
Three Parkway
Philadelphia, Pa. [illegible]

Phillips Petroleum Company
Chemical Department
Special Products Division
Phillips Building
Bartlesville, Okla. [illegible]

Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 Grades of Purity: [illegible]
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Pressure vent

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

S T E V W

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Flammable liquid
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: 90.2
13.3 Boiling Point at 1 atm.: 206.3°F (97°C) = 370°K
13.4 Freezing Point: [illegible] F (C) = [illegible] K
13.5 Critical Temperature: [illegible] F (C) = [illegible] K
13.6 Critical Pressure: [illegible] atm = [illegible] MN/m²
13.7 Specific Gravity: [illegible] at 20°C (68°F)
13.8 Liquid Surface Tension: 26.1 dynes/cm = 0.0261 N/m at 20°C
13.9 Liquid-Water Interfacial Tension: [illegible] dynes/cm = 0.0030 N/m at 20°C
13.10 Vapor (Gas) Specific Gravity: [illegible]
13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]
13.12 Latent Heat of Vaporization: [illegible] Btu/lb = [illegible] cal/g
13.13 Heat of Combustion: [illegible] Btu/lb = [illegible] cal/g
13.14 Heat of Decomposition: Not [illegible]
13.15 Heat of Solution: Not [illegible]
13.16 Heat of Polymerization: Not [illegible]

(Continued on page [illegible])

NOTES

BMN	n-BUTYL METHACRYLATE

Common Synonym			
Methacrylic acid, butyl ester Butyl methacrylate Butyl 2-methacrylate n-Butyl alpha-methacrylate	Liquid	Colorless	Mild odor
	Floats on water		

Fire	Combustible Containers may explode in fire
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment
Shoreline removal
Chemical and physical treatment

2. LABELS

None recommended
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Methacrylic acid, butyl ester; Butyl methacrylate; Butyl 2-methacrylate; n-Butyl alpha-methacrylate; Butyl 2-methyl 2-propenoate

3.2 **Coast Guard Compatibility Classification:** Acrylate

3.3 **Chemical Formula:** $CH_2{=}C(CH_3)CO_2CH_2CH_2CH_2CH_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Moderate acrylate

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Not [illegible] respirator, [illegible] chemical splash goggles

5.2 **Symptoms Following Exposure.** [illegible] with liquid causes [illegible] irritation of skin. [illegible] causes [illegible] and irritation of eyes and irritation of skin. [illegible] and irritation of nose and throat

5.3 **Treatment for Exposure:** INHALATION: [illegible] respirator [illegible] EYES: flush with [illegible] water for [illegible] minutes [illegible] SKIN: wash thoroughly with [illegible] INGESTION: induce vomiting [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion.** Grade [illegible]

5.7 **Late Toxicity:** Birth defects in rats, [illegible] and skeletal abnormalities

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 150°F O.C.

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Containers may explode

6.7 **Ignition Temperature:** 562°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** May occur when heated

7.6 **Inhibitor of Polymerization.**
[illegible] ppm monomethyl ether of hydroquinone
[illegible] ppm hydroquinone

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Rohm and Haas Co.
Independence Mall West
Philadelphia, Pa. 19105

[illegible] Polymers Co.
Plastics Department
[illegible] Market St.
Wilmington, Del. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Pressure [illegible]

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not rated

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	2
Reactivity (Yellow)	[illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 142.2

13.3 **Boiling Point at 1 atm.**
[illegible]

13.4 **Freezing Point.**
[illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] (Liquid)

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization.** [illegible]

(Continued on next page)

NOTES

BTP	p-tert-BUTYLPHENOL

Common Synonyms	Solid White Disinfectant like odor May float or sink in water
Fire	Combustible
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause difficult breathing SOLID Will burn skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** ^{1,4}-$(CH_3)_3CC_6H_4OH$
3.4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** Aromatic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical workers goggles clean body protecting clothing
5.2 **Symptoms Following Exposure:** Inhalation of vapors causes irritation of respiratory system. Ingestion causes irritation of mouth and stomach. Contact with eyes causes burns. Contact with dry skin produces no significant irritation, but wet skin is subject to moderate irritation, even a mild burn
5.3 **Treatment for Exposure:** INHALATION: move to fresh air, begin [illegible] respiration. Breathing has ceased. INGESTION: force milk or water and then immediately induce vomiting, treat symptomatically. EYES: immediately flush eyes with plenty of water for at least 15 min, see medical attention promptly. SKIN: flush with plenty of water, remove grossly contaminated clothing
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion.** Grade 2 [illegible] LD_{50} [illegible] 250 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 235°F C.C. (liquid)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents.** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective
6.5 **Special Hazards of Combustion Products.**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

The Dow Chemical Co
2030 Dow Center
Midland, Mich 48640
2 Aldrich Chemical Co
940 W. Saint Paul Ave
Milwaukee, Wis 53233
3 Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 98.5%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 150
13.3 **Boiling Point at 1 atm:** 463°F = 239.5°C = 512.7°K
13.4 **Freezing Point:** 210°F = 99°C = 372°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.037 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization.** Not pertinent
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 of 8

NOTES

BCS	BUTYLTRICHLOROSILANE

Common Synonyms			
n-Butyltrichlorosilane	Liquid	Colorless	Sharp, irritating odor
	Reacts violently with water. Irritating visible vapor cloud is produced		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. DO NOT USE WATER ON FIRE.
Exposure	VAPOR Irritating to eyes, nose and throat Harmful if inhaled LIQUID Will burn skin and eyes. Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning, continue
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** n-Butyltrichlorosilane

3.2 **Coast Guard Compatibility Classification:** Not applicable

*3.3 **Chemical Formula:** $C_4H_9HCl_3Si$

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp, irritating odor and like pungent and irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor type respirator, rubber gloves, rubber clothing, rubber aprons, goggles and other protective equipment as necessary to prevent contact.

5.2 **Symptoms Following Exposure:** Inhalation of vapor irritates upper respiratory system. Contact of liquid with eyes or skin causes severe burns. Ingestion causes burns of mouth and throat.

5.3 **Treatment for Exposure:** Seek medical attention if ill as a result of exposure. Stay in place.
INHALATION: remove fresh air, apply artificial respiration if required. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: DO NOT induce vomiting. Give large amounts of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** *Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam

6.5 **Special Hazards of Combustion Products:** Hydrogen chloride. Irritating and toxic gas produced

6.6 **Behavior in Fire:** Dense toxic gas produced. Reacts violently with water

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Non-combustible

7 CHEMICAL REACTIVITY

*7.1 **Reactivity with Water:** Reacts violently to generate hydrogen chloride (hydrochloric acid)

7.2 **Reactivity with Common Materials:** Will react with common metals to produce hydrogen chloride and cause severe corrosion

*7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water. Treat with soda ash, sodium bicarbonate, lime slurry

7.5 **Polymerization:** Not pertinent

*7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Dow Chemical Company
P.O. Box 992
Midland, Mich. 48640

Petrarch Systems, A Division of
PCR Inc.
Bristol, Pa. 19007

PCR Inc.
P.O. Box [illegible]
Gainesville, Fla. 32602

10 SHIPPING INFORMATION

*10.1 **Grades or Purity:** [illegible]

*10.2 **Storage Temperature:** Ambient

*10.3 **Inert Atmosphere:** No requirement

*10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NO

12. HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** [illegible]

*12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not rated

*12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Liquid

*13.2 **Molecular Weight:** [illegible]

*13.3 **Boiling Point at 1 atm:** [illegible] °F = [illegible] °C = [illegible] K

*13.4 **Freezing Point:** Not pertinent

*13.5 **Critical Temperature:** Not pertinent

*13.6 **Critical Pressure:** Not pertinent

*13.7 **Specific Gravity:** [illegible] at 20°C (liquid)

*13.8 **Liquid Surface Tension:** [illegible] dynes/cm at [illegible]°C in air

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

*13.10 **Vapor (Gas) Specific Gravity:** [illegible]

*13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

*13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g

*13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g

*13.14 **Heat of Decomposition:** Not pertinent

*13.15 **Heat of Solution:** Data not available

*13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

CTD

1,4-BUTYNEDIOL

Common Synonyms
2-Butyne-1,4-diol
4-Dihydroxy-2-butyne

Solid crystals or watery solution — Solid is white to light yellow. Solution is brownish yellow

Sinks and mixes with water

Stop discharge if possible
Call fire department
Avoid contact with liquid and solid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with water, alcohol foam, dry chemical or carbon dioxide

Exposure

CALL FOR MEDICAL AID
LIQUID OR SOLID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Wash affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED induce vomiting IF CONSCIOUS have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and pollution control agencies
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
2-Butyne-1,4-diol
1,4-Dihydroxy-2-butyne

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:**
$HOCH_2{\equiv}CCH_2OH$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid or 35% aqueous solution

4.2 **Color:** Solid colorless to pale yellow. Solution straw to amber color

4.3 **Odor:** Data not available

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Neoprene rubber gloves and safety goggles; face shield

5.2 **Symptoms Following Exposure.** May cause dermatitis

5.3 **Treatment for Exposure:** SKIN CONTACT: wash affected skin area thoroughly with water. EYE CONTACT: immediately flush with water for at least 15 minutes and get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits.** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 3 LD50 to 500 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** 263°F O.C. (pure butynediol)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Water, alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

GAF Corporation
Chemical Division
Calvert City, Kentucky 42029

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Tech. Flake, 96+; 35% solution

10.2 **Storage Temperature.** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** 86.09

13.3 **Boiling Point at 1 atm.** 460°F = 238°C = 511°K

13.4 **Freezing Point:** 140°F = 59°C = 332°K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity** 1.07 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion** −11,020 Btu/lb = −6120 cal/g = −256.2 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

BAD

iso-BUTYRALDEHYDE

Common Synonyms
2-Methylpropanal
Isobutyric aldehyde
Isobutyraldehyde
Isobutylaldehyde

Watery liquid — Colorless — Pleasant gasoline-like odor

Floats and mixes slowly with water. Flammable, irritating vapor is produced.

Avoid contact with liquid and vapor. Keep people away.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin.
Will burn eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning — high flammability.
Restrict access.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Isobutyraldehyde
Isobutyraldehyde
Isobutylaldehyde
2-Methylpropanal

3.2 **Coast Guard Compatibility Classification:** Aldehyde

3.3 **Chemical Formula:** $(CH_3)_2CHCHO$

3.4 **IMCO/United Nations Numerical Designation:** 3.2, 2045

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Appropriate protective clothing, including rubber gloves, rubber shoes, and protective coveralls.

5.2 **Symptoms Following Exposure:** Vapor is irritating to the eyes and mucous membranes.

5.3 **Treatment for Exposure:** EYES: immediately flush with plenty of water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available.

5.5 **Short-Term Inhalation Limits:** Data not available.

5.6 **Toxicity by Ingestion:** Grade 2, 0.5 to 5 g/kg (rat).

5.7 **Late Toxicity:** Data not available.

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.047 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 13°F (O.C.) = −40°F (C.C.)

6.2 **Flammable Limits in Air:** 2.0% - 10.0%

6.3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Data not available

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back. Fires are difficult to control due to ease of ignition.

6.7 **Ignition Temperature:** 365°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 4.8 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 162 lb/lb in 5 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Badische Co.
Williamsburg, Va. 23185
2. Eastman Kodak Co.
Texas Eastman Co. Division
Longview, Texas 75601
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Dry grade 98.0%, wet grade 96.0%, commercial 97%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-P-Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 72.11

13.3 **Boiling Point at 1 atm:** 147°F = 64.1°C = 337.3°K

13.4 **Freezing Point:** −112°F = −80°C = 193°K

13.5 **Critical Temperature:** 464°F = 240°C = 513°K

13.6 **Critical Pressure:** 600 psia = 41 atm = 4.2 MN/m²

13.7 **Specific Gravity:** 0.791 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 22.0 dynes/cm = 0.0220 N/m at 24°C

13.9 **Liquid-Water Interfacial Tension:** 7.2 dynes/cm = 0.0072 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:** 2.5

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.093

13.12 **Latent Heat of Vaporization:** 180 Btu/lb = 98 cal/g = 4.1 × 10⁵ J/kg

13.13 **Heat of Combustion:** −13,850 Btu/lb = −7693 cal/g = −322.1 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

BTR	n-BUTYRALDEHYDE

Common Synonyms
Butyraldehyde
Butaldehyde
Butyric aldehyde
Butanal
Butylaldehyde

Watery liquid — Colorless — Pungent odor

Floats and mixes slowly with water. Flammable, irritating vapor is produced

[illegible]

Fire

FLAMMABLE.
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea, vomiting, headache or loss of consciousness
[illegible]

LIQUID
Irritating to skin
Will burn eyes.
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: highly flammable
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Butanal
Butyraldehyde
Butyric aldehyde
Butylaldehyde

3 2 **Coast Guard Compatibility Classification:**
Aldehyde

3 3 **Chemical Formula:**
$CH_3CH_2CH_2CHO$

3 4 **IMCO/United Nations Numerical Designation.** 1 2 1129

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pungent aldehyde, pungent and intense

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective goggles, gloves and organic canister gas mask

5 2 **Symptoms Following Exposure:** Inhalation will cause irritation and possible nausea, vomiting headache and loss of consciousness. Contact with eyes causes burns. Skin contact may be irritating

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, if breathing has stopped, give artificial respiration, if breathing is difficult, give oxygen, call a doctor at once. SKIN AND EYES: immediately flush with water for at least 15 min, get medical care for eyes, remove contaminated clothing and wash underlying skin

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 5.15 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5 10 **Odor Threshold:** 0.0046 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 15°F O.C., 20°F C.C.

6 2 **Flammable Limits in Air:**
2.5% - 10.6%

6 3 **Fire Extinguishing Agents:**
Dry chemical, carbon dioxide, foam

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products.**
Not pertinent

6 6 **Behavior in Fire:** Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back. Fires are difficult to control due to ease of reignition

6 7 **Ignition Temperature:** 446°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** 4.4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** None

7 2 **Reactivity with Common Materials:**
None

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** May occur in presence of heat, acids, or alkalis

7 6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity.**
Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).**
1.62 lb/lb 5 days, 106% 5 days (theor.)

8 4 **Food Chain Concentration Potential:**
Data not available

9 SELECTED MANUFACTURERS

1 Dow Badische Co
Williamsburg, Va 23185

2 Eastman Kodak Co
Texas Eastman Division
Longview, Texas 75601

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:**
Water saturated 97% dry 99.5%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P-Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Liquid

13 2 **Molecular Weight:** 72.11

13 3 **Boiling Point at 1 atm:**
167°F = 74.8°C = 348.0°K

13 4 **Freezing Point:**
−142°F = −96.4°C = 176.8°K

13 5 **Critical Temperature:**
484°F = 251°C = 524°K

13 6 **Critical Pressure:**
590 psia = 40 atm = 4.1 MN/m²

13 7 **Specific Gravity:** 0.803 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
24.6 dynes/cm = 0.0246 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:**
5.7 dynes/cm = 0.0057 N/m at 22.3°C

13 10 **Vapor (Gas) Specific Gravity:** 2.5

13 11 **Ratio of Specific Heats of Vapor (Gas):**
1.089

13 12 **Latent Heat of Vaporization**
154 Btu/lb = 102 cal/g = 4.27 × 10⁵ J/kg

13 13 **Heat of Combustion:** −15,210 Btu/lb = −8450 cal/g = −35.38 × 10⁶ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

BRA — n-BUTYRIC ACID

Common Synonyms

Butanic acid
Butanoic acid
Ethylacetic acid
Propanecarboxylic acid
Butyric acid

Liquid — Colorless — Rancid butter odor

Floats and mixes with water
Freezing point is 23°F

[illegible]

Fire

Combustible
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.
[illegible]

LIQUID
Will burn skin and eyes.
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contaminant
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Butanic acid, Butanoic acid, Butyric acid, Ethylacetic acid, Propanecarboxylic acid

3.2 **Coast Guard Compatibility Classification:** Organic acid

3.3 **Chemical Formula:** $CH_3CH_2CH_2COOH$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Clear

4.3 **Odor:** Rancid, disagreeable, strong, penetrating, like rancid butter

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus, rubber gloves, vapor proof plastic goggles, impervious apron and boots

5.2 **Symptoms Following Exposure.** Inhalation causes irritation of mucous membrane and respiratory tract, may cause nausea and vomiting. Ingestion causes irritation of mouth and stomach. Contact with eyes may cause serious injury. Contact with skin may cause burns, chemical is readily absorbed through the skin and may cause damage by this route

5.3 **Treatment for Exposure:** INHALATION remove victim to fresh air, give oxygen if breathing is difficult, call a physician. INGESTION give large amount of water and induce vomiting. EYES irrigate with water for 15 min. and get medical attention. SKIN flush affected areas immediately and thoroughly with water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion** Grade 2, oral LD_{50} [illegible]

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Vapor [illegible] such that swimmers will find high concentrations unpleasant. The [illegible] temporary

5.9 **Liquid or Solid Irritant Characteristics** [illegible] irritant. May cause pain and second degree burns after a few minutes [illegible]

5.10 **Odor Threshold.** 0.001 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 166°F (C.C.) 160°F (C.C.)

6.2 **Flammable Limits in Air:** 2.1 vol % – 13.4

6.3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** 842°F

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate** [illegible] mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May attack aluminum or other light metals with formation of flammable hydrogen gas

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
400 ppm * trout lethal/fresh water
200 ppm 24 hr bluegill TL_m fresh water
*Time period not specified

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)*:**
1.150 lb/lb 5 days, 1.450 lb/lb 20 days

8.4 **Food Chain Concentration Potential:**
Seafood may be tainted following a spill but chemical does not concentrate in food chain

9. SELECTED MANUFACTURERS

1. Celanese Chemical Co.
522 Fifth Avenue
New York, N.Y. 10036
2. Eastman Chemical Products Inc.
Kingsport, Tenn. 37662
3. Mallinckrodt Chemical Works
223 Westside Avenue
P.O. Box 384
Jersey City, N.J. 07303

10. SHIPPING INFORMATION

10.1 **Grades or Purity** Commercial 99.5+%

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

X P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Corrosive Material

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm**
Liquid

13.2 **Molecular Weight:** 88.1

13.3 **Boiling Point at 1 atm:**
327°F = 164°C = 437°K

13.4 **Freezing Point** 23°F = -5°C = 268°K

13.5 **Critical Temperature:**
671°F = 355°C = 628°K

13.6 **Critical Pressure**
764 psia = 52 atm = 5.3 MN/m²

13.7 **Specific Gravity:** 0.958 at 20°C

13.8 **Liquid Surface Tension:**
26.74 dynes/cm = 0.02674 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity** 3.0

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.079 at 20°C

13.12 **Latent Heat of Vaporization:** 187 Btu/lb = 92.7 cal/g = 3.88 × 10⁵ J/kg

13.13 **Heat of Combustion:** −10,620 Btu/lb = −5,900 cal/g = −24.7 × 10⁶ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** 87 Btu/lb = 48.5 cal/g = 1.7 × 10⁵ J/kg

13.16 **Heat of Polymerization** Not pertinent

(Continued on next page)

NOTES

CDA	CACODYLIC ACID

Common Synonyms	
Hydroxydimethylarsine oxide Dimethylarsinic acid ANSAR Silvisar 510	Solid — Colorless or dyed blue Sinks and mixes with water

AVOID CONTACT WITH BLACK ANCHOR SEAL KEEP PEOPLE AWAY

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED IF SWALLOWED — IF UNCONSCIOUS OR HAVING CONVULSIONS
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — poison water contaminant
Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Hydroxydimethylarsine oxide, Dimethylarsinic acid, Ansar, Silvisar 510

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula** $(CH_3)_2AsO(OH)$

3 4 **IMCO/United Nations Numerical Designation:** 6.1 1572

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White, water solutions may be dyed blue

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator, goggles, protective clothing

5 2 **Symptoms Following Exposure:** Chemical is essentially not irritating in contact with skin or eyes. Ingestion causes arsenic poisoning, but symptoms are delayed

5 3 **Treatment for Exposure:** Be alert for delayed arsenic poisoning symptoms. EYES or SKIN: flush with water. INGESTION: induce vomiting and call physician at once

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 700 mg/kg

5 7 **Late Toxicity:** Arsenic poisoning

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** May form toxic oxides of arsenic when heated

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 100 ppm 96 hr scud, not toxic

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

The Ansul Company
Chemical Division
1 Stanton Street
Marinette, Wis 54143

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 50% solution in water, dyed blue

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 138

13 3 **Boiling Point at 1 atm:** >392°F = >200°C = >473 K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** [illegible] at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est.) −6100 Btu/lb = −3300 cal/g = −140 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** (est.) +54 Btu/lb = +30 cal/g = +1 × 10³ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CAT

CADMIUM ACETATE

Common Synonyms
Cadmium acetate dihydrate

Solid | Colorless | Odorless

Sinks and mixes with water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.

Exposure

DUST
POISONOUS IF INHALED
If inhaled will cause coughing or difficult breathing.

SOLID
POISONOUS IF SWALLOWED

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cadmium acetate dihydrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Cd(CH_3CO_2)_2 \cdot 2H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes coughing sneezing symptoms of lung damage Ingestion produces severe toxic symptoms both kidneys and liver injuries may occur Contact with dust causes eye irritation

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air seek medical attention INGESTION induce vomiting allas gastrointestinal irritation by swallowing milk or egg whites at frequent intervals perform gastric lavage seek medical attention EYES flush with water for at least 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ (as cadmium)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4 LD_{50} < 50 mg/kg

5 7 **Late Toxicity:** Delayed liver lung and kidney damage has followed repeated exposures to cadmium salts in industry

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 1 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic cadmium oxide fumes may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** Concentrated by shellfish

9 SELECTED MANUFACTURERS

1 American Hoechst Corp
Chemicals and Plastics Div
Rt 202 206 North
Somerville N J 08876

2 Mallinckrodt Chemical Works
223 Westside Avenue
P O Box 384
Jersey City N J 07303

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure 98% Reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 266.52

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.34 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

CMB	# CADMIUM BROMIDE

Common Synonyms			
Cadmium bromide tetrahydrate	Solid	White	Odorless
	Mixes with water		

AVOID CONTACT WITH SKIN AND DO NOT KEEP FOR LONG AWAY
Wear dust respirator and [illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

CAUTION WARNING
DUST
POISONOUS IF INHALED
If inhaled will cause coughing or difficult breathing.
[illegible]
SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
If swallowed will cause nausea, vomiting and loss of consciousness
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cadmium bromide tetrahydrate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $CdBr_2 \cdot 4H_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Inhalation causes coughing, sneezing, symptoms of lung damage. Ingestion produces severe toxic symptoms, both kidneys and liver injuries may occur. Contact with eyes causes irritation.
5.3 **Treatment for Exposure:** INHALATION: remove patient to fresh air, seek medical attention. INGESTION: induce vomiting, allay GI irritation by giving milk or egg whites at frequent intervals, perform gastric lavage, seek medical attention. EYES: flush with water for at least 15 min.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ (as cadmium)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 4, LD_{50} < 50 mg/kg
5.7 **Late Toxicity:** Delayed liver, kidney, and lung damage has followed respiratory exposure to cadmium salts in industry
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic cadmium oxide fumes may form in fires
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** Concentrated by shellfish

9. SELECTED MANUFACTURERS

1. American Hoechst Corp
   Chemicals and Plastics Div
   Rt 202 206 North
   Somerville, N.J. 08876
2. Gallard Schlesinger Chemical Mfg. Co
   584 Mineola Ave
   Carle Place, N.Y. 11514
3. Research Organic/Inorganic Chemical Corp
   Sun Valley, Calif. 91352

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 99.5%
Anhydrous 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 344.27
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** > 1.1 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:**
$= -2.3$ Btu/lb $= -1.3$ cal/g
$= -0.054 \times 10^3$ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

CDC

CADMIUM CHLORIDE

Common Synonyms	Solid crystals	White	Odorless
	Sinks and mixes with water		

[illegible]

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

SOLID

Harmful if swallowed

IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk [illegible]

IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS

May be dangerous if it enters water intakes.

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning. Water contaminant. Should be removed.

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms

3.2 **Coast Guard Compatibility Classification:** Not applicable.

3.3 **Chemical Formula:** CdCl

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Crystalline solid

4.2 **Color:** White

4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety glasses, rubber gloves, and respirator with proper filter.

5.2 **Symptoms Following Exposure:** Ingestion causes gastroenteric distress, pain and prostration. Severe disturbances, liver injury, and convulsions have been observed in severe intoxications.

5.3 **Treatment for Exposure:** INGESTION: induce vomiting and follow with castor, lavage, saline cathartic, and demulcents. Consider as neoplastogenic agents and flail therapy. CaNa EDTA has been effective in acutely poisoned animals and in a few humans. BAL has been found sufficiently effective in animal experiments to justify its use in human intoxication. Since the BAL cadmium complex has a nephrotoxic action, the physician will have to decide whether to use such a drug.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 2 ppm

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 4 LD_{50} below 50 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause second degree burns on long exposure

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

5.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] ppm 96-hr Bluegill TL$_m$ fresh water

8.2 **Waterfowl Toxicity:** LC_{50} >5000 ppm

8.3 **Biological Oxygen Demand (BOD):** Not pertinent

8.4 **Food Chain Concentration Potential:** Not pertinent

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp
   Specialty Chemical Division
   Morristown, N.J. 07960
2. Chemetron Corp
   Inorganic Chemicals Division
   Cleveland, Ohio 44113
3. Mallinckrodt Chemical Work
   Industrial Chemicals Division
   St. Louis, Mo 63160

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poison, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 22[illegible]

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 4.05 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued next page

NOTES

REVISED 1978

CFB	# CADMIUM FLUOROBORATE

Common Synonyms			
Cadmium fluoborate Cadmium fluoborate solution	Liquid	Colorless	Odorless
	Sinks and mixes with water		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles and self-contained breathing apparatus.
Stop the release of product.
Isolate area immediately and keep unprotected people out.
Notify appropriate health and pollution control agencies.

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED
If inhaled will cause coughing or difficult breathing.
Move victim to fresh air.
Give artificial respiration if not breathing.
Give oxygen if breathing is difficult.
LIQUID
Irritating to skin and eyes.
Harmful if swallowed
Avoid contact with liquid and vapor.
Flush affected areas with plenty of water.
IF IN EYES lift upper and lower lids and flush with plenty of water.
IF SWALLOWED and victim is conscious, induce vomiting by giving a table spoon of salt in a glass of warm water and repeat until vomit is clear. Give milk or whites of eggs beaten with water. Keep patient warm and quiet.
IF SWALLOWED and victim is unconscious or having convulsions do not induce vomiting. Keep patient warm and quiet.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify appropriate health and pollution control agencies.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4.

Issue warning. Water contaminant.
Disperse and flush.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cadmium fluoborate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $Cd(BF_4)_2 \cdot H_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves and apron, safety glasses and face shield
5.2 **Symptoms Following Exposure:** Ingestion produces severe toxic symptoms, both kidney and liver injuries may occur, may be fatal. Contact with eyes or skin causes irritation.
5.3 **Treatment for Exposure:** INHALATION: remove patient to fresh air, seek medical attention. INGESTION: call a physician at once. If victim is conscious, induce vomiting by giving a table spoon of salt in a glass of warm water and repeat until vomit is clear. Give milk or whites of eggs beaten with water. Keep patient warm and quiet. EYES: flush with plenty of water and get medical attention. SKIN: flush with plenty of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ (as cadmium)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 LD₅₀ 280 mg/kg (rat)
5.7 **Late Toxicity:** Delayed liver, kidney, and lung damage has followed respiratory exposure to cadmium salts in industry
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic hydrogen fluoride and cadmium oxide fumes may form in fires
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Concentrated by shellfish

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp
   P.O. Box 1087R
   Morristown, N.J. 07960
2. The Harshaw Chemical Co
   1945 E. 97 St.
   Cleveland, Ohio 44106
3. Gallard-Schlesinger Chemical Mfg. Co
   584 Mineola Avenue
   Carle Place, N.Y. 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 50% solution in water
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A/P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 286 (solute)
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.60 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

NOTES

CMN — CADMIUM NITRATE

Common Synonyms
Cadmium nitrate tetrahydrate

Solid — White — Odorless

Sinks in water

[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.
[illegible]

Exposure

[illegible]

DUST
POISONOUS IF INHALED
If inhaled will cause headache, coughing, or difficult breathing.
[illegible]

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cadmium nitrate tetrahydrate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $Cd(NO_3)_2 \cdot 4H_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, safety goggles, dust mask
5.2 **Symptoms Following Exposure:** Inhalation of fumes can produce coughing, chest constriction, pain, headache, nausea, vomiting, pneumonitis. Chronic poisoning is characterized by emphysema and kidney injury. Ingestion causes gastroenteritis, diarrhea, and severe toxic symptoms; liver, kidney and lung injuries may occur. Contact with eyes causes irritation.
5.3 **Treatment for Exposure:** INHALATION: remove patient to fresh air, seek medical attention. INGESTION: give large amounts of water and induce vomiting; give milk or egg whites, seek medical attention. EYES: flush with copious amounts of water for 15 min., consult a physician. SKIN: wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ (as cadmium)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 oral mouse LD_{50} = 100 mg/kg
5.7 **Late Toxicity:** Deformed liver, lung, and kidney damage has followed repeated exposures to cadmium salts in industry
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and cadmium oxide fume may form in fires
6.6 **Behavior in Fire:** Will increase intensity of fire when in contact with combustible material
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reactive
7.2 **Reactivity with Common Materials:** Mixtures with wood or other combustibles may catch fire
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.06 ppm* ** guppy 1 Day fresh water
0.2 ppm 10 days stickleback salted fresh water
*As cadmium
**Time period not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** Shellfish concentrate 900 - 1600 times

9. SELECTED MANUFACTURERS

1. The Harshaw Chemical Co
1945 E. 97th Street
Cleveland, Ohio 44106
2. Mallinckrodt Chemical Works
223 Westside Avenue
P.O. Box 384
Jersey City, N.J. 07303
3. Allied Chemical Corp
Specialty Chemicals Div
P.O. Box 1087R
Morristown, N.J. 07960

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]
	[illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** 135°F = 57°C = [illegible] K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.45 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution** [illegible] = 16 Cal/g = 0.691 × 10⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

COX	CADMIUM OXIDE

Common Synonyms Cadmium fume	Solid Yellow brown Odorless Sinks in water

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE.
Exposure	DUST POISONOUS IF INHALED If inhaled will cause coughing. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cadmium fume
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** CdO
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Yellow brown to brown
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Bu. Mines approved respirator, goggles, rubber gloves
5.2 **Symptoms Following Exposure:** A single exposure to cadmium oxide fumes can cause severe or fatal lung irritation; chronic poisoning is characterized by lung injury (emphysema) and kidney disfunction. Ingestion produces severe toxic effects. Both kidney and liver injuries may occur. Contact with eyes causes irritation
5.3 **Treatment for Exposure:** INHALATION: if there has been known exposure to dense cadmium oxide fume or cough, chest tightness, or respiratory distress occur after possible exposure, place patient at bed rest and call a physician. INGESTION: induce vomiting, stop irritation by giving milk or egg whites at frequent intervals, perform gastric lavage, seek medical attention. EYES: flush with water for at least 15 min
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³
5.5 **Short-Term Inhalation Limits:** 0.1 mg/m³ 30 min
5.6 **Toxicity by Ingestion:** Grade 3, rat LD_{50} = 72 mg/kg
5.7 **Late Toxicity:** Delayed liver, lung, and kidney damage has followed respiratory exposures to cadmium salts in industry
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic cadmium oxide fume may form in fires
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** Concentrated by shellfish

9. SELECTED MANUFACTURERS

1. American Smelting and Refining Co.
   20 Broadway
   New York, N.Y. 10005
2. J. T. Baker Chemical Co.
   Phillipsburg, N.J. 08865
3. Van Iaconi Chemicals Co.
   666 South Front St.
   Elizabeth, N.J. 07202

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 128.4
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 6.95 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

CMS	CADMIUM SULFATE

Common synonyms	Solid White Odorless Sinks and mixes slowly with water
[illegible]	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE.
Exposure	DUST POISONOUS IF INHALED If inhaled will cause headache, coughing, or difficult breathing SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. If swallowed will cause nausea and vomiting.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $CdSO_4$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** R. Must use approved respirator, rubber gloves, safety goggles

5.2 **Symptoms Following Exposure:** Inhalation may cause dryness of throat, coughing, constriction in chest and headache. Ingestion may cause salivation, vomiting, abdominal pains or diarrhea. Contact with eyes causes irritation.

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure and consult a physician. INGESTION: induce vomiting then allay irritation with milk or egg whites given at frequent intervals; perform gastric lavage; seek medical attention. EYES: flush with water for at least 30 min; consult a physician. SKIN: remove clothing and wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ as cadmium

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Oral rat LD_{50} = 88 mg/kg

5.7 **Late Toxicity:** Delayed lung injury and lung damage has followed respiratory exposure to cadmium salts in industry

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic cadmium oxide fume may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
[illegible] ppm * [illegible] in fresh water
* Time period not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:**
Shellfish concentrate cadmium
[illegible]

9 SELECTED MANUFACTURERS

1. The Harshaw Chemical Co.
[illegible] 19th Street
Cleveland, Ohio 44109
2. Mallinckrodt Chemical Works
[illegible] Westside Avenue
P.O. Box [illegible]
Jersey City, N.J. [illegible]
3. J.T. Baker Chemical Co.
Phillipsburg, N.J. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical
A.C.S. Hydrate grade, Reagent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 208.46

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 4.7 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible] Btu/lb
[illegible] = [illegible] Btu/gal
[illegible] = [illegible] J/g

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

CCA	CALCIUM ARSENATE

Common Synonyms			
Tricalcium arsenate Tricalcium ortho arsenate Cucumber dust	Solid	White	Odorless
	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED.
If inhaled will cause coughing or difficult breathing.
[illegible]

SOLID
POISONOUS IF SWALLOWED
If swallowed will cause nausea and vomiting.
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG [illegible] 4)

Issue warning poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cucumber dust
Tricalcium arsenate
Tricalcium orthoarsenate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Ca_3(AsO_4)_2$

3 4 **IMCO/United Nations Numerical Designation:** 6 1 15[illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield protective gloves

5 2 **Symptoms Following Exposure:** Inhalation causes respiratory irritation Ingestion causes irritation of mouth and stomach Contact with eyes causes irritation

5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give victim one tablespoonful of salt in glass of water repeat until vomit is clear then give 2 tablespoonfuls of Epsom salts or milk of magnesia and force fluids call a physician in all cases of suspected poisoning EYES flush with water for at least 15 min SKIN flush with water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1mg/m³

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Grade 4 oral rat LD_{50} = 20 mg/kg

5 7 **Late Toxicity:** Arsenic compounds may cause skin and lung cancer

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic arsenic fume may be formed in fire

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
1 1 ppm/48 hr/perch/toxic/fresh water
4 3 ppm, 264 hr/crabs/toxic/fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential** Possible bioaccumulation problem

9 SELECTED MANUFACTURERS

1 Los Angeles Chemical Co
4545 Ardine Street
South Gate Calif 90280

2 Pfaltz and Bauer, Inc
126 04 Northern Blvd
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 70% containing calcium carbonate and calcium hydroxide (limestone and slaked lime)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 398

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 3 62 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6

NOTES

CCP

CALCIUM CARBIDE

Common Synonyms
Carbide
Acetylenogen

Solid granules | Grey to bluish black | Garlic odor

Sinks in water, and bubbles appear on surface as flammable gas is produced

[illegible]

Fire

Not flammable
FLAMMABLE, EXPLOSIVE GAS IS PRODUCED ON CONTACT WITH WATER
[illegible]
DO NOT USE WATER OR FOAM IN [illegible]

Exposure

CALL FOR MEDICAL AID
SOLID
Irritating to skin and eyes
[illegible]

Water Pollution

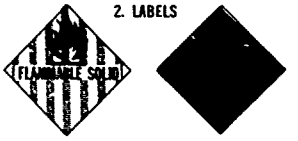
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Should be removed
Chemical and physical treatment

2. LABELS



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Acetylenogen, Carbide
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** CaC_2
3 4 **IMCO/United Nations Numerical Designation:** 4 3/1402

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Gray to bluish black
4 3 **Odor:** Garlic like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical safety goggles and (for those exposed to unusually dusty operations) a respirator such as those approved by the U S Bureau of Mines for nuisance dusts
5 2 **Symptoms Following Exposure:** Eye and skin irritation
5 3 **Treatment for Exposure:** INHALATION OF DUST remove from further exposure and call a doctor SKIN wash with plenty of water EYES flush with clean running water at an eye wash fountain for at least 15 min and get medical attention
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics.** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Dry powder preferably allow fire to burn
6 4 **Fire Extinguishing Agents Not to be Used** Water vaporizing liquid or foam carbon dioxide
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire.** If wet by water highly flammable acetylene gas is formed
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously with water to form the highly flammable acetylene gas which may ignite spontaneously
7 2 **Reactivity with Common Materials:** Reacts with copper and brass to form explosive compound
7 3 **Stability During Transport:** Stable in absence of moisture
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Not pertinent
8 2 **Waterfowl Toxicity:** Not pertinent
8 3 **Biological Oxygen Demand (BOD)** Not pertinent
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Airco Inc
Airco Alloys and Carbide Div
3601 Highland Ave
Niagara Falls N Y 14305
2 Midwest Carbide Corp
Keokuk Iowa 52632
3 Union Carbide Corp
Chemicals and Plastics Div
270 Park Ave
New York N Y 10017

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available
10 2 **Storage Temperature:** Data not available
10 3 **Inert Atmosphere:** Data not available
10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

RR-C

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable Solid
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	2
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 64 10
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2 22 at 18°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

CCC	# CALCIUM CHLORATE

Common Synonyms	Solid	White	Odorless
	Sinks and mixes with water		

[illegible]

Fire	**Not flammable.** **May explode on contact with combustibles** **Irritating gases may be produced when heated** Combat fires from safe distances [illegible] [illegible] discharge areas with water
Exposure	Call for medical aid **DUST** **Irritating to eyes, nose and throat** Move victim to fresh air For eyes hold eyelids open and flush with plenty of water **SOLID** **Irritating to skin and eyes** **Harmful if swallowed** Remove contaminated clothing and shoes Flush affected areas with plenty of water IN EYES hold eyelids open and flush with large amounts of water IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except get help
Water Pollution	**Effect of low concentrations on aquatic life is unknown** **May be dangerous if it enters water intakes** Notify [illegible] and wildlife officials Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 445-4)

Issue warning oxidizing material water contaminant
Should be removed
Chemical and physical treatment
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula:** $Ca(ClO_3)_2$
3 4 **IMCO/United Nations Numerical Designation.** N 1/1452

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield dust respirator coveralls or other protective clothing
5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of upper respiratory system Dust irritates eyes and skin Ingestion causes abdominal pain nausea vomiting diarrhea pallor shortness of breath unconsciousness
5 3 **Treatment for Exposure** INHALATION remove to fresh air EYES flush with water for 15 min SKIN flush with water INGESTION induce vomiting and get medical attention
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion** Grade 2 oral LD_{50} = 4 500 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Not pertinent
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable but may cause fire with other materials
6 2 **Flammable Limits in Air** Not pertinent
6 3 **Fire Extinguishing Agents.** Flood with water
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire:** When involved in a fire may cause an explosion Irritating gases may be generated when heated
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May form an explosive mixture with finely divided combustible material The mixture may ignite when rubbed
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Ceras Inc
Menomonee Falls Wis 53051
2 Gallard Schlesinger Chemical Manufacturing Corp
584 Mineola Ave
Carle Place N Y 11514
3 Dynamit Nobel AG
105 Stonehurst Court
Northvale N J 07647

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial May be shipped as dihydrate
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Oxidizing material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight.** 207
13 3 **Boiling Point at 1 atm** Decomposes
13 4 **Freezing Point** 644 F = 340°C = 613 K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity** 2 710 at 0°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution** (est) = 54 Btu/lb = −30 cal/g = −1 3 × 10 J/kg
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CLC — CALCIUM CHLORIDE

Common Synonyms			
Calcium chloride, anhydrous Calcium chloride hydrates	Solid or water solution Sinks and mixes with water	Whit to off-white	Odorless

Avoid contact with liquid and solid. Keep people away.
Wear rubber or synthetic clothing, including gloves.
Stop discharge if possible.
Isolate and remove discharge if safe.
Notify local health and other appropriate agencies.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
SOLUTION OR SOLID
Will burn skin and eyes.
If swallowed will cause nausea and vomiting

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Calcium chloride anhydrous, Calcium chloride hydrates

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $CaCl_2 \cdot xH_2O$ where x = 0 to 6

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid or water solution

4 2 **Color:** White to off white

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety glasses or face shield, dust type respirator, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes (particularly by dust) causes irritation and possible transient corneal injury. Contact of solid with dry skin causes mild irritation. Strong solutions can cause marked irritation, even a superficial burn.

5 3 **Treatment for Exposure.** INHALATION: move to fresh air, if discomfort persists, get medical attention. INGESTION: give large amounts of water. EYES: promptly flood with water and continue washing for at least 15 min, consult an ophthalmologist. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 2, oral LD_{50} = 1 000 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire**

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Anhydrous grade dissolves with evolution of some heat

7 2 **Reactivity with Common Materials:** Metals will slowly corrode in aqueous solutions

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
555 ppm/168 hr rock bass/killed tap water
10 650 ppm 96 hr sunfish LD_{50} fresh water
2 400 ppm/48 hr marine fish LD_{50} sea water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich 48640

2 Michigan Chemical Corp
351 E Ohio St
Chicago, Ill 60611

3 Allied Chemical Corp
Industrial Chemicals Div
P O Box 1139R
Morristown, N J 07960

10 SHIPPING INFORMATION

10 1 **Grades or Purity.** [illegible] water solutions containing 51 86%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 110 99 (solute)

13 3 **Boiling Point at 1 atm** Not pertinent

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2 15 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** −292 Btu/lb = −162 cal/g = −6 79 × 10^5 J/kg

13 16 **Heat of Polymerization** Not pertinent

Continued on page [illegible]

NOTES

CCR	CALCIUM CHROMATE

Common Synonyms
Calcium chromate (VI)
Gelbin yellow ultramarine
Steinbuhl yellow
Calcium chromate, dihydrate

Solid — Yellow — Odorless

Sinks and mixes slowly with water

Avoid contact with solid and dust. Keep people away
Wear rubber overclothing including gloves
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
Will increase the intensity of a fire

Flood discharge area with water

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

If in eyes hold eyelids open and flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

SOLID
Will burn skin and eyes
Harmful if swallowed

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have him drink water or milk and induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

Notify local health and wildlife officials
Notify operators of nearest water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Calcium chromate (VI)
Calcium chromate dihydrate
Gelbin Yellow Ultramarine
Steinbuhl Yellow

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** $CaCrO_4 \cdot 2H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** Yellow

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes severe circulatory collapse and chronic nephritis. Contact with eyes causes irritation. Contact with skin may cause dermatitis and ulcers

5 3 **Treatment for Exposure:** INHALATION: remove to fresh air. INGESTION: give large amounts of water, induce vomiting. EYES: flush with water for at least 15 min. SKIN: treat local injuries like acid burns, scrub with dilute (2%) sodium hyposulfite solution

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 3 LD$_{50}$ 500 mg/kg

5 7 **Late Toxicity:** Lung cancer may develop

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic chromium fume may be formed in fires

6 6 **Behavior in Fire.** The hydrated salt loses water when hot and changes color but no increase in hazard occurs

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential:** Bioconcentration up to 2000 fold possible under constant exposure. Not significant under spill conditions

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown N J 07960

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place N Y 11514

3 Pfaltz and Bauer Inc
126-04 Northern Blvd
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 192.1

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** >1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** [illegible] Btu/lb = 41 cal/g = [illegible] $\times 10^5$ J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page [illegible])

NOTES

CCN	CALCIUM CYANIDE

Common Synonyms			
Cyanide of calcium	Solid	White to gray or black	Almond odor
	Sinks and mixes with water		

AVOID CONTACT WITH SOLID [illegible] SPILLED
HOLD AWAY
[illegible]

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED
DO NOT USE WATER [illegible] ON DROPLETS ON ADJACENT DRUMS

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat
[illegible]

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
MAY BE DANGEROUS IF IT ENTERS WATER INTAKES
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison air contaminant, water contaminant
Restrict access
Evacuate area
Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Cyanide of calcium
Cyanogas G Fumigant,
Cyanogas A Dust

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula:** $Ca(CN)_2$ plus inert ingredients

3 4 **IMCO/United Nations Numerical Designation.** 6 1/1575

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White to gray to black

4 3 **Odor:** Compound reacts with moisture in air to form hydrogen cyanide gas which has a characteristic almond like odor

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus and full protective clothing including rubber footwear

5 2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache nausea, vomiting and weakness high concentrations are rapidly fatal

5 3 **Treatment for Exposure** *Call a doctor immediately* INHALATION break amyl nitrite pearl in cloth and hold lightly under nose for 15 sec, repeat 3 times at 15 sec intervals use artificial respiration if breathing stops EYES flush with water for 15 min do not allow water to enter nose or mouth SKIN flush with water do not allow water to enter nose or mouth INGESTION break an amyl nitrite pearl in a cloth and hold lightly under nose for 15 sec if patient is conscious induce vomiting and repeat until vomit is clear repeat inhalation of amyl nitrite 5 times at 15 sec intervals use artificial respiration if breathing has stopped

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 5 mg/m (as cyanide)

5 5 **Short-Term Inhalation Limits.** 5 mg/m for 30 min

5 6 **Toxicity by Ingestion:** Grade 4 oral LD_{50} = 39 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents** Use dry chemical sand or earth on adjacent fires

6 4 **Fire Extinguishing Agents Not to be Used.** Do not use water or carbon dioxide on adjacent fires

6 5 **Special Hazards of Combustion Products:** Decomposes in fire to give very toxic gases including hydrogen cyanide

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Releases very poisonous hydrogen cyanide gas slowly on contact with water Release is rapid if acid is also present

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable if kept dry

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
0 12 ppm 96 hr sunfish/TL_m/fresh water
> 25 ppm 48 hr cockle/TC_{50} salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 American Cyanamid Co
Agricultural Division
P O Box 400
Princeton N J 08540

2 Pfaltz and Bauer Inc
126-04 Northern Boulevard
Flushing N Y 11368

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 42% with 58% inert ingredients May contain up to 3% calcium carbide which releases flammable acetylene gas when wet

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Sealed containers in well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight:** 92

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 853 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** 264 Btu/lb = 147 cal/g = $6 14 \times 10^5$ J/kg

13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

CAF	CALCIUM FLUORIDE

Common Synonyms			
Flospar	Solid powder or granules	Gray	Odorless
	Sinks in water		

[illegible]

Fire	Not flammable
Exposure	[illegible] SOLID Harmful if swallowed Not irritating to skin or eyes [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes. [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Flospar
Fluorspar

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** CaF_2

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Gray

4 3 **Odor:** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Footwear

5 2 **Symptoms Following Exposure:** Little acute toxicity

5 3 **Treatment for Exposure:** Usually no treatment needed

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ 0.5 to 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 30000 ppm/* Tilapia vulgaris lethal/fresh water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Not pertinent

8 4 **Food Chain Concentration Potential:** Not pertinent

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Div
Marcus Hook, Pa 19061

2 Combustion Engineering Inc
C-E Minerals Div
443 South Gulph Rd
King of Prussia, Pa 19406

3 Ozark Mahoning Co
Tulsa, Oklahoma 74119

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Acid grade 97.4% Ceramic grade 91.5% Fine powder (dry or damp cake) Gravel fluorspar Pellet

10 2 **Storage Temperature:** Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-6)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 78.08

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 3.18 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CAH	CALCIUM HYDROXIDE

Common Synonyms Slaked lime	Solid granules	White	Odorless
	Sinks in water		

[illegible]

Fire	Not flammable
Exposure	ALL FOR MEDICAL AID **DUST** Irritating to nose and throat if inhaled. [illegible] **SOLID** Will burn skin and eyes Harmful if swallowed [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Slaked lime

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $Ca(OH)_2$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust proof goggles and mask

5.2 **Symptoms Following Exposure:** Dust irritates eyes, nose and throat

5.3 **Treatment for Exposure:** INGESTION: have victim drink milk and water. Do NOT induce vomiting. EYES: flush with a gentle stream of water for at least 10 min. and consult an opthalmologist for further treatment without delay. SKIN: wash off the lime and consult a physician

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion.** Grade 1 LD 50 [illegible] g/kg (rats)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** None

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 92 ppm 7 hr. rout toxic fresh water; 240 ppm 24 hr. mosquito fish 11 [illegible] fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Ash Grove Cement Co.
   1000 Ten Main Center
   Kansas City, Mo. 64105
2. Engelhard Minerals & Chemical Corp.
   Minerals and Chemicals Division
   Menlo Park, N. J. 08817
3. United States Gypsum Co.
   Chemicals Division
   Chicago, Ill. 60606

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Agricultural 68-71; industrial 70-73%; chemical 71-73%

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 74.09

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.24 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CHY — CALCIUM HYPOCHLORITE

Common Synonyms
STH
HTH Dry Chlorine
Neutral anhydrous calcium hypochlorite
Senry

Solid granules — White — Household bleaching powder odor

Sinks and mixes with water

[illegible]

Fire

Not flammable
May cause fire on contact with combustibles.
POISONOUS GASES ARE PRODUCED WHEN HEATED
[illegible]

Exposure

CALL FOR MEDICAL AID
SOLID
Irritating to skin and eyes
If swallowed, will cause nausea, vomiting or loss of consciousness
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — corrosive
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** HTH, HTH Dry Chlorine, Neutral anhydrous calcium hypochlorite, Senry

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CaOCl_2$

3.4 **IMCO United Nations Numerical Designation:** [illegible] 1748

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Like bleaching powder

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles, dust mask

5.2 **Symptoms Following Exposure:** INHALATION: hypochlorous acid fumes* cause severe respiratory tract irritation and pulmonary edema. INGESTION: pain and inflammation of mouth, pharynx, esophagus, and stomach, erosion of mucous membranes, chyme of the stomach, vomiting, hemorrhaging may cause vomitus to resemble coffee grounds; circulatory collapse with cold, pale, clammy skin, cyanosis, and shallow respirations; confusion, delirium, coma; edema of pharynx, glottis, and larynx with stridor and obstruction; perforation of esophagus or stomach with mediastinitis or peritonitis. SKIN CONTACT: may cause vesicular eruptions and eczematoid dermatitis.

5.3 **Treatment for Exposure:** INGESTION: swallow immediately milk, egg white, starch paste, milk of magnesia, aluminum hydroxide gel, or magnesium trisilicate gel. Avoid sodium bicarbonate because of the release of carbon dioxide. Do not use acids, antidotes; cautious gastric lavage with tap water or a 1% solution of sodium thiosulfate; milk of magnesia (1 oz) left in the stomach is useful as a mild antacid, adsorbent, demulcent, and cathartic; demulcents such as starch, egg white, milk, gruel; opiates for the control of pain. Treat shock vigorously with intravenous fluids. Prompt surgical intervention when indicated, e.g. tracheotomy, gastrectomy. SKIN: wash with liberal quantities of water and apply a paste of baking soda.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 0. LD50 above 15 g/kg

*Given off only if compound comes in contact with acid

Continued on page 4

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Poisonous gases may be produced when heated

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May cause fire on contact with wood or straw. Corrosive to most metal

7.3 **Stability During Transport:** The 70% grade may decompose violently if exposed to heat or direct sunlight. Gives off chlorine and chlorine monoxide above 350°F (poisonous gases)

7.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 0.5 ppm/* trout killed, fresh water
*Time period not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Not pertinent

8.4 **Food Chain Concentration Potential:** Not pertinent

9. SELECTED MANUFACTURERS

1. Olin Corp
   Chemicals Division
   Brandenburg, Ky. 40108
2. Pennwalt Corp
   Chemical Division
   4655 Biddle Ave
   Wyandotte, Mich. 48193
3. PPG Industries Inc
   Industrial Chemicals Division
   Barberton, Ohio 44203

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 70% (self propagating), 65% (non propagating)

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	1	2
Flammables (Red)	0	0
Reactivity (Yellow)	2	2
	OXY	OXY

*First column refers to non fire situation

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 174.98

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.35 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5

5. HEALTH HAZARDS (Cont'd.)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Irritates eyes, skin, and mucous membranes

5.10 **Odor Threshold:** Not pertinent

REVISED 1978

CAM	CALCIUM, METALLIC

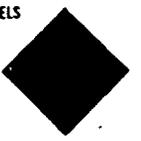
Common Synonyms	Solid — Silvery to grayish white — Odorless Sinks in water. Reacts slowly with water
Fire	FLAMMABLE
Exposure	SOLID Will burn skin and eyes.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning. high flammability.
Disperse and flush.

2. LABELS



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** Ca
3.4 **IMCO/United Nations Numerical Designation:** 4.3, 1401

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Silvery, turns to grayish white on exposure to air
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles and rubber gloves
5.2 **Symptoms Following Exposure:** Contact with eyes or skin produces caustic burns
5.3 **Treatment for Exposure:** EYES or SKIN: flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (flammable solid)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Dry graphite, soda ash, powdered sodium chloride, or appropriate metal fire extinguishing dry powder
6.4 **Fire Extinguishing Agents Not to be Used:** Water, halogenated hydrocarbons, dry chemical, carbon dioxide
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Burns violently, especially if finely divided
6.7 **Ignition Temperature:** 1454 - 18°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts to form flammable hydrogen gas, which may ignite. The reaction is not violent
7.2 **Reactivity with Common Materials:** Reacts with moist air to form skin of hydroxide. The reaction is not hazardous
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** See Calcium hydroxide (CAH)
8.2 **Waterfowl Toxicity:** See Calcium hydroxide (CAH)
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Pfizer Minerals
   Metals and Composite Products Division
   235 E. 42 Street
   New York, N.Y. 10017
2. Gallard-Schlesinger Chemical Manufacturing Co.
   Atomergic Chemetals Division
   584 Mineola Ave.
   Carle Place, L.I., N.Y. 11514
3. Cerac, Inc.
   13460 West Silver Spring Rd.
   Menomonee Falls, Wis. 53051

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 99.5%, redistilled 99.9%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Sealed containers must be in a ventilated area

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II RR

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable solid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	2
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 40.1
13.3 **Boiling Point at 1 atm:** 2,714°F = 1,490°C = 1,763°K
13.4 **Freezing Point:** 1,562°F = 850°C = 1,123°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.55 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** 6,790 Btu/lb = 3,770 cal/g = 158 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CNT	CALCIUM NITRATE

Common Synonyms	Solid	White	Odorless
	Sinks and mixes with water		

Fire	Not flammable May cause fire on contact with combustibles. POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	DUST Irritating to eyes, nose and throat SOLID Irritating to skin and eyes. Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: oxidizing material
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Calcium nitrate tetrahydrate
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $Ca(NO_3)_2 \cdot 4H_2O$
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator and rubber gloves
5.2 **Symptoms Following Exposure:** Dust causes mild irritation of eyes
5.3 **Treatment for Exposure:** EYES or SKIN flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable but may cause fire on contact with combustibles
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Flood with water
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** May give off toxic oxides of nitrogen when involved in fire
6.6 **Behavior in Fire:** Greatly intensifies the burning of all combustible materials
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Contact with combustible material may cause fire
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 10,000 ppm/96 hr/sunfish/TLm/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. J. T. Baker Chemical Co.
Phillipsburg, N. J. 08865
2. Mallinckrodt Chemical Works
223 West Side Avenue
P. O. Box 384
Jersey City, N. J. 07303
3. Barium and Chemicals, Inc.
P. O. Box 218
Steubenville, Ohio 43952

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Analytical reagent (99.0 + % purified technical)
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 164
13.3 **Boiling Point at 1 atm:** Decomposes
13.4 **Freezing Point:** 1,042°F = 561°C = 834°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.50 at 15°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** rest 1 - 90 Btu/lb = -50 cal/g = -2.1 × 10⁻⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CAO	CALCIUM OXIDE

Common Synonyms Unslaked lime Quicklime	Solid granules White to grey Odorless Sinks and reacts violently with water. Water appears to boil

[illegible]

Fire	**Not flammable** **May cause fire on contact with water and combustibles** [illegible] DO NOT USE WATER ON ADJACENT FIRES
Exposure	[illegible] **DUST** **Irritating to nose and throat** [illegible] **SOLID** **Will burn skin and eyes.** **Harmful if swallowed** [illegible] DO NOT INDUCE VOMITING
Water Pollution	**HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS** **May be dangerous if it enters water intakes.** [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning [illegible]
Restrict access
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Quicklime
Unslaked lime

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CaO

3.4 **IMCO United Nations Numerical Designation:** 9.0 1910

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White to gray

4.3 **Odor:** Odorless

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles, and any type of respirator prescribed for fine dust

5.2 **Symptoms Following Exposure:** Causes burns on mucous membrane and skin. Inhalation of dust causes sneezing

5.3 **Treatment for Exposure:** INGESTION: [illegible] have him drink water or milk. Do NOT induce vomiting. SKIN AND EYES: flush with water and seek medical help

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure and may cause secondary burns on long exposure

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Heat may cause ignition of combustibles. Material swells during reaction

7.2 **Reactivity with Common Materials:** No reaction unless water present, then chief effect is that of heat liberated

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
[illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Not pertinent

8.4 **Food Chain Concentration Potential:** Not pertinent

9. SELECTED MANUFACTURERS

Allied Chemical Corp.
Specialty Chemicals Division
Marcus Hook, Pa. [illegible]

2 Ash Grove Cement Co.
[illegible] Ten Main Center
Kansas City, Mo. 64105

[illegible] United States Gypsum Co.
Chemicals Division
Chicago, Ill. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

RR

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** QRM B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 56.08

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 3.3 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CCP	CALCIUM PEROXIDE

Common Synonyms			
Calcium dioxide	Solid powder	Yellow to white	Odorless
	Sinks in water		

[illegible]

Fire	Not flammable May cause fire on contact with combustibles Containers may explode in fire Flood discharge area with water [illegible]
Exposure	[illegible] DUST Irritating to eyes, nose and throat [illegible] SOLID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes. [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: oxidizing material
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Calcium dioxide
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** CaO_2
3.4 **IMCO/United Nations Numerical Designation:** 5.1 1457

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Yellow white
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** U.S.B.M. approved toxic, dust respirator, general purpose gloves, chemical safety goggles, full cover clothing
5.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Dust also irritates eyes and skin on contact and irritates mouth and stomach if ingested
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES: flush with water for 15 min and consult physician. SKIN: flush with water. INGESTION: give large amounts of water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable but may cause fire on contact with combustible material
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Flood with water or use dry powder (e.g. graphite or powdered limestone)
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Can increase severity of fire. Containers may explode
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts very slowly with water at room temperature to form limewater and oxygen gas
7.2 **Reactivity with Common Materials:** Heavy metals and dirt can accelerate decomposition to lime and oxygen. The reaction is not explosive
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. FMC Corporation
Industrial Chemicals Division
633 Third Avenue
New York, N.Y. 10017
2. Barium and Chemicals, Inc.
P.O. Box 218
Steubenville, Ohio 43952

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 60+%
10.2 **Storage Temperature:** Stable
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

H R R

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 72.1
13.3 **Boiling Point at 1 atm:** Decomposes
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.12 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** −135 Btu/lb = −75 cal/g = −1.1 × 10⁵ J/kg
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CAL	# CALCIUM PHOSPHATE

Common Synonyms MCP Monocalcium phosphate monohydrate Calcium biphosphate DCP Dicalcium phosphate Calcium pyrophosphate	Solid	White	Odorless
	Sinks and mixes with water		

[illegible]

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID **DUST** **Irritating to eyes, nose and throat** **If inhaled will cause coughing or difficult breathing** [illegible] **SOLID** **Irritating to skin and eyes** **If swallowed will cause nausea and vomiting** [illegible] IF SWALLOWED [illegible] DO NOT EVER give anything by mouth to an unconscious person IF SWALLOWED [illegible] DO NOT HAVE CONVULSIONS [illegible]
Water Pollution	Effect of low concentrations on aquatic life unknown May be dangerous if it enters water intakes. [illegible]

1. RESPONSE TO DISCHARGE

See hazardous chemicals handbook CG-446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** (a) MCP Monocalcium phosphate, monohydrate, Calcium phosphate, monobasic, monohydrate Acid calcium phosphate calcium superphosphate, Calcium biphosphate Primary calcium phosphate (b) DCP, Dicalcium phosphate (anhydrous or dihydrate), Dibasic calcium phosphate, Calcium monohydrogen phosphate, Secondary calcium phosphate (c) TCP Calcium

Continued on page 4

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask goggles and gloves

5.2 **Symptoms Following Exposure:** Inhalation of MCP or DCP may cause irritation of upper respiratory tract prolonged inhalation of concentrated pyrophosphate may cause a deposit of TCP in the lungs Ingestion of large quantities of any form of calcium phosphate may cause nausea vomiting cramps and diarrhea MCP may also be corrosive to embranes of mouth throat and gastrointestinal tract Local irritation of the eyes may result from contact with any of these phosphates prolonged or repeated exposure to MCP may lead to chronic conjunctivitis Contact with skin by MCP may cause local irritation or chronic dermatitis, prolonged or repeated contact with concentrated aqueous solutions of DCP may cause local irritation

5.3 **Treatment for Exposure:** INHALATION move to clean air see physician in case of persistent coughing expectoration, chest pain, or shortness of breath INGESTION get medical attention quickly induce vomiting by giving large amounts of water or warm salty water or by tickling back of patient's throat continue until vomitus is clear follow with milk eggs, or olive oil to soothe stomach EYES immediately flush with large quantities of running water for at least 15 min holding eyelids apart to insure thorough flushing of eyes and lids do not attempt to neutralize with chemical agents get medical attention quickly if physician is not available, continue irrigation for another 15 min SKIN immediately flush with water remove contaminated clothing under shower do not attempt to neutralize with chemical agent, get medical attention for persistent irritation

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 0 LD$_{50}$ > 15g/kg

Continued on page 4

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Some calcium phosphates form acid solutions in water These may attack metals with formation of flammable hydrogen gas which may collect in enclosed spaces

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Stauffer Chemical Co
   Industrial Chemical Division
   Westport Conn 06880
2. Mallinckrodt Chemical Works
   222 Westside Avenue
   P O Box 164
   Jersey City N J 07304
3. Monsanto Company
   800 North Lindbergh Blvd
   St Louis Mo 63166

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** NF USP Dentifrice Reagent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

NS(MCP)

H(DCP calcium pyrophosphate)

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

3. CHEMICAL DESIGNATIONS (Cont'd)

phosphate (b) basic (d) Calcium pyrophosphate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:**
(a) $CaH_4(PO_4)_2 \cdot H_2O$
(b) $CaHPO_4$ or $CaHPO_4 \cdot 2H_2O$
(c) $Ca_3(PO_4)_2$
(d) $Ca_2P_2O_7$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** Monocalcium phosphate 232.18 Dicalcium phosphate 136.06 Calcium pyrophosphate 254

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2 at 20°C (solids)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4

5. HEALTH HAZARDS (Cont'd)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Tasteless odorless

CPP	CALCIUM PHOSPHIDE

Common Synonyms			
Photophor	Solid	Gray	Musty odor
	Reacts violently with water Poisonous, flammable vapor is produced		

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY
Wear goggles and self-contained breathing apparatus
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

FLAMMABLE
IGNITES WHEN EXPOSED TO MOISTURE
POISONOUS GASES ARE PRODUCED IN FIRE
Wear goggles and self-contained breathing apparatus
Extinguish with dry chemicals or carbon dioxide
DO NOT USE WATER OR FOAM ON FIRE
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR PRODUCED IN REACTION WITH WATER
POISONOUS IF INHALED
Irritating to eyes nose and throat
Move to fresh air
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

DUST
Irritating to eyes
Move victim to fresh air
Hold eyelids open and flush with plenty of water

SOLID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and SKIN is CONSCIOUS have victim drink water or milk

Water Pollution

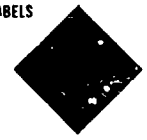
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Hazard Response Methods Handbook CG 446-4)

Issue warning high flammability
poison air contaminant water contaminant
Restrict access
Evacuate area (large discharge only)
Should be removed

2. LABELS



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Photophor
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula:** Ca_3P_2
3 4 **IMCO/United Nations Numerical Designation:** 4 3/1360

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Gray
4 3 **Odor:** Musty like acetylene

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Dust respirator, protective gloves and clothing goggles
5 2 **Symptoms Following Exposure:** Inhalation or ingestion causes faintness weakness nausea vomiting External contact with dust causes irritation of eyes and skin
5 3 **Treatment for Exposure:** INHALATION remove to fresh air, call a physician and alert to possibility of phosphine poisoning EYES or SKIN flush with water INGESTION give large amounts of water, call physician and alert to possibility of phosphine poisoning
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** 1 100 mg/m³

6. FIRE HAZARDS

6 1 **Flash Point** Not flammable but may ignite spontaneously if wetted
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Extinguish adjacent fires with dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water foam
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Can cause spontaneous ignition if wet Contributes dense smoke of phosphoric acid
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously, generating phosphine (a poisonous spontaneously flammable gas)
7 2 **Reactivity with Common Materials.** Can react with surface moisture to evolve phosphine which is toxic and spontaneously flammable
7 3 **Stability During Transport:** Stable if dry
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Ventron Corp
Alfa Products
P O Box 159
Beverly Mass 01915

2 Cerac Inc
x1460 W Silver Spring Rd
Menomonee Falls Wis 53051

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Sealed containers must be in well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

RR

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable solid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 182 2
13 3 **Boiling Point at 1 atm:** Decomposes
13 4 **Freezing Point:** (approx) 2,910°F = 1 600 °C = 1,870°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2 51 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Data not available
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CRE	# CALCIUM RESINATE

Common Synonyms			
Metallic resinate Calcium abietate Calcium rosin Calcium resinate, fused	Solid	Yellow to dark brown	Odorless
	Sinks in water		

Call fire department
Stop discharge if possible. Keep people away
Avoid contact with solid and dust
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
MAY IGNITE WHEN EXPOSED TO AIR
Extinguish with dry chemical, foam or carbon dioxide

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
It inhaled will cause coughing or difficult breathing.
If in eyes hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Calcium abietate, Calcium resinate, fused, Calcium rosin, Limed wood rosin, Metallic resinate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** (approx.) $Ca(OOCC_{19}H_{29})_2$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Amber, very dark brown

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, gloves

5 2 **Symptoms Following Exposure:** Inhalation of fumes from heated chemical may cause irritation of nose and throat. Ingestion causes irritation of nose and throat. Contact with eyes causes irritation. Contact of molten material with skin causes burns.

5 3 **Treatment for Exposure:** INHALATION: move victim to fresh air, get medical help immediately. INGESTION: give large amounts of water, induce vomiting. EYES: flush immediately with cold water, get medical help immediately. SKIN: if molten chemical burns skin, apply cold water immediately, get medical help for burn treatment.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water

6 5 **Special Hazards of Combustion Products.**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** 480°F (may ignite spontaneously)

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Crosby Chemicals, Inc
P.O. Box 460
Picayune, Miss. 39466

2 Reichold Chemicals Inc
Newport Division
P.O. Box 1433
Pensacola, Fla. 32596

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable solid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** (63 (approx.)

13 3 **Boiling Point at 1 atm** >610°F = >316°C = >589°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.13 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

CPH	# CAMPHENE

Common Synonyms			
3,3-Dimethyl-2-methylene norcamplane 2,2-Dimethyl-3-methylene-norbornane	Solid Floats on water	White	Camphor like odor

Stop discharge if possible. Keep people away.
Call fire department.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire	Combustible Extinguish with dry chemicals, foam, carbon dioxide. Water may be ineffective.
Exposure	CALL FOR MEDICAL AID **DUST** **Irritating to eyes, nose and throat** **If inhaled will cause headache or difficult breathing** If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. **SOLID** **Irritating to skin and eyes** **Harmful if swallowed** Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water to dilute. IF SWALLOWED, if victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
2,2-Dimethyl 3 methylenenorbornane
3,3 Dimethyl 2-methylenenorcamphane

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_{10}H_{16}$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Camphoraceous

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Gloves and face shield

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with eyes or skin causes irritation

5 3 **Treatment for Exposure:** INHALATION: move victim to fresh air, call physician immediately. EYES: flush immediately with clean, cool water, call physician immediately. SKIN: wash with alcohol, follow with soap and water wash

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:**
108°F O.C., 92°F C.C. (typical)

6 2 **Flammable Limits in Air:**
Data not available

6 3 **Fire Extinguishing Agents:**
Foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**
Water

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):**
Data not available

8 4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

1 Hercules Inc
Organics Department
Wilmington, Del 19899

2 Reichold Chemicals Inc
Newport Division
4075 Pace Boulevard
Pensacola, Fla 32596

3 SCM Corporation
Glidden-Durkee Div
P O Box 389
Jacksonville, Fla 32201

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 75 [illegible]

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
ORM-A

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm**
Solid

13 2 **Molecular Weight:** 136

13 3 **Boiling Point at 1 atm:**
310°F = 154°C = 427°K

13 4 **Freezing Point:**
122°F = 50°C = 323°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.87 at 15°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion** −19 400 Btu/lb
= −10 800 cal/g = −452 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

CPO	CAMPHOR OIL

Common Synonyms	
Liquid camphor	Oily liquid; Colorless or brown or blue; Penetrating camphor odor; Usually floats on water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	**Combustible** Extinguish with dry chemical, foam or carbon dioxide
Exposure	CALL FOR MEDICAL AID **VAPOR** **Not irritating to eyes, nose or throat** Move to fresh air **LIQUID** **Irritating to skin and eyes** **If swallowed, will cause nausea, vomiting or loss of consciousness** Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
Water Pollution	**Effect of low concentrations on aquatic life is unknown** **Foaling to shoreline** **May be dangerous if it enters water intakes.** Notify local health and pollution control officials Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Mechanical containment
Should be removed

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Liquid impure camphor
Liquid gum camphor

3.2 **Coast Guard Compatibility Classification**
Ketone

3.3 **Chemical Formula** $C_{10}H_{16}O$

3.4 **IMCO/United Nations Numerical Designation:** 3 (1130)

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless, brown, blue

4.3 **Odor:** Like camphor, fragrant and penetrating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Eye protection

5.2 **Symptoms Following Exposure:** Within 5 to 90 minutes after swallowing the irritating oil may be noted nausea and vomiting, feeling of warmth, headache, confusion, vertigo, excitement, restlessness, delirium and hallucinations, increased muscular excitability, tremors, and jerky movements, epileptiform convulsions followed by depression (convulsions sometimes occur early in the syndrome and may be severe but they do not have the grave prognosis of strychnine convulsions), coma, central nervous depression may at times be the primary clinical response, death results from respiratory failure or from status epilepticus (slow recovery, sometimes days or weeks) often with persistent gastric distress

5.3 **Treatment for Exposure:** For oral intoxication: gastric lavage, cathartics, diuretics and sedatives. Control convulsions with a short acting barbiturate, chloral hydrate, or ether. Do NOT use antiseptics or opiates

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 2 ppm

5.5 **Short-Term Inhalation Limits:** 3 ppm for 30 min

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are nonirritating to the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 117°F C.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire:** The solid often evaporates without first melting

6.7 **Ignition Temperature:** 466°C

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. CPC International Inc
S. B. Penick and Co. Division
100 Church St
New York, N. Y. 10007
2. Glyco Chemicals, Inc
51 Weaver St
Greenwich, Conn. 06830
3. R. W. Greef & Co. Inc.
1 Rockefeller Plaza
New York, N. Y. 10020

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Each lot of camphor oil has a unique composition which varies with the season of the year and the country of origin. At least a dozen grades are known, all have Chinese names. Most can poor sold in the U.S. is synthetic and is quite pure

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poison	1
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid (liquid if even slightly impure)

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm.**
>392°F = >200°C = >473°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.923 at 25°C (liquid)

13.8 **Liquid Surface Tension**
Data not available

13.9 **Liquid-Water Interfacial Tension:**
Data not available

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).**
Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion:**
Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

CLS	# CAPROLACTAM, LIQUID

Common Synonyms			
Aminocaproic lactam 2 Ketohexamethylenimine 2-Oxohexamethylenimine epsilon-Caprolactam Hexahydro-2H azepine 2-one	Liquid	Colorless	Mild odor
	Sinks and mixes with water		

Stop discharge if possible. Keep people away.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Extinguish with water, dry chemicals, foam, carbon dioxide.
Cool exposed containers with water.

Exposure

Call for medical aid.

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Aminocaproic lactam, epsilon Caprolactam, Hexahydro 2H azepin 2 one, 2 ketohexamethylenimine

3.2 **Coast Guard Compatibility Classification:** Caprolactam solution

3.3 **Chemical Formula:** $H_2N(CH_2)_5CO$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Gas mask or self-contained breathing apparatus, rubber gloves and boots, goggles or face shield

5.2 **Symptoms Following Exposure:** Inhalation causes coughing or mild irritation. Contact with hot liquid will burn eyes and skin.

5.3 **Treatment for Exposure:** INHALATION: remove patient to fresh air. EYES: wash with copious quantities of water for at least 15 min., call physician. SKIN: wash with water, call physician in case of thermal burn.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 2,140 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5.10 **Odor Threshold:** 0.3 mg/m³

6. FIRE HAZARDS

6.1 **Flash Point:** 257°F (O.C.), 230°F (C.C.)

6.2 **Flammable Limits in Air:** 1.84% (LFL)

6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 2.4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Badische Company
   Williamsburg, Va. 23185
2. Allied Chemical Corporation
   Plastics Division
   P.O. Box 2365R
   Morristown, N.J. 07960
3. Nipro Incorporated
   P.O. Box 1485
   Augusta, Ga. 30903

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99%

10.2 **Storage Temperature:** 75°C

10.3 **Inert Atmosphere:** Nitrogen cushion

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P-Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** 113

13.3 **Boiling Point at 1 atm:** 518°F = 268°C = 541°K

13.4 **Freezing Point:** 154°F = 68°C = 341°K

13.5 **Critical Temperature:** 944.4°F = 506.9°C = 780.1°K

13.6 **Critical Pressure:** 660 psia = 45 atm = 4.6 MN/m

13.7 **Specific Gravity:** 1.02 at 77°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 77°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 77°C

13.10 **Vapor (Gas) Specific Gravity:** 3.9

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 209 Btu/lb = 116 cal/g = 4.85×10^5 J/kg

13.13 **Heat of Combustion:** −13,700 Btu/lb = −7,640 cal/g = -320×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** −324 Btu/lb = −180 cal/g = -7.5×10^5 J/kg

(Continued on pages 5 and 6)

NOTES

CPT	CAPTAN

Common Synonyms			
N [(Trichloromethyl) thio]-4-cyclohexene-1, 2, -dicarboximide N-trichloromethylthio-cis-Δ^4-cyclohexene 1, 2, -dicarboximide Orthocide Vancide	Solid Sinks in water	White to brown	Slight odor

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear goggles, self-contained breathing apparatus, and rubber gloves
Call fire department
Stay upwind; use water spray to knock down dust
Isolate and remove discharged material
Notify local health and wildlife officials

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and self-contained breathing apparatus
Extinguish with water, dry chemicals, foam, or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.
Move victim to fresh air
Remove clothing; wash skin with plenty of water
If breathing has stopped, give artificial respiration
If breathing difficult, give oxygen
SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Remove contaminated clothing
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have him drink water or milk and induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except get him to water

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Avoid contaminating wildlife, fish, etc.
Notify persons using water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** N [(Trichloromethylthio)] 4 cyclohexene 1 2-dicarboximide N Trichloromethylthio-cis-Δ^4 cyclohexene-1 2-dicarboximide Orthocide Vancide

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula:** $C_9H_8Cl_3NO_2S$

3 4 **IMCO/United Nations Numerical Designation:** 6 1/1609

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White to buff

4 3 **Odor:** Slight pungent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, rubber gloves, and goggles

5 2 **Symptoms Following Exposure:** Vapor irritates eyes. Ingestion causes depression, lachrymation, labored respiration, diarrhea

5 3 **Treatment for Exposure:** Remove from exposure, keep airways open, adm oxygen, artificial respiration if necessary. EYES: flush with water for 15 min and get medical attention. SKIN: wash with soap and water. INGESTION: maintain respiration, induce vomiting, lavage stomach if patient is unconscious, give symptomatic and supportive treatment, save agent and vomitus for laboratory examination

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 3 oral rat LD_{50} = 4500 mg/kg

5 7 **Late Toxicity:** None observed in several species

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Flammable solid

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, carbon dioxide, foam

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating and toxic gases are produced in a fire; they may include sulfur dioxide, hydrogen chloride, phosgene, and oxides of nitrogen

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 30 ppm 24 hr zebrafish 11 m fresh water

8 2 **Waterfowl Toxicity:** > 5,000 ppm LC_{50}

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Bioaccumulation not likely

9. SELECTED MANUFACTURERS

1 R T Vanderbilt Company Inc
230 Park Avenue
New York N Y 10017

2 Stauffer Chemical Co
Mountain View Calif 94040

3 Chevron Chemical Co
940 Hensley Street
Richmond Calif 94804

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 90-97% also available as dusts, wettable powders and aqueous suspension

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous class B

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 300 6

13 3 **Boiling Point at 1 atm.** Decomposes

13 4 **Freezing Point:** 338°F = 170°C = 443 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 74 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** (est) = 7 100 Btu/lb = −3 940 cal/g = −16 5 × 10 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

CBY	CARBARYL

Common Synonyms	Solid powder, or in solution	White to gray	Weak odor
Sevin 1-Naphthyl N-methyl-carbamate	Solid sinks in water solution may float on water		

Stop discharge if possible
Call fire department
Avoid contact with solid and solution
Wear protective clothing
Notify appropriate agencies

Fire

Solid not flammable, but usually dissolved in combustible liquid
Extinguish with water, dry chemical or carbon dioxide

Exposure

CALL FOR MEDICAL AID
SOLID OR SOLUTION
Irritating to skin and eyes
Harmful if swallowed
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water, milk or milk and base victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Should be removed

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1-Naphthyl N-methylcarbamate
Sevin
3.2 **Coast Guard Compatibility Classification.** Not applicable
3.3 **Chemical Formula** $C_{12}H_{11}NO_2$
3.4 **IMCO/United Nations Numerical Designation** 6.1/6.1/1615

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Off-White
4.3 **Odor:** Weak

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Data not available
5.2 **Symptoms Following Exposure:** Data not available
5.3 **Treatment for Exposure:** SKIN AND EYE CONTACT flush affected tissues with water
INGESTION induce vomiting
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 5 mg/m³
5.5 **Short-Term Inhalation Limits:** Dust 30 mg/m³ for 30 min
5.6 **Toxicity by Ingestion** Grade 2 LD₅₀ 0 to 5 g/kg (oral LD₅₀ 0 to 5 g/kg)
5.7 **Late Toxicity:** Liver damage to rats at high dose by mouth
5.8 **Vapor (Gas) Irritant Characteristics:** None
5.9 **Liquid or Solid Irritant Characteristics:** Not stated
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.2 **Fire Extinguishing Agents** Solution fires: Water, foam, dry chemical, CO_2
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products.** Not pertinent
6.6 **Behavior in Fire** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate.** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction
7.2 **Reactivity with Common Materials.** No reaction
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 5.5 ppm 96 hr. bluegill, 11 mg/l fresh water, 0.013 ppm 48 hr. white shrimp, 11 mg/l salt water. Toxic to shrimp and crab species
8.2 **Waterfowl Toxicity** LD_{50} = 2179 mg/kg
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential:** None observed

9. SELECTED MANUFACTURERS

Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
Sevin 50W wettable powder
Sevin sprayable 80% powder
Sevin 4 oil
10.2 **Storage Temperature:** Data not available
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

11

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-A
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** 288°F = 142°C = 415°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.23 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

NOTES

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CBO	CARBOLIC OIL

Common Synonyms		
Mixed Oil Liquefied phenol	Liquid — Colorless – darkens on exposure to light	Sweet tar odor
	Sinks and mixes with water	

AVOID CONTACT WITH LIQUID. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES ARE PRODUCED WHEN HEATED
Wear chemical protective suit with self-contained breathing apparatus.
Extinguish with water, dry chemical, foam, or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Remove contaminated clothing and shoes.
Flush affected area with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water, milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning – poison.
Restrict access.
Should be removed.
Chemical and physical treatment.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Mixed oil
Liquefied phenol

3.2 **Coast Guard Compatibility Classification:** Phenol

3.3 **Chemical Formula:** C_6H_5OH

3.4 **IMCO/United Nations Numerical Designation:** 9.0 1671

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless, darkens on exposure to light

4.3 **Odor:** Sweet tar like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Fresh air mask for confined areas, rubber gloves, protective clothing, full face shield

5.2 **Symptoms Following Exposure:** Will burn eyes and skin. The analgesic action may cause loss of pain sensation. Readily absorbed through skin, causing increased heart rate, convulsions, and death.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, keep quiet and warm. If breathing stops, start artificial respiration. INGESTION: do NOT induce vomiting. Give milk, egg whites, or large amounts of water. Get medical assistance. No known antidote. EYES AND SKIN: remove contaminated clothing. Flush eyes with water for 15 minutes or until physician arrives. Wash skin with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** Causes cancer in experimental animals

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Earth severe skin irritant. May cause pain and second degree burns after a few minutes contact.

5.10 **Odor Threshold:** 0.05 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 175°F (79°C) – 185°F (85°C)

6.2 **Flammable Limits in Air:** 1.3% – 8.6%

6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Unburned vapor is toxic

6.6 **Behavior in Fire:** Yields flammable vapors when heated, which will form explosive mixtures with air

6.7 **Ignition Temperature:** 1319°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 3.5 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
TLm 25.5 mg/l/96 hr/bluegill; TLm/fresh water
1.5 ppm/48 hr/rainbow trout; TLm/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
2072 5 days

8.4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich 48640

2 Monsanto Co
Monsanto Polymers and Petrochemicals Co
800 N Lindbergh Blvd
St Louis, Mo 63166

3 United States Steel Corp
USS Chemicals Division
Clairton, Pa 15025

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
96-92% phenol, 80-82% phenol
(Remainder consists of cresol and water)

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

V P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES*

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 94.11

13.3 **Boiling Point at 1 atm.**
359.2°F = 181.8°C = 454.9°K

13.4 **Freezing Point:**
<105.6°F = <40.9°C = <314.1°K

13.5 **Critical Temperature:**
790.0°F = 421.1°C = 694.3°K

13.6 **Critical Pressure:**
889 psia = 60.5 atm = 6.13 MN/m²

13.7 **Specific Gravity:** 1.04 at 41°C (liquid)

13.8 **Liquid Surface Tension.**
41 dynes/cm = 0.041 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.089

13.12 **Latent Heat of Vaporization:**
129.6 Btu/lb = 72.0 cal/g = 3.014 × 10⁵ J/kg

13.13 **Heat of Combustion:** −13,401 Btu/lb
= −7445 cal/g = −31.70 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

*Data applies to phenol, the principal constituent

Continued on pages 5 and 6

NOTES

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CDO	# CARBON DIOXIDE

Common Synonyms			
Carbonic acid gas Carbonic anhydride	Liquefied compressed gas or solid	Colorless gas or white solid	Odorless
	Solid sinks and boils in water	Visible vapor cloud is produced	

AVOID CONTACT WITH LIQUID AND SOLID. STAY
PEOPLE AWAY
Wear goggles, self-contained breath[illegible]
Stop the harm if possible

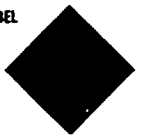
Fire	Not flammable Containers may explode in fire Cool exposed containers with water
Exposure	Call for medical aid **VAPOR** **If inhaled will cause dizziness, or difficult breathing** Move victim to fresh air If breathing is difficult, give oxygen **LIQUID OR SOLID** **Will cause frostbite** Flush affected areas with plenty of water DO NOT RUB AFFECTED AREAS
Water Pollution	Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Carbonic acid gas
Carbonic anhydride

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** CO_2

3 4 **IMCO/United Nations Numerical Designation:** 2 1013

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied compressed gas or solid ("Dry Ice")

4 2 **Color:** Colorless

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus in excessively high CO_2 concentration areas. For handling liquid or solid: wear safety goggles or face shield, insulated gloves, long sleeved shirt and trousers worn outside boots or over high top shoes to shed spilled liquid

5 2 **Symptoms Following Exposure:** Inhalation causes increased respiration rate, headache, subtle physiological changes for up to 5% concentration and prolonged exposure. Higher concentrations can cause unconsciousness and death. Solid can cause cold contact burns. Liquid or cold gas can cause freezing injury to skin or eyes similar to a burn

5 3 **Treatment for Exposure:** INHALATION: move victim to fresh air. SKIN: treat burns from contact with solid in same way as frostbite

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5000 ppm

5 5 **Short-Term Inhalation Limits:** 30 000 ppm for 60 min

5 6 **Toxicity by Ingestion:** Not pertinent (gas with low boiling point)

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Containers may explode when heated

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 100 200 mg/l * various organisms LC fresh water
*Time period not specified

8 2 **Waterfowl Toxicity:** Inhalation 5-6% no effect

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Chemetron Corporation
Cardox Products Division
111 E Wacker Drive
Chicago Ill 60601

2 Union Carbide Corporation
Linde Division
Morristown N J 08057

3 Liquid Carbonic Corporation
135 S LaSalle St
Chicago Ill 60603

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Research 99 995+%
Instrument 99 99+%, Bone Dry 99 5+%
Commercial 99 5+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Liquid: safety relief, solid: open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A C-II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Nonflammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight:** 44 0

13 3 **Boiling Point at 1 atm:** Not pertinent (sublimes)

13 4 **Freezing Point:** −109 3°F = −78 5°C = 194 7°K

13 5 **Critical Temperature:** 88°F = 31°C = 304°K

13 6 **Critical Pressure:** 1 070 psia = 72 9 atm = 7 40 MN/m

13 7 **Specific Gravity:** 1 56 at −79°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 1 53

13 11 **Ratio of Specific Heats c/c Vapor (Gas)** 1 0474

13 12 **Latent Heat of Vaporization:** 150 Btu/lb = 83 cal/g = 3 5 × 10⁵ J/kg

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

CBB	# CARBON BISULFIDE

Common Synonyms	
Carbon disulfide	Watery liquid Colorless to yellow Rotten egg to sweet odor Sinks in water Flammable, irritating vapor is produced

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber over-clothing (including gloves).
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus and rubber over-clothing (including gloves).
Extinguish with dry chemical, carbon dioxide.
Water and foam may be ineffective in fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Isolate warning high flammability
Restrict access
Evacuate area

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Carbon disulfide
3.2 **Coast Guard Compatibility Classification:** Carbon disulfide
3.3 **Chemical Formula:** CS_2
3.4 **IMCO United Nations Numerical Designation:** 3.1 1131

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Fairly sweetish, disagreeable, offensive, like that of decaying cabbage

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Only self-contained breathing mask with full face, approved by the United States Bureau of Mines, is recommended. If the vapor concentration exceeds 2% by volume or is unknown, supplied air respirators equipment of appropriate design with full face masks should be used by all persons entering contaminated area. Masks should be used only for emergency situations and should be located accordingly. Almost any type of industrial clothing is satisfactory. Splashes of small quantity are not harmful to fabrics, and evaporation from clothing is quite rapid. Clothing should, however, be removed and the skin washed with water. Goggles should be used when there is any danger of CS_2 splashes or sprays.

5.2 **Symptoms Following Exposure:** ACUTE EXPOSURE: mild to moderate irritation of skin, eyes and mucous membranes from liquid or concentrated vapors; headache, garlic breath, nausea, vomiting, diarrhea (even after vapor exposure) and occasionally abdominal pain, weak pulse, palpitations, fatigue, weakness in the legs, unsteady gait, vertigo, mania, hallucinations of sight, hearing, taste and smell in acute, massive vapor exposures; central nervous depression with respiratory paralysis; death may occur during coma or after a convulsion.

5.3 **Treatment for Exposure:** INHALATION: remove victim promptly from contaminated area. Administer oxygen and artificial respiration if needed. SKIN CONTACT: wash affected areas with copious quantities of water. INGESTION: induce vomiting and follow with gastric lavage and saline cathartics.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 20 ppm

5.5 **Short-Term Inhalation Limits:** 100 ppm for 30 minutes; 200 ppm for 10 minutes; 100 ppm for 30 minutes and 50 ppm for 60 minutes.

6. FIRE HAZARDS

6.1 **Flash Point:** −22°F (−30°C)
6.2 **Flammable Limits in Air:** 1.3% – 50%
6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic gases are generated; wear self-contained breathing apparatus
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 212°F
6.8 **Electrical Hazard:** Contact of the liquid or vapor with the surface of a lighted electric light bulb could cause ignition
6.9 **Burning Rate:** 2.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 35 ppm/48 hr/mosquitofish/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. FMC Corp.
   Inorganic Chemicals Div.
   633 Third Ave.
   New York, N.Y. 10017
2. PPG Industries Inc.
   Industrial Chemicals Div.
   Barberton, Ohio 44203
3. Stauffer Chemical Co.
   Industrial Chemicals Div.
   Delaware City, Delaware 19706

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, technical, USP
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Inerted
10.4 **Venting:** Pressure/vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

X-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4*
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 76.14
13.3 **Boiling Point at 1 atm:** 115°F = 46.3°C = 319.5°K
13.4 **Freezing Point:** −169.9°F = −112°C = 161°K
13.5 **Critical Temperature:** 523°F = 273°C = 546°K
13.6 **Critical Pressure:** 1100 psia = 76 atm = 7.7 MN/m²
13.7 **Specific Gravity:** 1.26 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 32 dynes/cm = 0.032 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 48.4 dynes/cm = 0.0484 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 2.6
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.2
13.12 **Latent Heat of Vaporization:** 153 Btu/lb = 85 cal/g = 3.59 × 10⁵ J/kg
13.13 **Heat of Combustion:** −5514 Btu/lb = −3220 cal/g = −13.5 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

5. HEALTH HAZARDS (Cont'd)

5.6 **Toxicity by Ingestion:** Grade 2, rat LD_{50} = 0.1 – 0.99 g/kg
5.7 **Late Toxicity:** Non-specific liver cell damage in rats, higher incidence of upper respiratory disease in humans
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure and may cause secondary burns on long exposure.
5.10 **Odor Threshold:** 0.21 ppm

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CMO	CARBON MONOXIDE

Common Synonyms			
Monoxide	Compressed gas or liquefied compressed gas	Colorless	Odorless
	Liquid floats and boils on water. Poisonous, flammable, visible vapor cloud is produced		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.

Fire

FLAMMABLE
Containers may explode in fire

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED

LIQUID
Will cause frostbite

Water Pollution

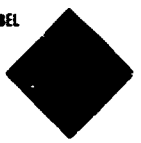
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison, high flammability
Restrict access
Evacuate area

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Monoxide
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** CO
3.4 **IMCO/United Nations Numerical Designation:** 2/1016

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Compressed gas or liquefied gas
4.2 **Color:** Colorless
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus, safety glasses and safety shoes. Type D or Type N canister mask
5.2 **Symptoms Following Exposure:** Inhalation causes headache, dizziness, weakness of limbs, confusion, nausea, unconsciousness, and finally death. 0.04% conc. 2 hr or 0.6% conc. 1 hr headache and discomfort with moderate exercise. 0.1-0.2% will produce throbbing in the head in about 2 hr, a tendency to stagger in about 1 hr, and confusion of the mind, headache, and nausea in about 2 hrs. 0.20-.25% usually produces unconsciousness in about 1 hr. Inhalation of a 0.4% conc. can prove fatal in less than 1 hr. Inhalation of high concentrations can cause sudden unexpected collapse. Contact of liquid with skin will cause frostbite
5.3 **Treatment for Exposure:** INHALATION: remove from exposure, give oxygen if available, support respiration, call a doctor. SKIN: if burned by liquid, treat as frostbite
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 50 ppm
5.5 **Short-Term Inhalation Limits:** 400 ppm 15 min
5.6 **Toxicity by Ingestion:** Not pertinent, gas with low boiling points
5.7 **Late Toxicity:** Toxicity from overexposure persists for many days
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
6.2 **Flammable Limits in Air:** 12% - 75%
6.3 **Fire Extinguishing Agents:** Let fire burn, shut off flow of gas and cool adjacent exposures with water. Extinguish only if wearing self-contained breathing apparatus with dry chemicals or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Asphyxiation due to carbon dioxide production may result
6.6 **Behavior in Fire:** Flame has very little color. Containers may explode in fire
6.7 **Ignition Temperature:** 1128°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 1.5 ppm 7 to 8 hr minnows and sunfish killed, fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals, Inc.
   Specialty Gas & Equipment Dept.
   733 W. Broad Street
   Emmaus, Pa. 18049
2. Matheson Gas Products
   East Rutherford, N.J. 07073

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Liquid 98.6+% Gas Research High Purity, CP (99.5%) Technical (99.0+%) Commercial (95.5+%)
10.2 **Storage Temperature:** Ambient (for gas) −312.7°F (for liquid)
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A B C D E F G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 28.0
13.3 **Boiling Point at 1 atm:** −312.7°F = −191.5°C = 81.7°K
13.4 **Freezing Point:** −326°F = −199°C = 74°K
13.5 **Critical Temperature:** −220°F = −140°C = 133°K
13.6 **Critical Pressure:** 507.5 psia = 34.51 atm = 3.502 MN/m²
13.7 **Specific Gravity:** 0.791 at −191.5°C (liquid)
13.8 **Liquid Surface Tension:** 9.8 dynes/cm = 0.009 N/m at −193°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 0.97
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.3962
13.12 **Latent Heat of Vaporization:** 92.8 Btu/lb = 51.6 cal/g = 2.16 × 10⁵ J/kg
13.13 **Heat of Combustion:** −4,343 Btu/lb = −2,412 cal/g = −10.1 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CBT	# CARBON TETRACHLORIDE

Common Synonyms
Carbon Tet
Tetrachlorocarbon

Watery liquid — Colorless — Sweet odor

Sinks in water. Poisonous vapor is produced.

[illegible]

Fire

Not flammable
POISONOUS AND IRRITATING GASES ARE PRODUCED WHEN HEATED
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to eyes
[illegible]

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning to persons
Restrict access
Should be removed

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Benzinoform
Nonflammable
Perchloromethane
Tetrachloromethane

3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3.3 **Chemical Formula:** CCl_4

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sweetish, aromatic, moderately strong ethereal, somewhat resembling that of chloroform

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister with full face mask, protect against rubber gloves

5.2 **Symptoms Following Exposure:** Dizziness, incoordination, anesthesia, may be accompanied by nausea and liver damage. Kidney damage also occurs, often producing decrease or stopping of urine output

5.3 **Treatment for Exposure:** EYES AND SKIN: flush with parts of water for eyes, get medical attention. Remove contaminated clothing and wash before reuse. INHALATION: immediately remove to fresh air, keep patient warm and quiet and get medical attention promptly. Start artificial respiration if breathing stops. INGESTION: induce vomiting and get medical attention promptly. No specific antidote known

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm

5.5 **Short-Term Inhalation Limits:** No ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 2 [illegible]

5.7 **Lethal Toxicity:** Causes severe liver damage and death if ingested

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes moderate irritation such that personnel would find be a concentration unpleasant. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Greater than 10 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Emits poisonous phosgene gas when exposed to open flames

6.6 **Behavior in Fire:** Decomposes to form chlorine and phosgene

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Michigan 48640

2. FMC Corp.
Industrial Chemical Div.
[illegible] Third Ave.
New York, N.Y. [illegible]

3. Stauffer Chemical Co.
Industrial Chemical Div.
Le Moyne, Alabama [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, chemical, USP

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

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12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-A

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reactive	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):**

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page [illegible])

NOTES

REVISED 1978

CAR	CARENE

Common Synonyms			
3-Carene Isodipene 4,7,7 Trimethyl-3-norcarene 3,7,7 Trimethylbicyclo[0,1,4] hept-3-ene	Liquid	Colorless	Sweet turpentine-like odor
	Floats on water		

Stop discharge if possible. Keep [illegible]
Avoid contact with liquid.
[illegible]
[illegible]

Fire	Combustible [illegible]
Exposure	ALL FORMS OF [illegible] VAPOR Irritating to eyes, nose and throat If inhaled will cause headache, coughing or difficult breathing [illegible] LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning (with flammables)
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 3-Carene, Isodipene
4,7,7 Trimethyl-3-norcarene
3,7,7 Trimethylbicyclo[0,1,4]hept-3-ene

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_{10}H_{16}$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sweet, pungent, like turpentine

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor or air-supplied mask, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes headache, confusion, respiratory distress. Ingestion irritates entire digestive system and may injure endocrine. If liquid enters lungs it causes severe pneumonitis. Contact with eyes or skin causes irritation

5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air, call a doctor, administer artificial respiration and oxygen if required. INGESTION: give large amounts of water and induce vomiting, call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available.

5.6 **Toxicity by Ingestion:** Grade 2 oral rat LD_{50} = 4.1 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Data not available

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective on fire

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Will attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Northwest Petrochemical Corp
P.O. Box [illegible]
Atlantic, Wash. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

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12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 136

13.3 **Boiling Point at 1 atm:** 318°F = 170°C = 443°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.860 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Data not available

13.13 **Heat of Combustion:** (est.) = 19,170 Btu/lb = 10,740 cal/g = −450 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

CTC	# CATECHOL

Common Synonyms			
Oxyphenic acid Pyrocatechuic acid Pyrocatechinic acid	Solid	White	Odorless
	Sinks and mixes with water		

[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
[illegible]

Exposure

[illegible]

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
Will burn skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Inner warning: water contaminant
Disperse and flush

2. LABELS

No hazard labels required in accordance of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2 Benzenediol, Catechin, 1,2 Dihydroxybenzene, ortho-Dihydroxybenzene, Oxyphenic acid, Pyrocatechin, Pyrocatechuic acid, Pyrocatechol, Pyrocatechuic acid

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** 1,2 HOC6H4OH

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator if required, rubber gloves, apron and boots. Face shield

5.2 **Symptoms Following Exposure:** Inhalation of dust or mists may cause irritation of eyes, nose, and throat. Ingestion may cause convulsions and respiratory failure. Contact with eyes causes burns and may be permanent impairment of vision. Prolonged or repeated contact with skin may cause burn

5.3 **Treatment for Exposure:** INHALATION: if ill effects occur, get medical attention. INGESTION: promptly give 8 oz pints of water and induce vomiting, get medical attention promptly. See specific antidote if known. EYES and SKIN: immediately flush with pints of water for at least 15 min. See eyes get medical attention promptly, remove and wash all contaminated clothing before reuse

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] mg/kg (rats)

5.7 **Late Toxicity:** Causes tumors in mice

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** Not pertinent (combustible solid)

6.2 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water and foam may be ineffective

6.5 **Special Hazards of Combustion Products:** May form toxic fumes at high temperatures

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. [illegible] Chemical Products Div, Camas, Wash. 98607
2. Dow Chemical Co, Midland, Mich. 48640
3. Eastman Organic Chemicals, Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
CP: high purity 99.1+%
NF: extremely high purity 99.9+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

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12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 110.11

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.344 (1.20% solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

CPS — CAUSTIC POTASH SOLUTION

Common Synonyms			
Potassium hydroxide solution Lye	Thick liquid Sinks and mixes with water	Colorless	Odorless

AVOID CONTACT WITH LIQUID. Keep people away.
Wear rubber overclothing (including gloves).
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes.
Harmful if swallowed

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Dispersal and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Potassium hydroxide solution; Lye
3.2 **Coast Guard Compatibility Classification:** Caustic
3.3 **Chemical Formula** KOH + H2O
3.4 **IMCO/United Nations Numerical Designation:** NO/1814

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Wide brimmed hat and close fitting safety goggles equipped with rubber side shields, long sleeved cotton shirt or jacket with buttoned collar and buttoned sleeves, rubber or rubber coated canvas gloves (Shirt sleeves should be buttoned over the gloves so that any spilled material will run down the outside.) Rubber safety toe shoes or boots and cotton coveralls (Trouser cuffs should be worn outside of boots.) Rubber apron
5.2 **Symptoms Following Exposure:** Causes severe burns of eyes, skin and mucous membranes
5.3 **Treatment for Exposure** (Act quickly) EYES flush with water for at least 15 min. SKIN flush with water, then rinse with dilute vinegar (acetic acid). INGESTION give water and milk. Do NOT induce vomiting. Call physician at once, even when injury seems to be slight
5.4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5.5 **Short-Term Inhalation Limits** Not pertinent
5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 365 mg/kg
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes
5.10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products.** Not pertinent
6.6 **Behavior in Fire** Not pertinent
6.7 **Ignition Temperature.** Not flammable
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** None
7.2 **Reactivity with Common Materials.** Attacks wool, leather and some metals such as aluminum, tin, lead and zinc, to produce flammable hydrogen gas. Separate from easily ignitible materials
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Dilute with water and rinse with dilute acid such as acetic acid
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 80 ppm/24 hr TLm (fresh water (these figures are for 100% potassium hydroxide))
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Diamond Shamrock Corp
   Diamond Shamrock Chemical Co
   Electro Chemicals Div
   Deer Park, Texas 77536
2. Monsanto Co
   Monsanto Industrial Chemicals Co
   800 North Lindbergh Blvd
   St. Louis, Mo 63166
3. Occidental Petroleum Corp
   Hooker Chemical Corp
   Industrial Chemicals Div
   Niagara Falls, N.Y. 14302

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 45%, 50%
10.2 **Storage Temperature:** Ambient or elevated
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

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12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Corrosive material
12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	4
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight** Not pertinent
13.3 **Boiling Point at 1 atm** >266°F = >130°C = >403°K
13.4 **Freezing Point** Not pertinent
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure.** Not pertinent
13.7 **Specific Gravity:** 1.45–1.50 at 20°C (liquid)
13.8 **Liquid Surface Tension** Not pertinent
13.9 **Liquid Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heat of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** (est.) −17 Btu/lb = −10 cal/g = −0.4 × 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 back

NOTES

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CSS

CAUSTIC SODA SOLUTION

Common Synonyms
Sodium hydroxide solution
Lye

Thick liquid — Colorless — Odorless

Sinks and mixes with water

AVOID CONTACT WITH LIQUID. Keep people away
Wear rubber overclothing (including gloves)
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
LIQUID
Will burn skin and eyes
Harmful if swallowed

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

Notify local health and pollution control officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — corrosive
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Sodium hydroxide solution; Lye
3.2 **Coast Guard Compatibility Classification** Caustic
3.3 **Chemical Formula:** NaOH + H O
3.4 **IMCO/United Nations Numerical Designation.** 8 0/1824

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wide brimmed hat, safety goggles with rubber side shields, tight fitting cotton clothing, rubber gloves under shirt cuffs, rubber boots and apron
5.2 **Symptoms Following Exposure.** Causes severe burns of eyes, skin, and mucous membranes
5.3 **Treatment for Exposure:** (Act quickly) EYES: Flush with water at once for at least 15 min. SKIN: flush with water, then rinse with dilute vinegar (acetic acid). INGESTION: give water and milk. Do NOT induce vomiting. Call physician at once, even when injury seems to be slight
5.4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5.5 **Short-Term Inhalation Limits.** Not pertinent
5.6 **Toxicity by Ingestion:** Grade 2, oral rabbit LD_{50} = 500 mg/kg
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics.** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Corrosive to aluminum, zinc, and tin. Contact with some metals may generate hydrogen gas, which is explosive and flammable
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Dilute with water, rinse with dilute acetic acid
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 125 ppm/96 hr/mosquito fish/Hum. fresh water; 180 ppm/24 hr/oysters/fish/salt water (These figures are 100% sodium hydroxide)
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Diamond Shamrock Corp, Electrochemicals Division, Painesville, Ohio 44077
2. Dow Chemical Co, Midland, Mich. 48640
3. PPG Industries, Inc, Industrial Chemicals Division, Barberton, Ohio 44203

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 1 73%
10.2 **Storage Temperature:** Ambient or elevated
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	4
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** Not pertinent
13.3 **Boiling Point at 1 atm:** >266°F = >130°C = >403°K
13.4 **Freezing Point.** Not pertinent
13.5 **Critical Temperature.** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.54 @ 20°C
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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CHC	CHARCOAL

Common Synonyms			
Vegetable carbon Animal carbon Activated charcoal Wood charcoal Shell charcoal	Solid powder, lumps, or grains May float or sink in water	Black	Odorless

Shut off ignition sources. Call fire department.
Stay upwind. Use water spray to knock down dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flood discharge area with water.

Exposure

DUST
Irritating to eyes, nose and throat.
Move victim to fresh air.
If in eyes, hold eyelids open and flush with plenty of water.

SOLID
Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Vegetable carbon, Vegetable charcoal, Animal carbon, Animal charcoal, Mineral carbon, Mineral charcoal, Activated charcoal, Wood charcoal, Shell charcoal

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** C

3.4 **IMCO/United Nations Numerical Designation:** 4.2/1361, 1362

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Powder, lumps, grains, or sticks

4.2 **Color:** Black

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator for dust

5.2 **Symptoms Following Exposure:** No significant symptoms

5.3 **Treatment for Exposure:** No treatment required

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Non-toxic (actually used in therapy of poisoning cases)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Flammable solid, may ignite spontaneously in air

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products:** Incomplete combustion forms toxic carbon monoxide

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 600-750°F

6.8 **Electrical Hazard.** Class I, Group B

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** May ignite spontaneously in air

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity.** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1. Barneby Cheney Co
   Cassady at Eighth Street
   Columbus, Ohio 43216
2. North American Carbon, Inc
   P. O. Box 19737
   Columbus, Ohio 43219
3. Union Carbide Corp
   Carbon Products Division
   270 Park Avenue
   New York, N. Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Various grades, those containing appreciable volatile material are more likely to catch fire. All shipments must be exposed to air and so certified.

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable solid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 12

13.3 **Boiling Point at 1 atm.** Very high

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 2 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** 14,100 Btu/lb = 7,830 cal/g = 328×10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent.

(Continued on pages 5 and 6)

NOTES

CDN	CHLORDANE

Common Synonyms

Chlordan
1, 2, 4, 5 6 7, 8, 8-octachloro-2, 3, 3a 4, 7 7a-hexahydro-4 7-methanoindene
Toxichlor
Octa-Klor
Velsicol 1068

Liquid or solution — Brown — Sharp odor

Sinks in water

AVOID CONTACT WITH LIQUID KEEP PEOPLE AWAY
[illegible]

Fire

Not flammable but solution may be combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Extinguish with dry chemical [illegible]
Water may be ineffective on fire
[illegible] exposed containers cool with water

Exposure

CALL FOR MEDICAL AID
LIQUID OR SOLUTION
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
[illegible]
Flush affected areas with plenty of water
DO NOT RUB AFFECTED AREAS
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED induce vomiting if CONSCIOUS have victim drink water milk and have victim induce vomiting
IF SWALLOWED induce vomiting if UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — poison
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Chlordan 1, 2, 4 5, 6, 7, 8, 8-Octachloro-2 3 3a, 4, 7, 7a hexahydro-4, 7-methanoindene, Velsicol 1068, CD-68, Toxichlor, Octa Klor

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula:** $C_{10}H_6Cl_8$

3 4 **IMCO/United Nations Numerical Designation:** 6 1 1615

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Brown

4 3 **Odor:** Penetrating aromatic slightly pungent like chlorine

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Respirator for sprays fogs or dust goggles rubber gloves

5 2 **Symptoms Following Exposure:** Moderately irritating to eyes and skin Ingestion absorption through skin or inhalation of mist or dust may cause excitability convulsions nausea vomiting, diarrhea and some local irritation of the gastrointestinal tract

5 3 **Treatment for Exposure:** INHALATION administer oxygen and give fluid therapy, do not give epinephrine since it may induce ventricular fibrillation, enforce complete rest EYES flush with water for at least 15 min SKIN wash off skin with adequate quantities of soap and water do NOT scrub INGESTION induce vomiting and follow with gastric lavage and administration of saline cathartics ether and barbiturates may be used to control convulsions oxygen and fluid therapy are also recommended do NOT give epinephrine Since no specific antidotes are known symptomatic therapy must be accompanied by complete rest

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 5 mg m³

5 5 **Short-Term Inhalation Limits:** 2 mg m³ for 30 min

5 6 **Toxicity by Ingestion** Grade 3 oral LD_{50} = 283 mg/kg (rat)

5 7 **Late Toxicity:** Possible liver damage loss of appetite and weight

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

Flash Point: Solution 225°F O C
132°F C C Solid is not flammable

6 2 **Flammable Limits in Air:** 0 7% 5% (kerosene solution)

6 3 **Fire Extinguishing Agents:** Dry chemical foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective on solution fire

6 5 **Special Hazards of Combustion Products.** Irritating and toxic hydrogen chloride and phosgene gases may be formed when kerosene solution of compound burns

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature:** 410°F (kerosene solvent)

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport.** Stable to 160°F

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 0 5 ppm/96 hr/goldfish/Flow/fresh water

8 2 **Waterfowl Toxicity:** LD_{50} = 1 200 mg/kg

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** High

9 SELECTED MANUFACTURERS

1 Velsicol Chemical Corp
341 East Ohio Street
Chicago Ill 60611

2 S B Penick & Co
100 Church Street
New York N Y 10007

3 Chempar Chemical Co
260 Madison Avenue
New York N Y 10016

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical A variety of dusts, powders, and solutions in kerosene containing 2-80% chlordane are shipped

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A X Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES*

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 409 8

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 6 at 25°C (liquid)

13 8 **Liquid Surface Tension** (est) 25 dynes/cm = 0 025 N m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est) 50 dynes/cm = 0 05 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est) −4 000 Btu lb = −2 200 cal/g = −93 × 10³ J kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

* Properties refer to undiluted, technical-grade chlordane

Continued on pages 5 and 6

NOTES

CLX — CHLORINE

Common Synonyms

Liquefied compressed gas Greenish yellow Irritating, bleach-like choking odor

Sinks and boils in water Poisonous, visible vapor cloud is produced

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away
[illegible]

Fire

Not flammable
May cause fire on contact with combustibles
POISONOUS GASES ARE PRODUCED IN FIRES
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Will burn eyes
[illegible]
IF IN EYES hold eyelids open and flush with plenty of water

LIQUID
Will burn skin and eyes
Will cause frostbite
[illegible]
IF IN EYES hold eyelids open and flush with plenty of water
DO NOT RUB AFFECTED AREAS

Water Pollution

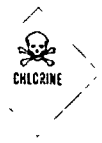
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — poison
Restrict access
Evacuate area

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification** Halogen
3.3 **Chemical Formula:** Cl
3.4 **IMCO/United Nations Numerical Designation** 2.0/1017

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied compressed gas
4.2 **Color:** Greenish yellow
4.3 **Odor:** Characteristic choking

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Quick opening safety shower and eye fountain, respiratory equipment approved for chlorine service. Wear safety goggles at all times when in vicinity of liquid chlorine.

5.2 **Symptoms Following Exposure:** Eye irritation, sneezing, copious salivation, general excitement and restlessness. Irritation may persist for several days. High concentrations cause respiratory distress and violent coughing, often with retching. Death may result from suffocation.

5.3 **Treatment for Exposure:** INHALATION: remove victim from source of exposure, call a doctor, support respiration, administer oxygen. EYES: flush with copious amounts of water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 ppm

5.5 **Short-Term Inhalation Limits:** 3 ppm for 5 min

5.6 **Toxicity by Ingestion:** Not pertinent, ingestion unlikely (chlorine is a gas above −34.5°C)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure.

5.10 **Odor Threshold:** 3.5 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic products are generated when combustibles burn in chlorine.
6.6 **Behavior in Fire:** Most combustibles will burn in chlorine, although gas is not flammable.
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Forms a corrosive solution
7.2 **Reactivity with Common Materials:** Reacts vigorously with most metals at high temperature. Copper may burn spontaneously.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 0.08 ppm/168 hr trout, TLm fresh water; 10 ppm/1 hr tunicates killed salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Diamond Shamrock Corp.
   Electro Chemicals Division
   Deer Park, Texas 77536
2. Dow Chemical Co.
   Midland, Mich. 48640
3. PPG Industries Inc.
   Industrial Chemicals Division
   Barberton, Ohio 44203

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Research purity, ultra high purity, high purity
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief (300 psi)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A C 1 J

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Nonflammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	2
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	1
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0
	OXY

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 70.91
13.3 **Boiling Point at 1 atm.:** −29.4°F = −34.1°C = 239.1°K
13.4 **Freezing Point:** −150°F = −101°C = 172°K
13.5 **Critical Temperature:** 291°F = 144°C = 417°K
13.6 **Critical Pressure:** 1118 psia = 76.05 atm = 7.704 MN/m²
13.7 **Specific Gravity:** 1.424 at 15°C (liquid)
13.8 **Liquid Surface Tension:** 26.55 dynes/cm at −35.3°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.4
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.329
13.12 **Latent Heat of Vaporization:** 124 btu/lb = 68.7 cal/g = 2.87 × 10⁵ J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

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CTF — CHLORINE TRIFLUORIDE

Common Synonyms

Liquefied compressed gas | Greenish yellow liquid or colorless gas | Strong sweetish odor

Sinks and may boil in water. Reacts violently with water to produce poisonous gas. Boiling point is 53° F

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY
Wear chemical protective suit with self-contained breathing apparatus
Stop discharge if possible
Evacuate area in case of large discharge
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
May explode on contact with combustibles.
POISONOUS GASES ARE PRODUCED WHEN HEATED
Containers may explode in fire
Wear chemical protective suit with self-contained breathing apparatus
Combat fires from safe distance or protected location
Extinguish with dry chemicals, carbon dioxide, foam
DO NOT USE WATER OR FOAM ON ADJACENT FIRES
Cool exposed structures with water

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to skin, eyes, nose and throat
Move victim to fresh air
If breathing has stopped, give artificial respiration
If breathing, give oxygen

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
DO NOT RUB AFFECTED AREAS
IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED give victim two GLASSES OF WATER or MILK
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify public health or water pollution control agencies
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison, air contaminant, water contaminant, corrosive, oxidizing material
Restrict access
Evacuate area

2. LABELS

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** CTF
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula:** ClF_3
3.4 **IMCO/United Nations Numerical Designation:** 2/1749

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied compressed gas
4.2 **Color:** Gas colorless. Liquid greenish yellow
4.3 **Odor:** Acrid, strong, pungent, sweetish, sweet and irritating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Neoprene gloves and protective clothing made of glass fiber and Teflon, including full hood, self contained breathing apparatus with full face mask
5.2 **Symptoms Following Exposure:** Inhalation causes extreme irritation. Irrespiratory, fatal pulmonary edema may result. Vapors are very irritating to eyes and skin. Liquid causes severe burns
5.3 **Treatment for Exposure.** Call physician at once after any exposure to this compound. INHALATION: remove victim to fresh air and *keep him quiet*, give artificial respiration if breathing has stopped, give oxygen, enforce rest for 24 hours. EYES: flush with water for at least 15 min., get medical attention but do not interrupt flushing for at least 10 min. SKIN: flush with water, then with 3% aqueous ammonia, then again with water, apply ice cold pack of saturated Epsom salt or 70% ethyl alcohol
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 ppm (ceiling limit)
5.5 **Short-Term Inhalation Limits:** 0.1 ppm for 5 min
5.6 **Toxicity by Ingestion:** Grade 4. LD_{50} < 50 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant, causes second and third degree burns on short contact and is very injurious to the eyes
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable but may cause fire on contact with some materials
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires unless well protected against hydrogen fluoride gas
6.5 **Special Hazards of Combustion Products:** If released from container, fumes are toxic and irritating
6.6 **Behavior in Fire.** If released from container can increase the intensity of fire. Containers may explode
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts explosively with water, evolving hydrogen fluoride (hydrofluoric acid) and chlorine
7.2 **Reactivity with Common Materials.** Causes ignition of all combustible materials and even sand or concrete. Very similar to fluorine gas
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Flood with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1. Matheson Gas Products Co
   East Rutherford, N.J. 07073
2. Air Products and Chemicals, Inc
   Specialty Gases Department
   P.O. Box 538
   Allentown, Pa. 18105
3. Union Carbide Corp
   Linde Division
   270 Park Avenue
   New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A C O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizer
12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 92.5
13.3 **Boiling Point at 1 atm.** 53°F = 11.6°C = 284.8°K
13.4 **Freezing Point:** −105°F = −76.1°C = 197.1°K
13.5 **Critical Temperature.** 307°F = 153°C = 426°K
13.6 **Critical Pressure:** 837 psia = 56.9 atm = 5.77 MN/m
13.7 **Specific Gravity:** 1.88 at 11°C (liquid)
13.8 **Liquid Surface Tension:** 26.6 dynes/cm = 0.0266 N/m at 0°C
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 3.2
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.2832
13.12 **Latent Heat of Vaporization:** 128 Btu/lb = 71.2 cal/g = 2.98 × 10⁵ J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CRA

CHLOROACETOPHENONE

Common Synonyms

Phenacyl chloride
omega-Chloroacetophenone
alpha-Chloroacetophenone
Phenyl chloromethyl ketone
Chloromethyl phenyl ketone
Tear gas

Solid — White to light yellow — Sharp odor

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes, nose and throat

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - air contaminant
Restrict access
Disperse and flush

2. LABEL

IRRITANT

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Phenacyl chloride, omega Chloroacetophenone, alpha Chloroacetophenone, Phenyl chloromethyl ketone, Tear gas, Chloromethyl phenyl ketone

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_6H_5COCH_2Cl$

3 4 **IMCO/United Nations Numerical Designation:** 6 1/1697

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White to pale yellow

4 3 **Odor:** Pungent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Full face organic canister mask, self-contained breathing apparatus, rubber gloves, protective clothing

5 2 **Symptoms Following Exposure:** Inhalation causes tearing, burning of the eyes and difficulty in breathing, high concentrations may lead to development of acute pulmonary edema after latencies of 8 hrs. to several days, possible systemic manifestations include agitation, coma, contraction of pupils of eyes, loss of reflexes. External contact causes irritation of skin and intense irritation of eyes. Ingestion causes agitation, coma, contraction of pupils of eye, loss of reflexes.

5 3 **Treatment for Exposure:** INHALATION: remove victim from contaminated atmosphere at once, give artificial respiration and oxygen if necessary, watch for pulmonary edema for several days. EYES: flush with water, do not rub. SKIN: flush with water. INGESTION: get medical attention, watch for development of pulmonary edema for several days.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 52 mg/kg (rat)

5 7 **Late Toxicity:** Fatty infiltration of liver

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** 0.016 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** Combustible solid, 244°F C.C. (solutions only)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride may form

6 6 **Behavior in Fire:** Unburned material may become volatile and cause severe eye irritation

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts slowly generating hydrogen chloride. The reaction is not hazardous

7 2 **Reactivity with Common Materials:** Reacts slowly with metals, causing mild corrosion

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Federal Laboratories, Inc.
Saltsburg, Pa. 15681

2 Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

3 MC/B Manufacturing Chemists
2909 Highland Avenue
Norwood, Ohio 45212

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Sometimes shipped as a solution in an organic solvent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

H RR

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Irritant

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 154.6

13 3 **Boiling Point at 1 atm:** 477°F = 247°C = 520°K

13 4 **Freezing Point:** 68.138°F = 20.59°C = 293.332°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.32 at 15°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est.) −9,340 Btu/lb = −5,190 cal/g = −21.7 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CAC — CHLOROACETYL CHLORIDE

Common Synonyms

Liquid | Colorless to light yellow | Sharp extremely irritating odor

Reacts violently with water. Irritating vapor is produced

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
DO NOT USE WATER ON ADJACENT FIRES

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: air contaminant, corrosive
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chloracetyl chloride
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** ClCH$_2$COCl
3.4 **IMCO/United Nations Numerical Designation:** 8 1752

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to slightly yellow
4.3 **Odor:** Sharp, pungent, extremely irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid type canister mask, self-contained breathing apparatus (full facek, rubber gloves and full protective clothing
5.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory system. External contact causes severe irritation of eyes and skin. Ingestion causes severe irritation of mouth and stomach
5.3 **Treatment for Exposure:** INHALATION: remove from exposure, support respiration, call physician. EYES: wash with copious amounts of water for 15 min, call physician. SKIN: wash with large amounts of water, treat burns as required. INGESTION: do NOT induce vomiting, give large amounts of water, call a physician
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2, LD$_{50}$ 0.5 to 5 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating, such that personnel will not usually tolerate moderate or high vapor concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires
6.5 **Special Hazards of Combustion Products:** Heat of fire can cause decomposition with evolution of highly toxic and irritating hydrogen chloride and phosgene vapors
6.6 **Behavior in Fire:** Highly irritating tear gas vapors released when heated. Hydrogen chloride gas is released if in contact with water
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to generate hydrogen chloride (hydrochloric acid)
7.2 **Reactivity with Common Materials:** Will react with surface moisture to generate hydrogen chloride, which is corrosive to metals
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co
   Midland, Mich 48640
2. White Chemical Corp
   P O Box 278
   Bayonne, N J 07002
3. Eastman Kodak Co
   Eastman Organic Chemicals
   Rochester, N Y 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid
*12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	3
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 112.9
13.3 **Boiling Point at 1 atm:** 221°F = 105°C = 378°K
13.4 **Freezing Point:** −8.5°F = −22.5°C = 250.7°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** 1.423 at 20°C (liquid)
13.7 **Specific Gravity:** 1.42 at 20°C (liquid)
13.8 **Liquid Surface Tension:** (est) 25 dynes/cm = 0.025 N/m at 20°C
13.9 ~~**Liquid-Water Interfacial Tension:**~~ Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 3.9
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1191
*13.12 **Latent Heat of Vaporization:** 166 Btu/lb = 92.0 cal/g = 3.85 × 10^5 J/kg
13.13 **Heat of Combustion:** (est) −4,000 Btu/lb = −2,000 cal/g = −90 × 10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** (est) −54 Btu/lb = −30 cal/g = −1.3 × 10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CAP	p-CHLOROANILINE

Common Synonyms

1 Amino-4-chlorobenzene
4-Chlorophenylamine
4-Chloroaniline

Solid — Yellowish white — Mild sweet odor

Sinks and mixes slowly with water

WORKERS CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY

[illegible]

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

[illegible]

Exposure

SOLID AND DUST
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — poison
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 Amino-4-chlorobenzene
4 Chlorophenylamine
4 Chloroaniline

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $4\text{-}ClC_6H_4NH_2$

3 4 **IMCO/United Nations Numerical Designation:** 6 1 1526

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Yellowish white cream to tan color (darkens on storage)

4 3 **Odor:** Slightly sweetish characteristic amine

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves chemical goggles protective clothing dust respirator

5 2 **Symptoms Following Exposure:** Inhalation or ingestion causes bluish tint to fingernails lips and ears indicative of cyanosis headache drowsiness and nausea followed by unconsciousness Liquid can be absorbed through skin and cause similar symptoms Contact with eyes causes irritation

5 3 **Treatment for Exposure:** INHALATION remove victim from exposure immediately, if needed administer oxygen refer to physician EYES flush with water for at least 15 min SKIN remove victim from exposure immediately remove contaminated clothing wash contacted area with copious amounts of water and soap if needed administer oxygen refer to physician INGESTION induce vomiting get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 300 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** (Combustible solid) > 220°F (C.C.)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water dry chemical foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and oxides of nitrogen may form in fires

6 6 **Behavior in Fire** Data not available

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** Data not available

9. SELECTED MANUFACTURERS

1 Monsanto Company
Monsanto Industrial Chemicals
800 North Lindbergh Boulevard
St Louis Mo 63166

2 E I duPont de Nemours & Co
Organic Chemicals Department
Dyes and Chemicals Division
Wilmington Del 19898

3 Aldrich Chemical Co
940 West St Paul Avenue
Milwaukee Wis 53233

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99 0% Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester) Store containers in a well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 127 6

13 3 **Boiling Point at 1 atm:** 446°F = 230°C = 503°K

13 4 **Freezing Point:** 158 F = 70°C = 343 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 43 at 19°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** (est) = −11 000 Btu/lb = −6 000 cal/g = −250 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CRB	# CHLOROBENZENE

Common Synonyms
Monochlorobenzene
Phenyl chloride
Benzene chloride

Watery liquid. Colorless. Sweet, almond odor

Sinks. Flammable vapor is produced

Avoid contact with liquid and vapor. Keep people away.
Stop discharge if possible.
Take precautions.
Neutralize and dilute water spray [illegible] vapor.
Isolate and remove discharged material.
Notify authorities if large quantities [illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

VAPOR
If inhaled, will cause coughing or dizziness.
Not irritating to eyes, nose and throat.

Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Should be removed.
Chemical and physical treatment.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Benzene chloride
MCB
Monochlorobenzene
Phenyl chloride

3.2 **Coast Guard Compatibility Classification:**
Halogenated hydrocarbon

3.3 **Chemical Formula:** C_6H_5Cl

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild amine odor, sweet, almond like aromatic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor and gas respirator where appropriate; no protection against chemical safety goggles or face shield; appropriate rubber gloves, apron or impervious clothing for splash protection; hard hat.

5.2 **Symptoms Following Exposure:** Irritating to skin, eyes and mucous membranes. Repeated exposure may cause dermatitis due to defatting action. Chronic inhalation of vapors may cause [illegible] damage, liver and kidneys. Acute vapor exposure can cause symptoms including coughing, [illegible], anesthesia and central nervous system depression.

5.3 **Treatment for Exposure:** Get medical attention [illegible] exposure and advise [illegible] exposure. Treat symptoms. INHALATION: remove victim to fresh air; add oxygen if needed. INGESTION: dilute by drinking water; if vomiting occurs, administer more water. Administer saline cathartic. EYES: flush thoroughly with water. SKIN: remove contaminated clothing; wash exposed area with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD50 [illegible] g/kg (rat, rabbit)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to eyes and throat.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.21 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 84°F (C.C.), 97°F (O.C.)

6.2 **Flammable Limits in Air:**
[illegible]

6.3 **Fire Extinguishing Agents:**
Carbon dioxide, dry chemical, foam or water spray.

6.4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent.

6.5 **Special Hazards of Combustion Products:**
Burning in open flame can form toxic phosgene and hydrogen chloride gases.

6.6 **Behavior in Fire:** Vapors can travel a considerable distance to a source of ignition and flash back.

6.7 **Ignition Temperature:** 1084°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** (est.) 4.6 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
20 ppm 96 hr. bluegill TLm, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):**
0.48 lb/lb/5 days

8.4 **Food Chain Concentration Potential:**
Data not available

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640

2. Monsanto Co.
Monsanto Industrial Chemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

3. Montrose Chemical Corp.
800 South Virgil Ave.
Los Angeles, Calif. 90005

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.9% technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

N E N

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 112.56

13.3 **Boiling Point at 1 atm:**
270°F = 132°C = 405°K

13.4 **Freezing Point:**
−0.4°F = −18.6°C = 227.6°K

13.5 **Critical Temperature:**
679°F = 359°C = 632°K

13.6 **Critical Pressure:**
650 psia = 44 bar = 4.52 MN/m²

13.7 **Specific Gravity:** 1.11 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
33 dynes/cm = 0.033 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension:**
37 dynes/cm = 0.037 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Unknown

13.12 **Latent Heat of Vaporization**
155 Btu/lb = 86 cal/g = 1.140 × 10⁶ J/kg

13.13 **Heat of Combustion,** (est.) 12,000 Btu/lb = 6,700 cal/g = 280 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

CBN	4-CHLOROBUTYRONITRILE

Common Synonyms		
4-Chlorobutyronitrile	Liquid Sinks in water	White to light yellow

[illegible]

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated [illegible]
Exposure	CAUTIONARY ALERT VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 4-Chlorobutyronitrile (Practical, mixture with 4-bromobutyronitrile)

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $CH_2ClCH_2CH_2CN$ + $CH_2BrCH_2CH_2CN$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** White to pale yellow

4.3 **Odor:** Data not available

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supply mask or self-contained breathing apparatus for repeated handling large amounts, rubber gloves, safety goggles

5.2 **Symptoms Following Exposure:** Chemical is moderately toxic. Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. Can penetrate the skin on prolonged contact, only slightly irritating

5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air, administer artificial respiration if required, call a doctor. INGESTION: give large amount of water, induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with plenty of water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3, LD50 400 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Data not available

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen cyanide, hydrogen bromide, and hydrogen chloride may form in fires

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Eastman Kodak Co
343 State St
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 50% - 40% 4-bromobutyronitrile + 8% glutaronitrile. Major components have some hazard ratings

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A X Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 103.55

13.3 **Boiling Point at 1 atm:** 374°F = 190°C = 463°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.22 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** 3.57

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.080 at 20°C

13.12 **Latent Heat of Vaporization:** (est.) 185 Btu/lb = 103 cal/g = 4.31×10^5 J/kg

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CRF	CHLOROFORM

Common Synonyms: Trichloromethane	Watery liquid · Colorless · Sweet odor Sinks in water. Irritating vapor is produced
	[illegible]
Fire	Not flammable POISONOUS AND IRRITATING GASES ARE PRODUCED WHEN HEATED [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat If inhaled, will cause headache, nausea, dizziness or loss of consciousness. [illegible] LIQUID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Isolate area. Ventilate area. Eliminate all ignition sources.
Restrict access.
Stop leak if possible without risk.
Stay upwind.
Keep out of low areas.
Ventilate closed spaces before entering.
Water spray may be useful in minimizing or diverting vapors.
Do not get water inside containers.
Do not flush to sewer or waterway.
Dike for later disposal.
Water spray may be useful in diluting spills to non-flammable mixtures.
Do not get water inside containers.
Do not flush to sewer or waterway.
Dike for later disposal.
Water spray may be useful in diluting spills to non-flammable mixtures.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichloromethane
3.2 **Coast Guard Compatibility Classification:** Halogenated compound
3.3 **Chemical Formula:** $CHCl_3$
3.4 **IMCO United Nations Numerical Designation:** 9.0 [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pleasant, sweet, ether like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles. Shoes. [illegible] Above 25 ppm suitable self-contained breathing apparatus.
5.2 **Symptoms Following Exposure:** Headache, nausea, dizziness, drowsiness, narcosis.
5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air. [illegible] Administer oxygen. Give medical attention. Do not administer epinephrine. INGESTION: Induce vomiting and get medical attention. Do not give anything by mouth to unconscious person. EYES: [illegible] SKIN: [illegible] Remove contaminated clothing and rinse them.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm for 10-hour work day
5.5 **Short-Term Inhalation Limits:** 50 ppm for 10 min
5.6 **Toxicity by Ingestion:** Grade 2. LD [illegible]
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate [illegible] at high concentrations unpleasant. Irritant to eyes.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum. Prolonged or repeated contact causes mild irritation and reddening of the skin.
5.10 **Odor Threshold:** [illegible]

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Poisonous and irritating gases are produced when heated
6.6 **Behavior in Fire:** Decomposes [illegible]
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data unavailable
8.2 **Waterfowl Toxicity:** [illegible]
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

[illegible] Chemical Corp.
[illegible] Chemical Division
[illegible]
[illegible] Chemical Co.
Midland, Mich. [illegible]
[illegible] Chemical Co.
Industrial Chemical Division
[illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, USP
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Not required
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3.

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-A
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicants	1
Acute Toxicants	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible] °C = [illegible] K
13.4 **Freezing Point:** [illegible] °C = [illegible] K
13.5 **Critical Temperature:** [illegible] °C = [illegible] K
13.6 **Critical Pressure:** [illegible] atm = [illegible] MN/m²
13.7 **Specific Gravity:** [illegible] (Water = 1)
13.8 **Liquid Surface Tension:** [illegible] dyne/cm = [illegible] N/m
13.9 **Liquid-Water Interfacial Tension:** [illegible] dyne/cm = [illegible] N/m
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

REVISED 1978

CHD	CHLOROHYDRINS (CRUDE)

Common Synonyms
Crude epichlorohydrin

Watery liquid — Colorless to yellow — Garlic odor

Sinks and mixes with water. Poisonous vapor is produced.

Fire

Combustible
Containers may explode in fire
Poisonous gases are produced in fire

Exposure

VAPOR
Poisonous if inhaled
Irritating to eyes, nose and throat

LIQUID
Poisonous if swallowed
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, Section 1.444.4

Isolate and ventilate area
Remove sources
Dike and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Crude epichlorohydrin

3.2 **Coast Guard Compatibility Classification:** Special class

3.3 **Chemical Formula:** OCH_2CHCH_2Cl

3.4 **IMCO United Nations Numerical Designation:** n.a. 2023

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Yellow to colorless

4.3 **Odor:** Pungent, like chloroform or garlic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor mask, or air mask or supplied air respirator, protective gloves

5.2 **Symptoms Following Exposure:** May cause contact dermatitis. Vapor irritates eyes, nose and throat. Headache, nausea, vomiting, coughing, unconsciousness, and irritation

5.3 **Treatment for Exposure:** INHALATION: Remove to fresh air and keep warm and quiet. Get medical attention. If breathing stops, start artificial respiration. INGESTION: Induce vomiting and get physician. DO NOT induce vomiting if victim is unconscious or convulsing. EYES AND SKIN: Flush with water for 15 min. and get medical attention. Remove contaminated clothing and wash before reuse.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** ppm

5.5 **Short-Term Inhalation Limits:** ppm

5.6 **Toxicity by Ingestion:** Grade 3 — moderately toxic

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes moderate irritation to eyes, nose and throat at high concentration; unpleasant. Threshold ppm

5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. Prolonged or repeated contact may cause inflammation and reddening of the skin

5.10 **Odor Threshold:** 0.5 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 92°F (33°C) (OCC)

6.2 **Flammable Limits in Air:** Not [illegible]

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide, water spray

6.4 **Fire Extinguishing Agents Not to be Used:** Not above; dry chemical, carbon dioxide, water spray, foam, and halogenated agents

6.5 **Special Hazards of Combustion Products:** Data not available; toxic gases are produced when heated

6.6 **Behavior in Fire:** Containers may explode in absence of pressure relief

6.7 **Ignition Temperature:** 448°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Mild reaction, but not a hazard

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Can polymerize in presence of strong acid and bases particularly chlorine

7.6 **Inhibitor of Polymerization:** None

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Mich. 48640

Shell Chemical Co.
Industrial Chemicals Dept.
Houston, Texas 77001

Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Water saturated, 99% pure, 98% pure, technical grade, 95% pure, chlorohydrin, 90% pure, 85% pure, 80% pure, 75% pure, 70% pure, 65% pure, 60% pure, 55% pure, 50% pure, 45% pure, 40% pure, 35% pure, 30% pure, 25% pure, 20% pure, 15% pure, 10% pure, 5% pure

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, Section 4.3

A T L X Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poison Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid Irritant	1
Poisons	4
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	
Self Reactivity	2

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.2 at 20°C/4°C

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** (est.) 142 Btu/lb = 78.8 cal/g = 3.30 × 10³ J/kg

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Data not available

NOTES

REVISED 1978

CME	CHLOROMETHYL METHYL ETHER

Common Synonyms			
Monochloromethyl ether Methyl chloromethyl ether α-chloroether	Liquid	Colorless	Irritating odor
	May float or sink in water. Poisonous, flammable vapor is produced.		

	[illegible]
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. [illegible] LIQUID Will burn skin and eyes. Harmful if swallowed. [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison, high flammability, air contaminant, corrosive.
Restrict access.
Evacuate area.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Monochloromethyl ether, Methyl chloromethyl ether, α-chloroether

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CH_3OCH_2Cl

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Irritating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, goggles, rubber gloves, protective clothing

5.2 **Symptoms Following Exposure:** Inhalation causes sore throat, fever, chills, difficulty in breathing. Contact of liquid with eyes causes severe burns and possible vapor in a powerful tear gas. Skin contact causes severe burns and necrosis. Ingestion causes severe burns of mouth and stomach.

5.3 **Treatment for Exposure:** INHALATION: remove from exposure, support respiration, call physician. EYES: wash with copious quantities of water for at least 15 min., call physician. SKIN: wash with large amounts of water. INGESTION: do NOT induce vomiting, give large amounts of water, call a physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = [illegible] mg/kg (rats)

5.7 **Late Toxicity:** Considered to be a cancer producing

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant. May cause pain and second degree burns after a few minutes contact.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible] °C

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and phosgene gases may be formed.

6.6 **Behavior in Fire:** Unburned material may form powerful tear gas. When wet, also forms irritating formaldehyde gas.

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts to produce formaldehyde and hydrogen chloride. The reaction is not violent.

7.2 **Reactivity with Common Materials:** Will react with surface moisture to produce hydrogen chloride, which is corrosive to metal.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water. Rinse with sodium bicarbonate or lime solution.

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co., Midland, Mich. 48640
2. Aldrich Chemical Co., 940 West St. Paul Ave., Milwaukee, Wis. 53233
3. Eastman Kodak Co., Eastman Organic Chemicals, Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vent

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

NOTEWAY

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	1
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 80.5

13.3 **Boiling Point at 1 atm:** 140°F = 60°C = 333°K

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.07 at 25°C (liquid)

13.8 **Liquid Surface Tension:** [illegible] dynes/cm = 0.0030 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 2.8

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1195

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 2

NOTES

CPN	p-CHLOROPHENOL

Common Synonyms			
4-Chlorophenol	Solid	White to straw	Medicinal odor
	Sinks in water		

Avoid contact with solid and dust. Keep people away
Wear rubber overclothing (including gloves)
Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Irritating gases may be produced when heated
Wear goggles and self-contained breathing apparatus
Extinguish with water, dry chemicals, foam, or carbon dioxide

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause headache or dizziness
If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
Will burn skin and eyes
If swallowed will cause nausea and vomiting
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS
or vomiting, keep keep victim warm
DO NOT INDUCE VOMITING

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning: water contaminant
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 4 Chlorophenol
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula:** $1\,4\,ClC_6H_4OH$
3 4 **IMCO/United Nations Numerical Designation.** 6 1/2020

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Colorless to straw
4 3 **Odor:** Strong medicinal

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, face shield, boots and apron, respiratory protection
5 2 **Symptoms Following Exposure.** Inhalation causes headache, dizziness, weak pulse. Ingestion causes irritation of mouth and stomach, headache, dizziness, weak pulse. Contact with eyes causes severe irritation and burning. Contact with skin causes irritation and burn if absorbed causes same symptoms as inhalation
5 3 **Treatment for Exposure:** INHALATION: move to fresh air, get medical attention if any symptoms develop. INGESTION: do not induce vomiting unless advised by a physician, give large amounts of milk, egg whites, or water and get medical help immediately, no specific antidote known. EYES: immediately flush with plenty of water for at least 30 min. SKIN: flush in safety shower while removing all contaminated clothing, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 500 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** 30 ppm

6. FIRE HAZARDS

6 1 **Flash Point:** 250°F CC
6 2 **Flammable Limits in Air:** Not pertinent (combustible solid)
6 3 **Fire Extinguishing Agents.** Water, foam, dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:**
6 5 **Special Hazards of Combustion Products.** Toxic and irritating hydrogen chloride and chlorine gases may form in fires
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
0 7 ppm/96 hr/crab/lethal range/sea water
0 4 ppm/96 hr/crab/safe range/sea water
14 ppm/24 hr/minnow/TL_m/fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 The Dow Chemical Co
2030 Dow Center
Midland, Mich 48640

2 Proxol Inc
509 Madison Avenue
New York, N Y 10022

3 Monsanto Company
800 North Lindbergh Blvd
St Louis Mo 63166

10. SHIPPING INFORMATION

10 1 **Grades of Purity:** Pure, 99%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

HSS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 128 6
13 3 **Boiling Point at 1 atm.** 428°F = 220°C = 493°K
13 4 **Freezing Point:** 109°F = 43°C = 316°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 31 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** (est) 160 Btu/lb = 89 cal/g = 3 7 X 10^5 J/kg
13 13 **Heat of Combustion.** −9,330 Btu/lb = 5,180 cal/g = 217 X 10^5 J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

CPL	# CHLOROPICRIN, LIQUID

Common Synonyms

Trichloronitromethane
Nitrochloroform
Picfume
Nitro trichloromethane

Oily liquid — Colorless — Extremely irritating odor

Sinks in water. Poisonous vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control officials.

Fire

Not flammable
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire
Wear chemical protective suit with self-contained breathing apparatus.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn skin and eyes
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison, water contaminant, air contaminant
Restrict access: isolate area
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichloronitromethane, Nitrochloroform, Picfume, Nitrotrichloromethane

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CCl_3NO_2

3.4 **IMCO/United Nations Numerical Designation:** 6.1/1580

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Intensely irritating lachrymator; intense and penetrating odor which causes a pronounced secretion of tears

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic type canister mask, goggles or face shield, rubber gloves, protective cloth. g

5.2 **Symptoms Following Exposure.** Inhalation causes nausea, eye watering, vomiting, bronchitis and pulmonary edema. Vapor is a powerful tear gas. Liquid irritates and burns skin and causes severe burns of eyes. Ingestion causes severe irritation of mouth and stomach.

5.3 **Treatment for Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove from exposure, support respiration. EYES: flush with copious quantities of water for at least 15 min. SKIN: wash with water for 15 min. INGESTION: do NOT induce vomiting, give large amounts of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 ppm

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 250 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.

5.10 **Odor Threshold.** 1.1 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Cool exposed containers with water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Compound forms a powerful tear gas when heated. Heated material may detonate under fire conditions

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. Great Lakes Chemical Corporation
   P. O. Box 2200
   West Lafayette, Ind. 47996
2. Dow Chemical Co.
   Midland, Mich. 48640
3. Sobin Chemicals, Inc.
   Sobin Park
   Boston, Mass. 02210

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

X X

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Poisonous, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	4
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	3

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 164.4

13.3 **Boiling Point at 1 atm.** 234°F = 112°C = 385°K

13.4 **Freezing Point:** −83°F = −64°C = 209°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.64 at 25°C (liquid)

13.8 **Liquid Surface Tension.** 32.3 dynes/cm = 0.0323 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 5.7

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.0991

13.12 **Latent Heat of Vaporization:** 10^3 Btu/lb = 57.3 cal/g = 2.4×10^5 J/kg

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CSA — CHLOROSULFONIC ACID

Common Synonyms
Chlorosulfonic acid

Liquid — Colorless to light yellow — Sharp, choking odor

Reacts violently with water
Appears to explode
Poisonous gas is produced

AVOID CONTACT WITH LIQUID AND VAPOR [illegible]

Fire

May cause fire on contact with combustibles
Flammable, explosive gases may be formed on contact with metals and moisture

DO NOT USE WATER
Use dry chemicals or carbon dioxide
Wear goggles, self-contained [illegible] rubber boots, rubber gloves, chemical gloves

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose, and throat
Harmful if inhaled
Move to fresh air
If [illegible] has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have him drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — air contaminant
corrosive
Restrict access
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chlorsulfonic acid
3.2 **Coast Guard Compatibility Classification.** Inorganic acids
3.3 **Chemical Formula.** $ClSO_3H$
3.4 **IMCO/United Nations Numerical Designation** NO 1754

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color.** Colorless to pale yellow
4.3 **Odor:** Sharp acrid penetrating pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Acid proof goggles or rubber hood, long rubber gloves, rubber shoes, long rubber apron, shirt and trousers of wool or acrylic fiber, and a hat with a brim. For emergency use involving considerable exposure, a complete rubber suit with hood, gloves and boots of rubber should be used. In case of fire use self contained breathing apparatus
5.2 **Symptoms Following Exposure.** INHALATION Vapor extremely irritating to lungs and mucous membranes. Vapor has such a sharp and penetrating odor that inhalation of severely toxic quantities is unlikely unless it is impossible to escape the fumes. CONTACT WITH EYES OR SKIN liquid acid will severely burn body tissue
5.3 **Treatment for Exposure:** Call a physician in all cases. INHALATION remove victim to fresh air if he is not breathing, apply artificial respiration, give oxygen if breathing is difficult, do NOT induce vomiting. SKIN flush with plenty of water for at least 15 min while removing contaminated clothing and shoes
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 5 ppm
5.5 **Short-Term Inhalation Limits:** 5 ppm for 5 min, 30 ppm for 10 min, 10 ppm for 60 min
5.6 **Toxicity by Ingestion** Data not available
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics.** Severe eye and throat irritant. Can cause eye or lung injury and cannot be tolerated even at low concentrations
5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third degree burns on short contact. Very injurious to the eyes
5.10 **Odor Threshold:** 1.5 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Water
6.5 **Special Hazards of Combustion Products:** Decomposes into irritating and toxic gases
6.6 **Behavior in Fire** Although nonflammable it may ignite other combustibles. Contact with water AND metal produces explosive hydrogen gas
6.7 **Ignition Temperature** Not flammable
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently with water forming hydrochloric acid (vapor) and sulfuric acid
7.2 **Reactivity with Common Materials:** Hydrogen, a highly flammable and explosive gas, is generated by the action of the acid on most metals. May cause ignition by contact with combustible materials
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Although the acid reacts violently with water (flooding from a distance) must be carried out before neutralizing with lime, water or sodium bicarbonate solution
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
282 ppm/96 hr mosquito fish TLm fresh water
100-300 ppm/48 hr shrimp LC50 salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Cities Service Co., Inc.
Industrial Chemicals Division
60 Wall St
New York, N.Y. 10005
2. E. I. du Pont de Nemours & Co., Inc.
Industrial & Biochemicals Dept
Wilmington, Del. 19898
3. Monsanto Co.
Monsanto Industrial Chemicals Co
800 North Lindbergh Blvd
St. Louis, Mo. 63166

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere.** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

VO

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Corrosive material
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	2
Special	W OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** 116.53
13.3 **Boiling Point at 1 atm**
311°F = 155°C = 428°K
13.4 **Freezing Point:**
−112°F = −80°C = 193°K
13.5 **Critical Temperature.** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.78 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization:** (est.)
198 Btu/lb = 110 cal/g = 4.6 × 10⁵ J/kg
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on page 4 and 5

NOTES

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4-CHLORO-o-TOLUIDINE

Common Synonyms			
2 Amino-5-chlorotoluene 5-Chloro-2-aminotoluene 4-Chloro 2-methylaniline Fast Red TR base Red TR base	Solid	Gray to white	Weak fishy odor
	Sinks in water. Freezing point is 79° F.		

AVOID CONTACT WITH SOLID AND DUST. KEEP HUGE AWAY
Wear goggles, self-contained breathing apparatus and rubber protective clothing during fire hazard
Call fire department
Stop exposure. Use water spray to knock down fumes
Isolate and remove damaged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Extinguish with water, dry chemical, foam, carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Move victim to fresh air
If in eyes, hold eyelids open and flush with plenty of water
If breathing is difficult, give oxygen

SOLID
POISONOUS IF SWALLOWED
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
If IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water, milk and have vomiting induced
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify authorities if solution enters water intakes
Notify operators of affected water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2-Amino-5-chlorotoluene
5-Chloro-2-aminotoluene
4 Chloro-2 methylaniline
Fast Red TR base
Red TR base

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** 2 CH_3-4-$ClC_6H_3NH_2$

3 4 **IMCO/United Nations Numerical Designation:** 6 1/1579

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Grayish white

4 3 **Odor:** Weak fishy

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator, goggles, rubber gloves, protective clothing

5 2 **Symptoms Following Exposure:** Inhalation, ingestion or skin contact causes bluish tint in fingernails, lips and ears. Headache, drowsiness and nausea also occur. Contact with eyes causes irritation

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give oxygen if needed, get medical attention. EYES: flush with water for at least 15 min. SKIN: wash immediately with soap and water. INGESTION: induce vomiting, get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 464 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Combustible solid

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and hydrochloric acid fumes may form

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Pfister Chemical Inc
Linden Avenue
Ridgefield, N J 07657

2 E I duPont de Nemours & Co
Dyes and Chemicals Division
Wilmington, Del 19898

3 Blackman Uhler Chemical Co
P O Box 5627
Spartanburg, S C 29301

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classification:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 141 6

13 3 **Boiling Point at 1 atm:** 466°F = 241°C = 514°K

13 4 **Freezing Point:** 77°F = 25°C = 298°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (est) > 1 1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CMA	CHROMIC ANHYDRIDE

Common Synonyms			
Chromic oxide Chromium trioxide Chromic acid	Solid flakes or powder Sinks and mixes with water	Dark red	Odorless

Avoid contact with solid and dust. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing including gloves.
Stay upwind and use water spray to knock down dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
May cause fire on contact with combustibles
Containers may explode when heated in a fire
Extinguish with water.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID
SOLID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Chromic acid
Chromic oxide
Chromium trioxide

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CrO_3

3.4 **IMCO United Nations Numerical Designation:** 5.1/1463

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Dark red
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles and respirator. (Special chromic acid filters are available for respirators to prevent inhalation of dust or mist.)

5.2 **Symptoms Following Exposure:** Very irritating to eyes and respiratory tract. Ingest on causes severe gastrointestinal symptoms. Contact with eyes or skin causes burns; prolonged contact produces dermatitis (chrome sores).

5.3 **Treatment for Exposure:** INGESTION: call a physician, do NOT induce vomiting. SKIN OR EYES: wash eyes thoroughly for at least 15 min; flush contact skin areas with water; remove contaminated clothing and wash before reuse.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion.** Grade 3. LD_{50} to 500 mg/kg

5.7 **Late Toxicity:** Lung cancer

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third degree burns on short contact. Very injurious to the eyes.

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Water
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire** Containers may explode
6.7 **Ignition Temperature:** May ignite organic materials on contact
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** May react with organic materials rapidly enough to generate sufficient heat to cause ignition. Prolonged contact particularly on wood floors, may produce a fire hazard.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate solution.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.01 ppm/48 hr daphnia TLm
52 ppm/96 hr goldfish died
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp
Industrial Chemicals Division
Morristown, N. J. 07960
2. Diamond Shamrock Corp
Soda Products Division
Castle Hayne, N. C. 28429
3. Essex Chemical Corp
Chemicals Division
Kearny, N. J. 07032

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, technical flake 99.75%
10.2 **Storage Temperature** Data not available
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting.** Data not available

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 100.01
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.70 at 20°C (solid)
13.8 **Liquid Surface Tension** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

CMC	# CHROMYL CHLORIDE

Common Synonyms			
Chromium (VI) dioxychloride Chromium oxychloride	Liquid	Dark red	Unpleasant odor
	Reacts violently with water Irritating visible vapor cloud is produced		

[illegible]

Fire

Not flammable
May cause fire on contact with combustibles
Irritating gases are produced when heated
Containers may explode in fire
[illegible]
DO NOT USE WATER OR FOAM ON [illegible]
[illegible]

Exposure

ALL FORMS DO [illegible]

VAPOR
Irritating to eyes nose and throat
If inhaled will cause difficult breathing
[illegible]

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes
[illegible]
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison, corrosive air contaminant, water contaminant, oxidizing substance
Restrict access
Evacuate area
Disperse and flush with care

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Chromium (VI) dioxychloride
Chromium oxychloride

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** CrO_2Cl_2

3 4 **IMCO/United Nations Numerical Designation:** 8/1758

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Dark red

4 3 **Odor:** Acrid

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus (full face) rubber gloves protective clothing

5 2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory system Contact with eyes or skin causes irritation and burning Ingestion causes burning of mouth and stomach

5 3 **Treatment for Exposure:** Get medical attention following all exposures to this compound INHALATION remove from exposure support respiration EYES flush with copious quantities of water for 15 min SKIN flush with water for 15 min INGESTION do NOT induce vomiting give large amounts of water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4, LD_{50} < 50 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury They cannot be tolerated even at low concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to the eyes

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable but may cause fire on contact with combustible materials

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires unless fully protected against toxic fumes

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Vapors are very irritating to eyes and mucous membranes May increase severity of fire

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently to form hydrogen chloride (hydrochloric acid) and chlorine gases and chromic acid

7 2 **Reactivity with Common Materials:** Will cause severe corrosion of common metals

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flood with water Rinse with sodium bicarbonate or lime solution

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Gallard-Schlesinger Chemical Manufacturing Corp
584 Mineola Avenue
Carle Place Long Island N Y 11514

2 Ventron Corp . Alfa Products
P O Box 159
Beverly, Mass 01915

3 Research Organic/Inorganic Chemical Corp
11666 Sheldon Rd
Sun Valley Calif 91352

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99 5+%

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-O

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	4
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 154 9

13 3 **Boiling Point at 1 atm:** 241°F = 116°C = 389°K

13 4 **Freezing Point** −141 7°F = −96 5°C = 176 7°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 96 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 36 61 dynes/cm = 0 03661 N/m at 19°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 5 3

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 2832

13 12 **Latent Heat of Vaporization:** 113 Btu/lb = 62 6 cal/g = 2 62 × 10 J/kg

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** −279 Btu/lb = −155 cal/g = −6 48 × 10 J/kg

13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

CIT	# CITRIC ACID

Common Synonyms			
beta Hydroxy-tricarboxylic acid 2 Hydroxy 1 2 3-propane-tricarboxylic acid beta Hydroxytricarballylic acid	Solid	White	Odorless
	Sinks and mixes with water		

[illegible]

Fire

Combustible

[illegible]

Exposure

ALL FORMS MEDICAL AID

DUST
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible] IN CONVULSIONS
[illegible]

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2-Hydroxy-1 2,3 propane-tricarboxylic acid beta Hydroxytricarballylic acid beta Hydroxy-tricarboxylic acid

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $HOC(CH_2CO_2H)_2CO_2H$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield protective gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat Contact with eyes causes irritation

5 3 **Treatment for Exposure:** INHALATION move to fresh air EYES flush immediately with physiological saline or water get medical care if irritation persists SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 oral LD_{50} = [illegible] g/kg (rat)

5 7 **Late Toxicity:** Chronic effects in humans are unknown

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limit, in Air:** 0 28-2.29 kg/m³ (dust)

6 3 **Fire Extinguishing Agents.** Water foam dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:** Melts and decomposes The reaction is not hazardous

6 7 **Ignition Temperature:** 1,850°F (powder)

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** Will corrode copper zinc aluminum and their alloys

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 594 ppm/48 hr/goldfish/killed/fresh water 160 ppm/48 hr/shore crab/[illegible] salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 40% 5 days 60% 10 20 days

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Pfizer Chemicals Division
235 E 42nd St
New York N Y 10017

2 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown, N J 07960

3 Mallinckrodt Chemical Works
223 Westside Avenue
P O Box 384
Jersey City N J 07303

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** USP Reagent Monohydrate grade

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 192 1

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 307°F = 153°C = 426°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 54 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** 4 006 Btu lb = 2,226 cal g = 9 3 0 J kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(continued on next page)

NOTES

CBA	COBALT ACETATE

Common Synonyms			
Cobalt acetate tetrahydrate Cobaltous acetate Cobalt[II] acetate	Solid	Pink	Vinegar like odor
	Sinks and mixes with water		

Stop discharge if possible. Keep people away.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
If in eyes: hold eyelids apart and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing difficult, give oxygen.
SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES: hold eyelids apart and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS: give several glasses of water to drink and induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAS CONVULSIONS: do nothing except [illegible] water.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearest water intake.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: water contaminant.
Disperse and flush.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cobalt (II) acetate, Cobalt acetate tetrahydrate, Cobaltous acetate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $Co(C_2H_3O_2)_2 \cdot 4H_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Pink
4.3 **Odor:** Slight acetic acid odor, vinegar like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator, rubber gloves, goggles or face shield, protective clothing
5.2 **Symptoms Following Exposure:** Inhalation causes shortness of breath and coughing; permanent disability may occur. Ingestion causes pain and vomiting. Contact with eyes causes irritation. Contact with skin may cause dermatitis.
5.3 **Treatment for Exposure:** INHALATION: move to fresh air; if breathing has stopped, begin artificial respiration. INGESTION: give large amounts of water; induce vomiting. EYES: flush with water for at least 15 min. SKIN: wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³ (as cobalt)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3; LD_{50}: 500 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic cobalt oxide fumes may form in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Bioconcentration of 200–1000 fold only under constant exposure. Not significant in spill conditions.

9. SELECTED MANUFACTURERS

1. Mooney Chemicals, Inc.
   2301 Scranton Road
   Cleveland, Ohio 44113
2. The Harshaw Chemical Co.
   1948 E. 97th St.
   Cleveland, Ohio 44106
3. Mallinckrodt Chemical Works
   222 Westside Avenue
   P.O. Box 384
   Jersey City, N.J. 07303

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, Reagent
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

SS

12. HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 249.1
*13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** 284°F = 140°C = 413°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.71 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

CBC	COBALT CHLORIDE

Common Synonyms			
Cobaltous chloride hexahydrate Cobaltous chloride Cobaltous chloride dihydrate	Solid	Pink to red	Slight sharp odor
	Sinks and mixes with water		

[illegible]

Fire	Not flammable
Exposure	CALIFORNIA Dept of APS **DUST** Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing. [illegible] **SOLID** Irritating to skin and eyes. If swallowed will cause nausea and vomiting [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cobalt(II) chloride
Cobaltous chloride Cobaltous chloride dihydrate Cobaltous chloride hexahydrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $CoCl_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Pink to red

4 3 **Odor:** Very slight acrid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves side shield goggles Bureau of Mines respirator protective clothing

5 2 **Symptoms Following Exposure:** Inhalation causes respiratory disease shortness of breath and coughing permanent disability may occur Ingestion causes pain vomiting and diarrhea Contact causes irritation of eyes and may cause skin rash

5 3 **Treatment for Exposure.** INHALATION move victim to fresh air if breathing has stopped begin artificial respiration and call a doctor INGESTION give large amount of water induce vomiting EYES flush with water at least 15 min consult physician if irritation persists SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 1 mg/m³ (as cobalt)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 LD$_{50}$ 300 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic cobalt oxide fumes may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
100 ppm 30 - 72 hr goldfish killed fresh (hard) water
10 ppm 168 hr goldfish killed fresh (soft) water
200 ppm * mummichogs no effect sea water
* Time period not specified

8 2 **Waterborn Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

(Continued on page 4)

9 SELECTED MANUFACTURERS

1 Mooney Chemicals Inc
2301 Scranton Rd
Cleveland OH 44113

2 The Harshaw Chemical Co
1945 East 97th St
Cleveland Ohio 44106

3 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown N J 07960

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Anhydrous 100 1%
May also be shipped as dihydrate

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 237 9

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:**
1k °F = 86°C = 359°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 924 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** 22 Btu/lb
= 12 cal/g = 0 50 x 10³ J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

8 WATER POLLUTION (Cont'd.)

8 4 **Food Chain Concentration Potential:**
Bioconcentration of 200 1000 fold only under constant exposure Not significant in spill conditions

CON

COBALT NITRATE

Common Synonyms
Cobaltous nitrate
Cobalt[II] nitrate
Cobaltous nitrate hexahydrate

Solid — Red — Odorless

Sinks and mixes with water

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cobalt(II) nitrate, Cobaltous nitrate, Cobaltous nitrate hexahydrate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $Co(NO_3)_2 \cdot 6H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Red

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Bu Mines approved respirator, rubber gloves, safety goggles, protective clothing

5.2 **Symptoms Following Exposure:** Inhalation causes shortness of breath and coughing, permanent disability may occur. Ingestion causes pain and vomiting. Contact with eyes or skin causes irritation

5.3 **Treatment for Exposure:** INHALATION: move to fresh air, if breathing has stopped, begin artificial respiration and call a doctor. INGESTION: give large amount of water, induce vomiting, call a doctor. EYES: flush with water for at least 15 min. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3 LD50 = 400 mg/kg (rabbit)

5.7 **Late Toxicity:** Causes malignant tumors in rabbits

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6.6 **Behavior in Fire:** May increase intensity of fire

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Contact with wood and paper may cause fire

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
10 ppm* stickleback, lethal, 96 hrs, fresh water
15 ppm* 96 hr stickleback avg survival time, fresh water
20 ppm* 96 hr stickleback avg survival time, fresh water
*as cobalt

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

Continued on page 4

9. SELECTED MANUFACTURERS

1. Mooney Chemicals Inc
2301 Scranton Road
Cleveland, Ohio 44113

2. The Harshaw Chemical Co
1945 E 97th St
Cleveland, Ohio 44106

3. Alfred Chemical Corp
Specialty Chemicals Div
P O Box 1057R
Morristown, N J 07960

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, hexahydrate. May also be shipped as anhydrous solid

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	0	1
Flammability (Red)	0	0
Reactivity (Yellow)	0	0
	OX	OX

*First column refers to nonfire situation

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 291.04

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** 131°F = 55°C = 328°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.54 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** 31 Btu/lb = 17 cal/g = 0.71 × 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

8. WATER POLLUTION (Cont'd)

8.4 **Food Chain Concentration Potential:** Bioconcentration of 200–1000 fold only under constant exposure. Not significant in spill condition.

CBS	COBALT SULFATE

Common Synonyms			
Cobaltous sulfate heptahydrate Cobalt[II] sulfate Bieberite	Solid	Rose pink	Odorless
	Sinks and mixes with water		

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Bieberite, Cobalt(II) sulfate, Cobaltous sulfate heptahydrate

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula:** $CoSO_4 \cdot 7H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Rose pink

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Be sure approved respirator, goggles, protective gloves

5 2 **Symptoms Following Exposure:** Inhalation causes shortness of breath and coughing, permanent disability may occur. Ingestion causes pain and vomiting. Contact with eyes or skin causes irritation

5 3 **Treatment for Exposure:** INHALATION: move to fresh air, if breathing has stopped, begin artificial respiration and call a doctor. INGESTION: give large amount of water, induce vomiting, call a doctor. EYES: flush with water for at least 15 min, consult a physician if irritation persists. SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 0.1 mg/m³ (as cobalt)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 LD50 500 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic cobalt oxide fumes may form in fire

6 6 **Behavior in Fire**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
10 ppm*/** stickleback lethal fresh water
*As cobalt
**Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential:** Bioconcentration of 200 - 1000 fold only under constant exposure. Not significant in spill conditions

9. SELECTED MANUFACTURERS

1 Mooney Chemicals Inc
2301 Scranton Road
Cleveland, Ohio 44113

2 The Harshaw Chemical Co
1945 E 97th St
Cleveland, Ohio 44106

3 Mallinckrodt Chemical Works
223 Westside Ave
P O Box 384
Jersey City, N J 07303

10 SHIPPING INFORMATION

10 1 **Grades or Purity.** Technical reagent, may also be shipped as a monohydrate or hexahydrate

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

SN

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 281

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.948 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** 23 Btu/lb
[illegible] cal/g [illegible] J/kg

13 16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

CLD	COLLODION

Common Synonyms

Cellulose nitrate solution
Nitrocellulose solution
Pyroxylin solution
Box tor gum
Nitrocellulose gum

Thick liquid — Colorless — Ether-like odor

Floats on water. Flammable, irritating vapor is produced. Boiling point is around 94° F.

[illegible]

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause dizziness, difficult breathing, or loss of consciousness
[illegible]

LIQUID
Not harmful

Water Pollution

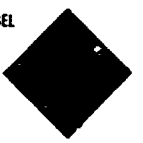
Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

[illegible]

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** [illegible]
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** Not pertinent
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** [illegible]
4.2 **Color:** [illegible]
4.3 **Odor:** Depend [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]
5.2 **Symptoms Following Exposure:** [illegible]
5.3 **Treatment for Exposure:** INHALATION [illegible]
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]
5.5 **Short-Term Inhalation Limits:** [illegible]
5.6 **Toxicity by Ingestion:** [illegible]
5.7 **Late Toxicity:** [illegible]
5.8 **Vapor (Gas) Irritant Characteristics:** [illegible] The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin
5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** −49°F (C.C. (ether)
6.2 **Flammable Limits in Air:** [illegible] (ether solution)
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** The formation of extremely toxic gases notably oxides of nitrogen, hydrogen cyanide, and carbon monoxide is possible
6.6 **Behavior in Fire:** Highly flammable solvent vapors are formed. May travel a long distance to a source of ignition and flash back
6.7 **Ignition Temperature:** 356°F (ether)
6.8 **Electrical Hazard:** Class I, Group C
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Mallinckrodt Chemical Works
Second and Mallinckrodt Streets
St. Louis, Mo. 63160
2. Fabrisonics, Inc.
Pace Valley Industrial Park
Warrington, Pa. 18976

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** USP. All grades contain less than 60% nitrocellulose by weight
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

A T S V W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Heat	
Vapor Irritant	
Liquid or Solid Irritant	0
Poisons	2
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	
Aesthetic Effect	
Reactivity	
Other Chemicals	
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	0 2
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

*[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** 94°F = 34°C (ether solvent)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.772 at 25°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

COP	COPPER ACETATE

Common Synonyms	Solid	Bluish-green	Odorless
Acetic acid, cupric salt Crystallized verdigris Neutral verdigris Cupric acetate monohydrate	Mixes with water		

[illegible]

Fire	Not flammable Irritating gases may be produced when heated
Exposure	[illegible] DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing. [illegible] SOLID Will burn eyes Irritating to eyes If swallowed will cause nausea, vomiting or loss of consciousness. [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetic acid, cupric salt, Crystallized verdigris, Cupric acetate monohydrate, Neutral verdigris

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $Cu(C_2H_3O_2)_2 \cdot H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Bluish green

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of throat and lungs. Ingestion of large amounts causes violent vomiting and purging, intense pain, collapse, coma, convulsions, and paralysis. Contact with solutions irritates eyes, contact with solid causes severe eye surface injury and irritation of skin

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min., get medical attention if injury was caused by solid. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 - 5 g/kg (rat)

5.7 **Late Toxicity:** Causes degeneration of liver in dogs

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating vapors of acetic acid may form in fires

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish. Hazard to humans unknown

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp.
General Chemical Div.
40 Rector St.
New York, N.Y. 10006

2. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

3. J. T. Baker Chemical Co.
Phillipsburg, N.J. 08865

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 95 - 99%, Reagent 99%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 199.65

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** 239°F - 115°C = 388°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.9 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

CAA	COPPER ACETOARSENITE

Common Synonyms	
Schweinfurth green Imperial green Paris green Emerald green Moss green	Solid Powder Green Odorless Sinks and mixes slowly with water

[illegible]

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	[illegible] DUST POISONOUS IF INHALED Irritating to eyes, nose and throat [illegible] SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning [illegible] water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Imperial green, Moss green, Vienna green, Meadow green, Paris green, Mitis green, Kings green, Parrot green

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** [illegible]

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Emerald green

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator [illegible] goggles [illegible] face shield

5.2 **Symptoms Following Exposure:** Dust causes eye [illegible] Ingestion causes gastric disturbance tremors, muscular cramps and nerves [illegible] may lead to death

5.3 **Treatment for Exposure:** Following ingestion [illegible] nausea [illegible] severe exposure [illegible] dust get medical attention. Alert doctor [illegible] poisoning. EYES flush with water [illegible] wash thoroughly with soap and water. INGESTION give copious [illegible] water and induce repeated vomiting. Give [illegible] Epsom salt [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³ as arsenic

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4 [illegible] LD_{50} = 22 mg/kg rats

5.7 **Late Toxicity:** Arsenic poisoning

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** [illegible] may be formed in fires

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** [illegible] 5,000 ppm LC_{50}

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

Los Angeles Chemical Company
[illegible] Ardine Street
[illegible]

2. Chempar Chemical Co., Inc.
260 Madison Avenue
New York, N.Y. 10016

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Decomposes

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C solid

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

CPA	COPPER ARSENITE

Common Synonyms

Cupric arsenite
Swedish green
Cupra green
Copper orthoarsenite

Solid — Green — Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST KEEP FROM AWAY

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

IF SWALLOWED

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water
contamination
Restrict access
Should be removed
Chemical and physical treatment

2 LABEL

POISON

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** Cupric arsenite Swedish green Scheele's green Cupra green Copper orthoarsenite

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula:** $CuHAsO_4$

3 4 **IMCO/United Nations Numerical Designation** 6?/1586

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** Green, yellowish green

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Dust respirator rubber gloves goggles or face shield

5 2 **Symptoms Following Exposure** Dust irritates eyes Ingestion causes gastric disturbance tremors muscular cramps and nervous collapse that may cause death

5 3 **Treatment for Exposure:** Following ingestion or unusually severe exposure to dust get medical attention Alert doctor to possible of arsenic poisoning EYES flush with water for 15 min SKIN wash with soap and water INGESTION give large amounts of water induce vomiting give cathartic such as 2 oz of Epsom salt in water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.5 mg/m³ (as arsenic)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Grade 3 LD$_{50}$ 50 to 500 mg/kg

5 7 **Late Toxicity** Arsenic poisoning

5 8 **Vapor (Gas) Irritant Characteristics.** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Poisonous volatile arsenic oxides may be formed in fires

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9. SELECTED MANUFACTURERS

1 Gallard Schlesinger Chemical Manufacturing Co
584 Mineola Avenue
Carle Place N Y 11514

2 Cerac Inc
3306 West Silver Spring Rd
Milwaukee Falls Wis 53051

10. SHIPPING INFORMATION

10 1 **Grades or Purity.** Commercial

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Poisonous Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 277 4

13 3 **Boiling Point at 1 atm** Decomposes

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity** (est) > 1 1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CPB

COPPER BROMIDE

Common Synonyms
Cupric bromide anhydrous

Solid | Black | Odorless

Sinks and mixes with water

Stop discharge if possible. Keep people away.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
Irritating gases may be produced when heated

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Will burn eyes
Irritating to skin

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cupric bromide anhydrous
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula.** $CuBr_2$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Black
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of throat and lungs. Ingestion of large amounts causes violent vomiting and purging, intense pain, collapse, coma, convulsions and paralysis. Contact with solutions causes eye irritation, contact with solid causes severe eye surface injury and skin irritation.
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min, get medical attention if injury was caused by solid. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3, LD_{50} 500 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents.** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products.** Irritating hydrogen bromide gas may form in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish. Hazard to humans unknown

9. SELECTED MANUFACTURERS

1. American Hoechst Corp
   Chemicals and Plastics Div
   Rt 202 - 206 North
   Somerville, N J 08876
2. Mallinckrodt Chemical Works
   223 Westside Ave
   P O Box 384
   Jersey City, N J 07303
3. J T Baker Chemical Co
   Phillipsburg, N J 08865

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure, 99% Reagent
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 223.35
13.3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13.4 **Freezing Point:** 928°F = 498°C = 771°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 4.77 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** −70.9 Btu/lb = −39.4 cal/g = -1.65×10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CPC	COPPER CHLORIDE

Common Synonyms			
Cupric chloride dihydrate Eriochlorite (anhydrous)	Solid	Blue-green	Odorless
	Sinks and mixes with water		

Stop discharge if possible. Keep people away.
Avoid contact with solid and liquid.
Isolate area and discharge if safe to.
Notify local health and pollution control agencies.

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID **DUST** **Irritating to eyes, nose and throat** **If inhaled will cause coughing or difficult breathing** Remove victim to fresh air and flush with plenty of water. If victim has stopped give artificial respiration. If victim is difficult give oxygen. **SOLID** **Will burn eyes.** **Irritating to eyes** **If swallowed will cause nausea and vomiting** Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES hold eyelids open and flush with plenty of water. IF SWALLOWED and victim CONSCIOUS give drinks of water and have victim induce vomiting. IF SWALLOWED and victim UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm.
Water Pollution	**HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS** **May be dangerous if it enters water intakes** Notify local health and wildlife officials. Notify operators of affected water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cupric chloride dihydrate
Eriochalcite (anhydrous)

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $CuCl_2 \cdot 2H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Green, blue green, blue

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Bu Mines approved respirator, rubber gloves, safety goggles

5 2 **Symptoms Following Exposure:** Inhalation causes coughing and sneezing. Ingestion causes pain and vomiting. Contact with solutions irritates eyes, contact with solid causes severe eye surface injury and skin irritation

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water, induce vomiting, get medical attention. EYES: flush with water for 15 min, consult a physician if injury was caused by solid. SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 LD_{50} 500 mg/kg

5 7 **Late Toxicity:** Causes liver damage in rabbits

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride gas may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** In presence of moisture may corrode metals; the reaction is not hazardous

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity**
0.009 ppm (as Cu), */goldfish/rapid death/fresh water
0.1 - 0.3 ppm */oyster/toxic/salt water
0.55 ppm/12 hr/mussel/killed/salt water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish. Hazard to humans unknown

9. SELECTED MANUFACTURERS

1 The Harshaw Chemical Co
1945 E 97th St
Cleveland Ohio 44106

2 J T Baker Chemical Co
Phillipsburg N J 08865

3 Diamond Shamrock Chemical Co
Chemetals Division
711 Pittman Road
Baltimore Md 21226

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent C.P.
Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM-B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 170.48 (dihydrate)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.54 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

CCY	COPPER CYANIDE

Common Synonyms		
Cuprous cyanide Cupricin	Solid powder Sinks in water	White

[illegible] KEEP PEOPLE AWAY

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause dizziness or loss of consciousness
[illegible]

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause dizziness and loss of consciousness
[illegible]
IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cupricin Cuprous cyanide
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** CuCN
3 4 **IMCO/United Nations Numerical Designation:** 6 1/1587

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Powder
4 2 **Color:** White
4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator protective goggles or face mask, protective clothing

5 2 **Symptoms Following Exposure:** Following severe exposure to dust symptoms of cyanide poisoning may develop (see ingestion) Ingestion causes anxiety confusion dizziness sudden loss of consciousness odor of bitter almonds on breath or in vomitus rapid weak pulse convulsions and paralysis Contact with eyes causes irritation

5 3 **Treatment for Exposure:** *Get medical attention after all exposures to this substance* INHALATION remove victim to fresh air INGESTION if breathing has stopped begin artificial respiration immediately administer by inhalation amyl nitrite pearls for 15 30 seconds of every minute, while a sodium nitrite solution is being prepared discontinue amyl nitrite and immediately inject intravenously 10 ml of a 3% soln of sodium nitrite (sterile if necessary) over a period of 2 to 4 min do not remove needle, through same needle infuse 50 ml of a 25% aqueous soln of sodium thiosulfate injection should take about 10 min (Concentrations of 15 50% are permissible if total dose is approx 12 grams) Oxygen therapy may be of value in combination with the above If symptoms recur repeat injections of nitrite and thiosulfate at half the above doses EYES flush with water for at least 15 min SKIN flush with water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m³ (as cyanide)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 4, LD50 < 50 mg/kg
5 7 **Late Toxicity:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic hydrogen cyanide gas may form in fires
6 6 **Behavior in Fire**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable In presence of moisture, toxic hydrogen cyanide gas may collect in enclosed spaces
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish Hazard to humans unknown

9 SELECTED MANUFACTURERS

1 J T Baker Chemical Co
Phillipsburg, N J 08865

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

3 Pfaltz and Bauer Inc
126 04 Northern Blvd
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical C P
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Closed container

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

JJ

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 89 56
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2 92 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

5 HEALTH HAZARDS (Cont'd)

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

CPF	COPPER FLUOROBORATE

Common Synonyms			
Cupric fluoborate solution Copper borofluoride solution Copper[II] fluoborate solution	Liquid	Dark blue	Odorless
	Sinks and mixes with water		

Fire	Not flammable Irritating gases may be produced when heated
Exposure	VAPOR Irritating to eyes nose and throat If inhaled will cause coughing or difficult breathing LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Copper borofluoride solution Copper(II) fluoborate solution, Cupric fluoborate solution

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula:** $Cu(BF_4)_2 \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Clear dark blue

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield rubber apron and gloves

5 2 **Symptoms Following Exposure:** Inhalation of mist irritates nose and throat Ingestion causes pain and vomiting Contact causes severe irritation of eyes and irritation of skin

5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amounts of water and induce vomiting if required EYES flush with water for at least 15 min get medical attention if irritation persists. SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 LD_{50} 500 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating hydrogen fluoride gas may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May corrode some metals

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water rinse with dilute solution of sodium bicarbonate or soda ash

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish Hazard to humans unknown

9. SELECTED MANUFACTURERS

1 American Hoechst Corp
Chemicals and Plastics Div
Rt 202 206 North
Somerville N J 08876

2 Allied Chemical Corp
P O Box 1087R
Morristown N J 07960

3 The Harshaw Chemical Co
1945 E 97 St
Cleveland, Ohio 44106

10 SHIPPING INFORMATION

10 1 **Grades or Purity:**
Technical, C P } 45 -50% solutions in water

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 237 16 (solute only)

13 3 **Boiling Point at 1 atm:** (approx) 212°F = 100°C = 373°K

13 4 **Freezing Point:** Data not available

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 54 at 20°C (liquid)

13 8 **Liquid Surface Tension.** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CID	COPPER IODIDE

Common Synonyms			
Cuprous iodide	Solid	Tan or off white	Odorless
	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST. KEEP FOOD AWAY

Fire

Not flammable
Irritating gases may be produced when heated

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cuprous iodide, Marshite
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** CuI
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Beige
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion of copper salts produces violent vomiting and purging, intense pain, collapse, coma, convulsions and paralysis. Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3 LD_{50} 500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Irritating hydrogen iodide or iodine vapors may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish. Hazard to humans unknown

9 SELECTED MANUFACTURERS

1 Gallard Schlesinger Chemical Mfg Co
584 Mineola Avenue
Carle Place N Y 11514

2 Pfaltz and Bauer Inc
126 04 Northern Blvd
Flushing N Y 11368

3 Ventron Corp
P O Box 159
Beverly, Mass 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Anhydrous 99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 190 4
13 3 **Boiling Point at 1 atm:** 2,354°F = 1,290°C = 1,563°K
13 4 **Freezing Point:** 121°F = 605°C = 878°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 5 62 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CNN	COPPER NAPHTHENATE

Common Synonyms			
Paint drier	Liquid	Dark green	Gasoline-like odor
	May float or sink in water		

Shut off ignition sources. Call fire department.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Extinguish with dry chemical, foam, carbon dioxide.
Water may be ineffective.
Cool exposed containers with water.

Exposure

Call in medical aid.
LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with generous amounts of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water (milk).
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Paint drier
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** Mixture
3.4 **IMCO/United Nations Numerical Designation:** 3.3/1168

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Dark green
4.3 **Odor:** Like gasoline, slight aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, plastic gloves (as for gasoline)
5.2 **Symptoms Following Exposure:** Vapor causes mild irritation of eyes and mild irritation of respiratory tract if inhaled. Ingestion causes irritation of stomach. Aspiration causes severe lung irritation and rapidly developing pulmonary edema, central nervous system excitement followed by depression.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. EYES: wash with copious amounts of water for at least 15 min. SKIN: wipe off and wash with soap and water. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. ASPIRATION: enforce bed rest, give oxygen, call a doctor.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 500 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1 oral rat LD_{50} = 4.6 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to the eyes and throat.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 100°F C.C. (typical)
6.2 **Flammable Limits in Air:** 0.8% - 5.0% (mineral spirits)
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 500°F (mineral spirits)
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 2.0 ppm/72 hr blue-green algae; 100% kill fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 8% 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Witco Chemical Corporation
   Organics Division
   277 Park Avenue
   New York, N.Y. 10017
2. Cincinnati Milacron Chemicals Inc.
   500 Jersey Ave.
   New Brunswick, N.J. 08903
3. Ferro Corporation
   7050 Krick Rd.
   Bedford, Ohio 44146

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 8% in mineral spirits, or mineral oil; 5% in mineral spirits. May float instead of sink in water.
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Not required
10.4 **Venting:** Pressure vacuum or open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

X-T-U-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Mixture
13.3 **Boiling Point at 1 atm:** 310 - 395°F = 154 - 202°C = 427 - 475°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.93 - 1.05 at 25°C (liquid)
13.8 **Liquid Surface Tension:** 20 dynes/cm = 0.020 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 45 dynes/cm = 0.045 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** (est.) = -17,600 Btu/lb = -9,800 cal/g = -410 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CNI

COPPER NITRATE

Common Synonyms			
Cupric nitrate trihydrate Gerhardite	Solid	Blue	Odorless
	Sinks and mixes with water		

Fire

Not flammable
Will increase the intensity of a fire
Irritating gases may be produced when heated

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Will burn eyes
If swallowed will cause nausea vomiting or loss of consciousness

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cupric nitrate trihydrate, Gerhardite
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $Cu(NO_3)_2 \cdot 3H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Blue
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of throat and lungs Ingestion of large amounts causes violent vomiting and purging intense pain collapse coma convulsions and paralysis Solutions irritate eyes contact with solid causes severe eye surface injury and skin irritation
5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amounts of water induce vomiting get medical attention EYES flush with water for at least 15 min get medical attention if injury was caused by solid SKIN flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2 LD50 0 5 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of nitrogen may form in fire
6 6 **Behavior in Fire:** Can increase intensity of fire if in contact with combustible material
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Mixtures with wood paper and other combustibles may catch fire
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
5 ppm 11 hr rainbow trout killed fresh water
0 22 1 0 ppm 48 240 hr barnacles & related species killed salt water
1 9 ppm 96 hr oyster TL_m salt water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish Can be concentrated by food chain Hazard to humans unknown

9. SELECTED MANUFACTURERS

1 American Hoechst Corp
Chemicals and Plastics Div
Rt 202 206 North
Somerville N J 08876

2 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown N J 07960

3 J T Baker Chemical Co
Phillipsburg N J 08865

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure 100% Technical Reagent May also be shipped as anhydrous grade
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	0	1
Flammability (Red)	0	0
Reactivity (Yellow)	0	0
	OXY	OXY

*First column refers to no fire situation

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 241 60
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** 238 1°F = 114 5°C = 387 7°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2 32 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 208

NOTES

COL	COPPER OXALATE

Common Synonyms			
Cupric oxalate hemihydrate	Solid	Bluish white	Odorless
	Sinks in water		

[illegible]

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	[illegible] DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cupric oxalate hemihydrate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** CuC_2O_4 / H_2O
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Bluish white
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion of very large amount may produce symptoms of oxalate poisoning, watch for edema of the glottis and delayed constriction of esophagus. Contact with eyes causes irritation
5.3 **Treatment for Exposure:** INHALATION remove to fresh air, if exposure has been prolonged watch for symptoms of oxalate poisoning (nausea, shock, collapse and convulsions). INGESTION give large amount of water, induce vomiting, get medical attention. EYES flush with water for at least 15 min. SKIN flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic carbon monoxide gas may form in fire
6.6 **Behavior in Fire**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish. Hazard to humans unknown

9. SELECTED MANUFACTURERS

1. Gallard Schlesinger Chemical Mfg. Co.
584 Mineola Ave.
Carle Place, N. Y. 11514
2. Pfaltz and Bauer, Inc.
126-04 Northern Blvd.
Flushing, N. Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 98+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 160.6
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** >1 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

CSF

COPPER SULFATE

Common Synonyms
Blue Vitriol
Sulfate of copper
Copper sulfate pentahydrate
Cupric sulfate

Solid-granules or crystals — White to blue — Odorless

Sinks and mixes with water

Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

SOLID
If swallowed, will cause nausea, vomiting or loss of consciousness
IF SWALLOWED and conscious, GIVE TOUS large quantities of water or milk and have vomiting induced [illegible]
IF SWALLOWED and not in a CONSCIOUS OR HAVING CONVULSIONS [illegible] keep warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning — water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Blue vitriol
Copper sulfate pentahydrate
Cupric sulfate
Sulfate of copper

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $CuSO_4 \cdot 5H_2O$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Blue

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Filtering masks to minimize inhalation of dust

5 2 **Symptoms Following Exposure:** INGESTION copper sulfate may induce severe gastroenteritis distress consisting gastroenteritis pain and bloody vomitus and hemorrhagic penetration anuria hematuria anemia increase white blood cell [illegible] and circulatory failure

5 3 **Treatment for Exposure:** INGESTION induce vomiting and administer water lavage chemical saline cathartic fluid therapy and transfusions if required calcium disodium EDTA has been used moderately effective SKIN AND EYES wash affected tissues with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 3 LD_{50} 50 to 500 mg/kg (Rat)

5 7 **Late Toxicity:** Causes liver, kidney and testicular damage in rats

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause second degree burns on long exposure

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
3.8 ppm/24 hr rainbow trout, 11 gm fresh water
0.14 ppm/48 hr prawn, 1 Cu salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Anaconda Co
Great Falls, Mont 59401

2 Cities Service Co Inc
Industrial Chemicals Division
60 Wall St
New York, N Y 10005

3 Mallinckrodt Chemical Works
Industrial Chemicals Division
St Louis, Mo 63160

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 249.7

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.29 at 15°C (solids)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

CSY	CORN SYRUP

Common Synonyms	Thick liquid Colorless Odorless Soaks and mixes with water
[illegible]	
Fire	Not flammable
Exposure	Not harmful
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE:

See Response Methods Handbook CG 446-4

Dispersal and flush

2. LABELS

No Hazard Label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** [illegible]

3 2 **Coast Guard Compatibility Classification:** Miscellaneous water solutions

3 3 **Chemical Formula:** Not pertinent

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** None

5 2 **Symptoms Following Exposure:** Not [illegible]

5 3 **Treatment for Exposure:** None

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** None

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** None

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** None

8 2 **Waterfowl Toxicity:** None

8 3 **Biological Oxygen Demand (BOD):** [illegible] days [illegible] theor. 5 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 CPC International Inc
Argo, Ill 60501

2 A. E. Staley Mfg. Co
Decatur, Ill 62525

3 Standard Brands Inc
Clinton Corn Processing Co. Division
Clinton, Iowa 52732

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

N P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.4 at 17° C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

COU	COUMAPHOS

Common Synonyms			
CORAL O,O-Diethyl O-(3-chloro-4-methyl-2-oxo-2H-1-benzopyran-7-yl) phosphorothioate	Solid Solid sinks in water	White	Weak sulfurous odor

Fire	Combustible
Exposure	CALL FOR MEDICAL AID SOLID OR DUST Irritating to skin and eyes Harmful if swallowed or inhaled
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning - water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** CORAL O,O-Diethyl O-(3-chloro-4-methyl-2-oxo-2H-1-benzopyran-7-yl)phosphorothioate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_{14}H_{16}ClO_5PS$

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Slight odor of sulfur compounds

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor respirator, rubber gloves, goggles

5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes some dizziness, chest tightness, sweating, contracted pupils of eyes, stomach pains, vomiting, and diarrhea. Pulmonary edema may develop as long as 12 hours after acute exposure. Contact with eyes causes irritation; overexposure may cause temporary loss of vision. Irritates skin.

5.3 **Treatment for Exposure:** Get medical attention after all overexposure to this substance. Atropine sulfate and 2-PAM are antidotes. INHALATION: remove to fresh air, support respiration, keep patient quiet until medical help arrives, observe for development of pulmonary edema even after 12 hours. INGESTION: induce vomiting give water and again induce vomiting give aqueous slurry of medicinal charcoal. EYES: flush with water for at least 15 min. SKIN: wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4 oral LD_{50} = [illegible] mg/kg rats

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 0.02 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water fog, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of sulfur and phosphorus may form in fires

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Nonreactive

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Hazel Corporation
Box [illegible]
Shawnee Mission, Kan. 66[illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible] ingredients, the balance being inert solids

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Control Codes:** [illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on next page)

NOTES

CCT	CREOSOTE, COAL TAR

Common Synonyms			
Creosote oil Dead oil	Liquid	Yellow to black	Tarry odor
	May float or sink in water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Foaling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning - water contaminant
Mechanical containment
Shoreline removal
Chemical and physical treatment

2. LABELS

No labels required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Creosote oil
Dead oil

3.2 **Coast Guard Compatibility Classification:** Group

3.3 **Chemical Formula:** Mixture

3.4 **IMCO/United Nations Numerical Designation:** 9 2022

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Yellow to brown to black

4.3 **Odor:** Creosote or tarry odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible] goggles and face shield, metallic or impermeable boots, aprons

5.2 **Symptoms Following Exposure:** Vapors cause mucous membrane irritation and burns. Liquid causes severe burns of eyes and reddening and [illegible] skin. Prolonged contact with skin may cause [illegible]. Ingestion causes salivation, vomiting, [illegible], difficulties, chest pain, [illegible], headache. Dilated pupils reflects hypothermia [illegible]

5.3 **Treatment for Exposure:** INHALATION [illegible] fresh air. [illegible] breathing gas or artificial respiration, preferably mouth-to-mouth, if breathing difficult, give oxygen as [illegible] physician. EYES: Wash immediately with plenty of water [illegible]. SKIN: Scrub with vegetable oil or [illegible] soap and water. INGESTION: Give [illegible] water [illegible] do NOT induce vomiting

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] mg/kg

5.7 **Late Toxicity:** Repeated exposure may cause cancer of skin

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation and [illegible] at [illegible] and high concentrations are painful. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Liquid is severe irritant. May cause painful and severe degree burns after a few minutes contact

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** > 100 F (> [illegible] C)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide or foam

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Data not available

6.6 **Behavior in Fire:** Heavy [illegible] black smoke is formed

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corporation
Plastics Division
[illegible] Park Avenue
New York, N.Y. [illegible]

2. Koppers Company, Inc.
Organic Materials Division
Koppers Building
Pittsburgh, Pa. [illegible]

3. Allied Chemical Corporation
Semet Solvay Division
Frankfort Tar Plant
[illegible] North Third Street
Frankfort, Ohio [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Whole creosote or various fractions depending on boiling point. All have similar properties

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrestors

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

V F X Y

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	[illegible]
Aesthetic Effect	4
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Mixture

13.3 **Boiling Point at 1 atm:** > 150 F (> 100 C) (> [illegible] K)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] liquid

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

CRS	CRESOLS

Common Synonyms Cresylic acids dihydroxytoluenes Methylphenols Oxytoluenes	Waters liquid or solid crystals · Colorless or yellow · Sweet tarry odor Sinks in water

[illegible]

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible]
Exposure	[illegible] LIQUID Will burn skin and eyes Harmful if swallowed [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See response Methods Handbook [illegible]

[illegible]

2 LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
[illegible]

3.2 **Coast Guard Compatibility Classification:** Cresol

3.3 **Chemical Formula:** [illegible]

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid or solid

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** [illegible] INHALATION [illegible] INGESTION [illegible] NOT [illegible] SKIN OR EYES [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** [illegible]

6.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** [illegible]

6.6 **Behavior in Fire:** [illegible]

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** [illegible]

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** [illegible]

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD):** [illegible]

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

11 HAZARD ASSESSMENT CODE

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	2
Liquid or Solid Irritant	[illegible]
Poison	[illegible]
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	4
Reactivity	
Other Chemicals	2
Water	[illegible]
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification	
	[illegible]	[illegible]
Health Hazard (Blue)	[illegible]	[illegible]
Flammability (Red)	[illegible]	[illegible]
Reactivity (Yellow)	[illegible]	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** [illegible]

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** [illegible]

[illegible]

10 SHIPPING INFORMATION (Cont'd.)

[illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

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CGE — CRESYL GLYCIDYL ETHER

Common Synonyms	Solid — White Sinks and mixes with water

Stop discharge if possible. Keep people away.
Shut off ignition sources. Call fire department.
Avoid contact with solid and dust.
Do not contact discharged material.
Notify local health and pollution control agencies.

Fire	**Combustible** Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID **DUST** **Irritating to eyes, nose and throat** **Harmful if inhaled** [illegible] **SOLID** **Irritating to skin and eyes** **Harmful if swallowed** [illegible] IF IN EYES: [illegible] with plenty of water. IF SWALLOWED: [illegible] CONSCIOUS [illegible] with [illegible] IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: [illegible] keep warm.
Water Pollution	**Effect of low concentrations on aquatic life is unknown** **May be dangerous if it enters water intakes** Notify local health and wildlife officials. Notify operators of affected water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-6)

Issue warning — water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cresol epoxypropyl ether, Tolyl epoxypropyl ether, Tolyl glycidyl ether

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $CH_3C_6H_4O\ CH_2\ CH\ CH_2\ O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Data not available

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister mask or air pack, rubber gloves, goggles or face shield, body covering clothing

5.2 **Symptoms Following Exposure:** Contact with eyes causes irritation. Contact with skin causes primary irritation and allergic sensitization

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. EYES: flush with water for at least 15 min., get medical attention. SKIN: immediately wash off with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 200°F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Shell Chemical Co.
One Shell Plaza
P. O. Box 2463
Houston, Texas 77001

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 100%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A T U-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** 164

13.3 **Boiling Point at 1 atm:** (approx.) 498°F = 259°C = 532°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.09 at 20°C (liquid)

13.8 **Liquid Surface Tension** Data not available

13.9 **Liquid-Water Interfacial Tension.** Data not available

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization.** Data not available

13.13 **Heat of Combustion:** (est.) −16,500 Btu/lb = −9,190 cal/g = −384 × 10³ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CTA

CROTONALDEHYDE

Common Synonyms
Crotonic aldehyde
beta-Methylacrolein
trans-2 Butenal

Water liquid | Yellow | Tar odor

Floats and mixes slowly with water. Flammable irritating vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area

Exposure

CAUTION: TOXIC AGENT

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause coughing, nausea, vomiting or loss of consciousness

LIQUID
Will burn skin and eyes
Harmful if swallowed

DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
water contaminant
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
beta-Methylacrolein
Crotonaldehyde
Crotonic aldehyde
trans-2 Butenal

3.2 **Coast Guard Compatibility Classification**
Aldehyd

3.3 **Chemical Formula:** $CH_3CH=CHCHO$

3.4 **IMCO/United Nations Numerical Designation:** UN 1143

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color** Yellow

4.3 **Odor** Tarry

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Air supplied mask for concentrations > 2% by volume, plastic gloves, monogoggles, eye bath and safety shower

5.2 **Symptoms Following Exposure:** INHALATION Vapors are exceedingly irritating, causing coughing, chest pain, nausea, vomiting and collapse. CONTACT WITH SKIN OR EYES may cause burns and systemic illness. Contact of liquid or vapors with eyes causes burns

5.3 **Treatment for Exposure:** INHALATION remove victim to fresh air, give oxygen if breathing is difficult, call a physician. INGESTION have victim drink water or milk, do NOT induce vomiting. SKIN OR EYES immediately flush with plenty of water for at least 15 min, physician should see in case of eye irritation from vapor or liquid

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 2 ppm

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion** Grade 3 LD50 to 500 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Earns severe skin irritant, causes pain and second degree burns after a few minutes contact

5.10 **Odor Threshold** 0.13 ppm

6. FIRE HAZARDS

6.1 **Flash Point.** 59°F (15°C)

6.2 **Flammable Limits in Air:**
2.1% - 15.5%

6.3 **Fire Extinguishing Agents**
Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6.5 **Special Hazards of Combustion Products.**
Vapors are very irritating to nose, eyes and skin

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature** 450°F

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate** 3.3 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction

7.2 **Reactivity with Common Materials**
No reaction

7.3 **Stability During Transport:**
May polymerize

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization** May polymerize or condense with evolution of heat in presence of alkalies, amines, or acids

7.6 **Inhibitor of Polymerization**
None used

8. WATER POLLUTION

8.1 **Aquatic Toxicity**
Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD).**
1 Mlb/1 x 10 days

8.4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

1. Celanese Corp.
Celanese Chemical Co. Division
245 Park Ave.
New York, N.Y. 10017

2. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity.** 98.0

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere.** No requirement

10.4 **Venting** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight** 70.09

13.3 **Boiling Point at 1 atm**
216.9°F = 102.2°C = 375.4°K

13.4 **Freezing Point:**
−100°F = −75°C = 198°K

13.5 **Critical Temperature**
365°F = 185°C = 458°K

13.6 **Critical Pressure**
630 psia = 43 atm = 4.4 MN/m²

13.7 **Specific Gravity:** 0.852 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
Data not available

13.9 **Liquid-Water Interfacial Tension**
Data not available

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.104

13.12 **Latent Heat of Vaporization:**
261 Btu/lb = 141 cal/g = 4.65 × 10⁵ J/kg

13.13 **Heat of Combustion**
-14,000 Btu/lb
= -7760 cal/g = -325 × 10⁵ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on page 5

NOTES

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CUM — CUMENE

Common Synonyms
Cumol
Isopropylbenzene

Watery liquid — Colorless — Gasoline-like odor

Floats on water

[illegible]

Fire

Combustible.
[illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Cumol
Isopropylbenzene

3 2 **Coast Guard Compatibility Classification:** Aromatic hydrocarbon

3 3 **Chemical Formula:** $C_6H_5CH(CH_3)_2$

3 4 **IMCO/United Nations Numerical Designation** 3 1918

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Strong slightly irritant fragrant aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** as necessary to avoid skin contact. If concentration in air is greater than 1000 ppm use self-contained breathing apparatus

5 2 **Symptoms Following Exposure:** Narcotic action with long lasting effects depressant to central nervous system

5 3 **Treatment for Exposure:** INHALATION move patient immediately to fresh air administer artificial respiration or oxygen if necessary seek medical attention SKIN OR EYES wash exposed skin surfaces thoroughly flush eyes thoroughly with water for 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 50 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 3 LD50 50 to 500 mg/kg

5 7 **Late Toxicity:** None reported

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold** 1 2 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** 111°F C C

6 2 **Flammable Limits in Air:** 0.9% - 6.5%

6 3 **Fire Extinguishing Agents.** Foam carbon dioxide or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 797°F

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate** [illegible] mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 110 ppm/24 hr/Brine Shrimp/TLm

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 40% of theoretical in 5 days, fresh water

8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

1 Gulf Oil Corp
Gulf Oil Chemicals Co Div
Cedar Bayou Texas 77520

2 Monsanto Co
Monsanto Polymers & Petrochemicals Co
800 North Lindbergh Blvd
St Louis Mo 63166

3 Union Carbide Corp
Chemicals & Plastics Div
270 Park Ave
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Research grade pure grade technical grade

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight** 120 19

13 3 **Boiling Point at 1 atm:** 306.3°F = 152.4°C = 425.6°K

13 4 **Freezing Point.** −140.9°F = −96.1°C = 177.15°K

13 5 **Critical Temperature** 676.2°F = 357.9°C = 631.1°K

13 6 **Critical Pressure:** 465.5 psia = 31.67 atm = 3.208 MN/m²

13 7 **Specific Gravity:** 0.8663 at 15°C (liquid)

13 8 **Liquid Surface Tension** 28.2 dynes/cm = 0.0282 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** 54.6 dynes/cm = 0.0546 N/m at 22.7°

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.09

13 12 **Latent Heat of Vaporization:** 134 Btu/lb = 74.6 cal/g = 3.12 × 10⁵ J/kg

13 13 **Heat of Combustion.** −17,710 Btu/lb = −9840 cal/g = −412.0 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 1 back

NOTES

REVISED 1978

CMH — CUMENE HYDROPEROXIDE

Common Synonyms
alpha alpha-Dimethylbenzene hydroperoxide
Dimethylbenzyl hydroperoxide
CHP
Isopropylbenzene hydroperoxide
Cumyl hydroperoxide

Liquid — Colorless to light yellow — Sharp irritating odor

Sinks in water

[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache or coughing
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — oxidizing material
water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** alpha alpha Dimethylbenzene hydroperoxide, Dimethylbenzyl hydroperoxide, Isopropylbenzene hydroperoxide, Cumyl hydroperoxide, CHP

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula:** $C_6H_5C(OOH)(CH_3)_2$
$C_6H_5CH(CH_3)_2$ (mixture)

Continued on page 4

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Sharp irritant aromatic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained or airline breathing apparatus, solvent resistant rubber gloves, chemical splash goggles, rubber apron, rubber or PVC clothing, full face shield

5.2 **Symptoms Following Exposure:** Inhalation of vapor causes headache and burning throat. Liquid causes severe irritation of eyes, on skin causes burning, throbbing sensation, irritation and blisters. Ingestion causes irritation of mouth and stomach

5.3 **Treatment for Exposure** Get medical attention after all exposures to this compound
INHALATION remove victim and administer artificial respiration and oxygen if necessary
EYES flash with water for 15 min. SKIN wash several times with soap and water, treat as burn
INGESTION induce vomiting and follow with gastric lavage

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 382 mg/kg (rat)

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 147°F O.C. (120°F C.C.)

6.2 **Flammable Limits in Air** 0.9% - 6.5%

6.3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6.5 **Special Hazards of Combustion Products.** Toxic phenol vapors may form from hot material

6.6 **Behavior in Fire** May decompose violently when heated. Burning rate becomes more rapid as fire burns

6.7 **Ignition Temperature.** Decomposes violently at temperatures above 300°F

6.8 **Electrical Hazard.** Data not available

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials:** Decomposition is catalyzed by metals such as aluminum, copper, brass, zinc and lead. The reaction is not hazardous unless hot

7.3 **Stability During Transport:** Stable if kept below 125°F and out of direct sunlight

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Hercules Incorporated
Organics Department
Wilmington, Del. 19899
2. Reichhold Chemicals, Inc.
Specialty Chemicals Division
P.O. Box 9405
Austin, Texas 78766
3. Allied Chemical Corporation
Plastics Division
P.O. Box 2365R
Morristown, N.J. 07960

10 SHIPPING INFORMATION

10.1 **Grades or Purity** 77-85% the balance being cumene hydrocarbon

10.2 **Storage Temperature:** Below 125°F

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Containers must be stored in well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U-X Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Organic Peroxide

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	4
	OXY

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** Mixture

13.3 **Boiling Point at 1 atm:** Decomposes

13.4 **Freezing Point:** 16°F = −9°C = 264 K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity** 1.03 at 25°C (liquid)

13.8 **Liquid Surface Tension.** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension** (est.) 30 dynes/cm = 0.030 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion** (est.) −13,400 Btu/lb = −7,400 cal/g = −310 × 10³ J/kg

13.14 **Heat of Decomposition.** −855 Btu/lb = −475 cal/g = −199.9 × 10³ J/kg

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on page 3 and 4

3 CHEMICAL DESIGNATIONS (Cont'd.)

3.4 **IMCO/United Nations Numerical Designation.** 5.2/1524

CES — CUPRIETHYLENEDIAMINE SOLUTION

Common Synonyms

Liquid — Blue to dark purple — Fishy odor

Sinks and mixes with water. Irritating vapor is produced

AVOID CONTACT WHEN LIQUID. KEEP PEOPLE AWAY

Fire

Not flammable
Irritating gases may be produced when heated

Exposure

CAUTION: ALARM

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Method Handbook CG 446-4)

Issue warning: corrosive water contaminant
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cuprethylenediamine hydroxide solution

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula** $Cu(OH)_2 \cdot NH_2CH_2CH_2NH_2 \cdot H_2O$

3.4 **IMCO/United Nations Numerical Designation:** 8/1761

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Blue or dark purple (May contain red or blue sediment)

4.3 **Odor:** Like ammonia, fishy

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, organic canister mask, rubber gloves, protective clothing

5.2 **Symptoms Following Exposure:** Inhalation of vapor irritates mucous membrane and may cause asthma. Liquid causes severe irritation of eyes and possible corneal injury. Contact with skin causes irritation. Ingestion causes irritation of mouth and stomach

5.3 **Treatment for Exposure:** INHALATION: remove from exposure, support respiration, call physician. EYES: irrigate with large quantities of water for at least 15 min, call physician. SKIN: wash with large amounts of water. INGESTION: give large amounts of water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Non flammable solution

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Irritating vapors of ethylenediamine may be produced when heated

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Dissolves cotton, wood, and other cellulosic materials. Corrosive to copper, aluminum, zinc, and tin

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Olin Corporation
Fausta Paper Division
Pisgah Forest, N.C. 28768

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Nitrogen

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Mixture

13.3 **Boiling Point at 1 atm:** (approx.) 212°F = 100°C = 373°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** (est.) > 1.1 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

CYA	CYANOACETIC ACID

Common Synonyms			
Cyanacetic acid Malonic mononitrile	Liquid	Yellowish brown	Unpleasant odor
	Sinks and mixes with water		

	[illegible]
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat Harmful if inhaled [illegible] LIQUID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cyanacetic acid
Malonic mononitrile

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula:** CNCH-COOH

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** White

4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Contact irritates eyes and may irritate skin

5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amounts of water get medical attention EYES flush with water for at least 15 min SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Water, foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and toxic and flammable acetonitrile vapors may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Kay Fries Chemicals Inc
360 Lexington Ave
New York N Y 10017

2 Eastman Organic Chemicals
Rochester, N Y 14650

3 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 98+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 ***NAS Hazard Rating for Bulk Water Transportation:*** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	0	3
Flammability (Red)	1	1
Reactivity (Yellow)	0	0

*First column refers to nonfire situation

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 85 06

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 151°F = 66°C = 339°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** >1 1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** −6 300 Btu/lb = −3 500 cal/g = −146 × 10³ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 1 and 4

NOTES

CYG	# CYANOGEN

Common Synonyms	
Ethane dinitrile Dicyan Oxalic acid dinitrile Oxalonitrile Dicyanogen	Liquefied gas Colorless Almond Odor Floats and boils on water. Poisonous, flammable vapor cloud is produced.

Fire	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR POISONOUS IF INHALED Irritating to eyes LIQUID POISONOUS IF SWALLOWED Will cause frostbite
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, high flammability, air contaminant, water contaminant.
Restrict access.
Evacuate area.

2. LABELS

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethanedinitrile, Dicyan, Oxalic acid dinitrile, Oxalonitrile, Dicyanogen

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $(CN)_2$

3.4 **IMCO/United Nations Numerical Designation.** 2/1026

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied compressed gas

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic almond like, pungent, penetrating, may not be sufficiently strong to provide an adequate warning

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus, rubber gloves, rubber protective clothing, rubber-soled shoes

5.2 **Symptoms Following Exposure:** Vapor irritates eyes and causes giddiness, headache, fatigue and nausea if inhaled

5.3 **Treatment for Exposure:** In general, treatment is similar to that used following exposure to hydrogen cyanide. INHALATION: move victim to fresh air and have him lie down; do not permit him to exert himself; remove contaminated clothing but keep patient covered and comfortably warm; summon a physician; break an amyl nitrite pearl in a cloth and hold it lightly under the victim's nose for 15 seconds; repeat five times at about 15 sec intervals; use artificial respiration if breathing has stopped. EYES: flush with water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm

5.5 **Short-Term Inhalation Limits:** 5 mg/m³ for 30 min (as a cyanide)

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Flammable gas

6.2 **Flammable Limits in Air:** 6.6% - 43%

6.3 **Fire Extinguishing Agents:** If fire burn, shut off flow of gas, cool exposed areas with water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Unburned vapors are highly toxic

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode in fire, releasing the highly toxic gas

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction but water provides heat to vaporize liquid cyanogen

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Matheson Gas Products, P.O. Box 85, East Rutherford, N.J. 07073
2. Air Products and Chemicals, Inc., Specialty Gas Dept., P.O. Box 538, Allentown, Pa. 18105
3. Union Carbide Corp., Linde Division, 270 Park Avenue, New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 98.5%

10.2 **Storage Temperature:** Cool ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Store containers in well ventilated area

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

A B C K-L-M N

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous Class A

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	4
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 52.0

13.3 **Boiling Point at 1 atm:** −6.1°F = −21.1°C = 252.1°K

13.4 **Freezing Point:** −18.2°F = −27.9°C = 245.3°K

13.5 **Critical Temperature:** 259.9°F = 126.6°C = 399.8°K

13.6 **Critical Pressure:** 857 psia = 58.2 atm = 5.91 MN/m²

13.7 **Specific Gravity:** 0.954 at −21°C (liquid)

13.8 **Liquid Surface Tension:** 22 dynes/cm = 0.022 N/m at −21°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 1.8

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.205 at 25°C

13.12 **Latent Heat of Vaporization:** 200 Btu/lb = 111 cal/g = 4.65 × 10⁵ J/kg

13.13 **Heat of Combustion:** −9,059 Btu/lb = −5,033 cal/g = −210.6 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** 2,520 Btu/lb = 1,400 cal/g = 58.5 × 10⁶ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

CBR	# CYANOGEN BRIDE

Common Synonyms	Solid crystals Colorless Penetrating odor Sinks and mixes with water
	AVOID CONTACT WITH SOLID. Keep people away. [illegible]
Fire	**Not flammable** **POISONOUS GASES ARE PRODUCED WHEN HEATED** [illegible]
Exposure	CALL FOR MEDICAL AID **DUST** **POISONOUS IF INHALED OR IF SKIN IS EXPOSED** **Irritating to eyes** Move to fresh air [illegible] **SOLIDS** **POISONOUS IF SWALLOWED** **Will burn skin and eyes** [illegible] IF IN EYES hold eyelids open and flush with plenty of water IF SWALLOWED [illegible] CONSCIOUS [illegible] water or milk DO NOT INDUCE VOMITING
Water Pollution	**HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS** **May be dangerous if it enters water intakes** [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue safety [illegible] poison
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
No common synonyms

3 2 **Coast Guard Compatibility Classification:**
Not applicable

3 3 **Chemical Formula:** BrCN

3 4 **IMCO/United Nations Numerical Designation:** 6 1 1889

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Colorless

4 3 **Odor:** Penetrating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical cartridge respirator, goggles, protective clothing, rubber gloves

5 2 **Symptoms Following Exposure:** Same symptoms as hydrogen cyanide. Because it irritates the eyes, throat, and lungs severely, it is unlikely that anyone would voluntarily remain in areas with a high enough concentration to exert a toxic effect

5 3 **Treatment for Exposure:** Call a physician. INHALATION: remove victim to fresh air. If he is not breathing, give artificial respiration, preferably mouth to mouth. If symptoms of cyanide poisoning are observed, administer amyl nitrite as instructed for HCN. INGESTION: have victim drink water or milk, do NOT induce vomiting

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.3 ppm (suggested)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity:** Workers exposed to solutions may develop dermatitis

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact. Very injurious to the eyes

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air**
Not flammable

6 3 **Fire Extinguishing Agents:**
Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products:**
Poison gases are produced in fire

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:**
Strong bleaching powder solution
let stand 24 hr

7 5 **Polymerization:** Does not occur

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):**
Data not available

8 4 **Food Chain Concentration Potential.**
None

9 SELECTED MANUFACTURERS

1 Apache Chemicals
Rockford, Ill 61105

2 Columbia Organic Chemicals, Inc
912 Drake St
Columbia, S C 29205

3 Eastman Kodak Co
Eastman Organic Chemicals Division
Rochester, N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Data not available

10 2 **Storage Temperature**
Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

11

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Poisonous liquid or solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	1
Self Reaction	1

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 105.93

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point**
120 to 124°F = 49 to 51°C = 322 to 324°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.01 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 3.6

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page [illegible]

NOTES

CCL — CYANOGEN CHLORIDE

Common Synonyms

Liquid or compressed gas Colorless Sharp pungent odor

Poisonous vapor cloud is produced. Boiling point is 56° F

[illegible]

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED IN FIRE
[illegible]

Exposure

[illegible]

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes
[illegible]

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes
[illegible]

Water Pollution

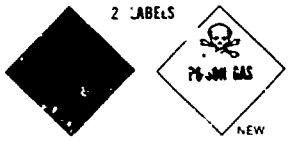
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning - poison
Restrict access
Evacuate area

2 LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** [illegible]

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CNCl

3.4 **IMCO/United Nations Numerical Designation:** 6.1 1589

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Compressed gas

4.2 **Color:** Colorless

4.3 **Odor:** Acrid choking

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible] respirator, oxygen, protective clothing

5.2 **Symptoms Following Exposure:** [illegible] and Canadian [illegible] with heavy chest edema, cough, shortness of breath, and tracheitis and pulmonary edema. It is probable that anyone would volunteer to remain [illegible] which [illegible] severe irritation of the eyes.

5.3 **Treatment for Exposure:** INHALATION: [illegible] oxygen, call a doctor. [illegible] INGESTION: [illegible] drink water or milk. [illegible] according

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm

5.5 **Short-Term Inhalation Limit:** Data not available

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** Long term exposure causes dermatitis, loss of appetite, headache, upper respiratory irritation in humans

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations

5.9 **Liquid or Solid Irritant Characteristics.** Severe irritant. Causes burns and third degree burns on short contact. Very dangerous to the eyes

5.10 **Odor Threshold:** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Overheated containers can explode

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Very slow reaction

7.2 **Reactivity with Common Materials:** Slow, not immediately hazardous

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 0.03 ppm* fish killed from cyanide
*Duration not specified

8.2 **Waterfowl Toxicity.** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Gallard-Schlesinger Chemical Manufacturing Corp
American Chemical Co. Division
344 Minola Ave
Carle Place, N.Y. 11514

2. Nuclear Chemicals Inc
5000 Mulington Road
Memphis, Tenn. 38127

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A C I J X

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous gas or liquid, Class A

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Gas

13.2 **Molecular Weight** 61.48

13.3 **Boiling Point at 1 atm.** [illegible]

13.4 **Freezing Point:** 20°F = -6.9°C = 266.3°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.22 at 0°C (gas)

13.8 **Liquid Surface Tension** 24.6 dynes/cm = 0.0246 N/m at 19°C

13.9 **Liquid-Water Interfacial Tension.** Data not available

13.10 **Vapor (Gas) Specific Gravity:** 2.1

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.22+

13.12 **Latent Heat of Vaporization** [illegible]

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

CHX	# CYCLOHEXANE

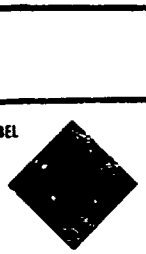
Common Synonyms: Hexahydrobenzene	Water's liquid — Colorless — Gasoline-like odor Floats on water. Flammable irritating vapor is produced. Freezing point is 44° F
	[illegible]
Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat If inhaled, will cause dizziness, narcosis, vomiting or loss of consciousness [illegible] LIQUID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning: High flammability
Evacuate area
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Hexahydrobenzene
Hexamethylene
Hexanaphthene

3.2 **Coast Guard Compatibility Classification:** Paraffin

3.3 **Chemical Formula:** C_6H_{12}

3.4 **IMCO United Nations Numerical Designation:** 3.1 1145

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Resembling benzene mild sweet resembling chloroform

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Hydrogen sulfide vapor canister, supplied air or self-contained breathing apparatus, hydrocarbon insoluble rubber or plastic gloves, chemical goggles or face shield, hydrocarbon insoluble rubber or plastic apron

5.2 **Symptoms Following Exposure:** Dizziness, headache and nausea. Inhalation of vapor may cause unconsciousness and collapse

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, if breathing [illegible] apply artificial respiration and administer oxygen. SKIN OR EYE CONTACT: remove contaminated clothing and gently flush affected areas with water for [illegible] minutes

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 400 ppm

5.5 **Short-Term Inhalation Limits:** 300 ppm for 60 min

5.6 **Toxicity by Ingestion:** Grade 1 [illegible]

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system at present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] F C.C.

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible] mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 15,500 ppm/24 hr mosquito fish, [illegible] fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Exxon Chemical Co., Houston, Texas 77001
2. Phillips Petroleum Co., Bartlesville, Okla. 74004
3. Texaco Inc., 135 East 42nd St., New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Research grade 99.5+, 99.9+; commercial 99.9+

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arresters or pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

X-T-L-V-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	[illegible]
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	[illegible]
Poisons	2
Water Pollution	
Human Toxicity	[illegible]
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** [illegible]

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 50 dynes/cm = 0.050 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** No pertinent

13.15 **Heat of Solution:** No pertinent

13.16 **Heat of Polymerization:** No pertinent

[illegible]

NOTES

REVISED 1978

CHN	CYCLOHEXANOL

Common Synonyms
Hexalin
Hexahydrophenol
Cyclohexyl alcohol
Hydroxycyclohexane

Oily liquid — Colorless to light yellow — Alcohol odor

Floats and mixes slowly with water. May solidify. Freezing point is 75°F

Fire

Combustible

Exposure

LIQUID OR SOLID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Adronal, Hexalin, Anol, Hexahydrophenol, Cyclohexyl alcohol, Hydroxycyclohexane

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $C_6H_{11}OH$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid

4.2 **Color:** Colorless to faintly yellow

4.3 **Odor:** Like camphor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield

5.2 **Symptoms Following Exposure:** Narcosis, depression. Other central nervous system tending to produce sleep or unconsciousness

5.3 **Treatment for Exposure:** Eye contact is more hazardous than other exposure. Skin irritation or ingestion. Flush eyes with water and remove clothing. Resuscitate

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 50 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD50 [illegible] g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause slight smarting. The eyes or respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure and may cause secondary burns on long exposure

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 100°F (C.C.) 154°F (C.C.)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

3.7 **Ignition Temperature:** 572°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.9 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 0.08 lb/lb/5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp
Specialty Chemicals Division
Hopewell, Va. 23860

2. Monsanto Co.
Monsanto Industrial Chemicals Co.
St. Louis, Mo. 63166

3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical pure

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A P Q T U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 100.16

13.3 **Boiling Point at 1 atm.:** 322°F = 161°C = 434°K

13.4 **Freezing Point:** 74.3°F = 23.5°C = 296.5°K

13.5 **Critical Temperature:** 666°F = 352°C = 625°K

13.6 **Critical Pressure:** 540 psia = 37 atm = 3.7 MN/m²

13.7 **Specific Gravity:** 0.947 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 34.2 dynes/cm = 0.0342 N/m at 19.2°C

13.9 **Liquid-Water Interfacial Tension:** 39 dynes/cm = 0.0039 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.071

13.12 **Latent Heat of Vaporization:** 196 Btu/lb = 109 cal/g = 4.56 × 10⁵ J/kg

13.13 **Heat of Combustion:** 16 000 Btu/lb = 8910 cal/g = 3.73 × 10⁷ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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CCH	CYCLOHEXANONE

Common Synonyms	
Cyclohexyl ketone	Watery liquid — Colorless to light yellow — Sweet, peppermint odor Floats and mixes slowly with water

	[illegible]
Fire	Combustible [illegible]
Exposure	[illegible] **LIQUID** **Will burn skin and eyes** **Harmful if swallowed** [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Dispersal and fl[illegible]

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Anon
Cyclohexyl ketone
Hexal O
Nadone
Pimelic ketone
Sextone

3 2 **Coast Guard Compatibility Classification:** Ketone

3 3 **Chemical Formula:** $C_6H_{10}CO$

3 4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to light yellow

4 3 **Odor:** Like peppermint and acetone

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical goggles

5 2 **Symptoms Following Exposure:** Inhalation of vapors from hot material causes narcosis. The liquid may cause dermatitis

5 3 **Treatment for Exposure:** Immediately flush eyes with plenty of water, call a physician

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 50 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 2 LD50 [illegible] g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Characteristics:** [illegible] the skin and eyes on direct contact by [illegible] exposure and may cause [illegible] dermatitis. Burns with prolonged exposure

5 10 **Odor Threshold:** 0.12 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** 129°F O.C. 111°F C.C.

6 2 **Flammable Limits in Air:** 1.1 - 9.3

6 3 **Fire Extinguishing Agents.** Use dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** [illegible]

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 4.2 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

Allied Chemical Corp
Specialty Chemicals Div
Hopewell, Virginia 23860

E. I. du Pont de Nemours & Co
Industrial & Biochemicals Dept
Wilmington, Delaware 19898

Monsanto Co
Monsanto Industrial Chemicals Co
800 North Lindbergh Blvd
St. Louis, Missouri 63166

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical [illegible]

10 2 **Storage Temperature:** Data not available

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A P Q T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	[illegible]
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at 1 atm:** 312.4°F = [illegible]°C = 429.[illegible]°K

13 4 **Freezing Point:** −24.2°F = −[illegible]°C = 242.[illegible]°K

13 5 **Critical Temperature:** [illegible]°F = [illegible]°C = [illegible]°K

13 6 **Critical Pressure:** [illegible] atm = [illegible] MN/m²

13 7 **Specific Gravity:** [illegible] g/cm³ at 20°C

13 8 **Liquid Surface Tension.** [illegible] dynes/cm at 20°C

13 9 **Liquid-Water Interfacial Tension:** 90 dynes/cm = 0.090 N/m at 22.7°C

13 10 **Vapor (Gas) Specific Gravity:** [illegible]

13 11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13 12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] kJ/kg

13 13 **Heat of Combustion:** −[illegible] Btu/lb = [illegible] cal/g = [illegible] kJ/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued next page

NOTES

REVISED 1978

CHP	CYCLOHEXANONE PEROXIDE

Common Synonyms			
1 Hydroperoxycyclohexyl 1 hydroxycyclohexyl peroxide Hydroperoxycyclohexyl hydroxycyclohexyl peroxide Dicyclohexanone diperoxide	Thick liquid Sinks in water	White	Odorless

Fire	Combustible Containers may explode in fire
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: oxidizing material water contaminant
Mechanical treatment
Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Hydroperoxycyclohexyl 1 hydroxycyclohexyl peroxide, Hydroperoxycyclohexyl hydroxycyclohexyl peroxide, Cadox HDP, Luperco JDB-50-T, Dicyclohexanone diperoxide

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula:** $C_6H_{10}(OOH)\text{-}O\text{-}O\text{-}C_6H_{10}OH$ in dimethylphthalate

Continued on page 4

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid or paste

4 2 **Color:** Colorless or white

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves, protective clothing

5 2 **Symptoms Following Exposure:** Irritates eyes and skin, burns. Ingestion causes irritation mouth and stomach

5 3 **Treatment for Exposure:** EYES flush with water for at least 15 min, get medical attention. SKIN wipe off and wash with soap and water, get medical attention. INGESTION induce vomiting, get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] g/kg

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Combustible liquid (>100°F C.C. Cleveland open cup)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water fog, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** May explode

6 7 **Ignition Temperature** [illegible] dimethylphthalate

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Pennwalt Corporation
Lucidol Division
P O Box 1201
Buffalo, N Y 14240

Day Industries Inc
Arco Chemical Division
555 Garden Street
Elyria, Ohio 44035

Stokes Chemical Corp
500 Agard Road
Muskegon, Mich 49445

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 45 percent in dimethylphthalate

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (Pressure vent)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

[illegible]

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Organic Peroxide

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid or liquid

13 2 **Molecular Weight:** Mixture

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** [illegible] at 20°C (liquid)

13 8 **Liquid Surface Tension:** [illegible] dynes/cm = [illegible] N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** [illegible] dynes/cm = [illegible] N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg

13 14 **Heat of Decomposition:** Data not available

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** None

Continued on pages 5 and 6

3 CHEMICAL DESIGNATIONS (Cont'd.)

3 4 **IMCO/United Nations Numerical Designation:** 1 00°1 (>70%) 5 2 1525 (<70%)

CHT	CYCLOHEXENYLTRICHLOROSILANE

Common Synonyms	Liquid	Colorless	Sharp irritating odor
	Reacts with water. Poisonous gas is produced on contact with water		

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

GAS PRODUCED IN REACTION WITH WATER
POISONOUS IF INHALED
Irritating to eyes, nose and throat

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: corrosive, water contaminant
Restrict access
Disperse and flush with care

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $C_6H_{10}SiCl_3$
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sharp, hydrochloric acid-like pungent and irritating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor, [illegible] respirator, rubber gloves, chemical workers goggles, other protective equipment as necessary to protect skin and eyes
5.2 **Symptoms Following Exposure:** Inhalation causes [illegible] of mucous membrane. Contact with eyes or skin causes severe burns. Ingestion causes severe burns of mouth and stomach
5.3 **Treatment for Exposure:** Get medical attention immediately following all exposures to this compound. INHALATION: remove from exposure, support respiration. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: give large amounts of water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 2,830 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** [illegible]
6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]
6.5 **Special Hazards of Combustion Products:** Irritating [illegible]
6.6 **Behavior in Fire:** [illegible]
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** [illegible]
6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]
7.2 **Reactivity with Common Materials:** [illegible]
7.3 **Stability During Transport:** [illegible]
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water [illegible]
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** [illegible]

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]
8.2 **Waterfowl Toxicity:** [illegible]
8.3 **Biological Oxygen Demand (BOD):** [illegible]
8.4 **Food Chain Concentration Potential:** [illegible]

9. SELECTED MANUFACTURERS

[illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** [illegible]
10.4 **Venting:** Pressure [illegible]

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classification:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 7 and 8

NOTES

CHA	# CYCLOHEXYLAMINE

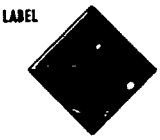
Common Synonyms Aminocyclohexane Hexahydroaniline	Liquid Colorless Strong fishy odor Floats and mixes with water
[illegible]	
Fire	**FLAMMABLE** Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area [illegible]
Exposure	CALL FOR MEDICAL AID **LIQUID** Will burn skin and eyes Harmful if swallowed [illegible] IF IN EYES [illegible] water IF SWALLOWED [illegible] CONSCIOUS [illegible] drink water DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Aminocyclohexane
Hexahydroaniline

3 2 **Coast Guard Compatibility Classification**
Aliphatic amine

3 3 **Chemical Formula:** $C_6H_{11}CH_2NH_2$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Strong fishy

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Rubber gloves chemical goggles approved Bureau of Mines respirator for organic vapors

5 2 **Symptoms Following Exposure** Cyclohexylamine is strongly caustic. Inhalation of vapors and contact of liquid with skin and eyes causes severe burns

5 3 **Treatment for Exposure** INGESTION do NOT induce vomiting EYES flush with water for at least 15 min and obtain immediate medical attention SKIN immediately remove contaminated clothing and flush skin with large amounts of water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 300 mg/m³

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 LD_{50} 50 to 500 mg/kg

5 7 **Late Toxicity:** Produced cancer of the bladder in the rat.

5 8 **Vapor (Gas) Irritant Characteristics.** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics** Severe skin irritant Causes second and third degree burns on short contact very injurious to the eyes

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 90°F O C

6 2 **Flammable Limits in Air:**
Data not available

6 3 **Fire Extinguishing Agents:** Foam carbon dioxide dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products:**
Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 560°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 5 0 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).**
Data not available

8 4 **Food Chain Concentration Potential.**
None

9. SELECTED MANUFACTURERS

1 Abbott Laboratories
Chemical Division
Wichita Kansas 67200

2 Monsanto Co
Monsanto Industrial Chemicals Co
800 North Lindbergh Blvd
St Louis Mo 63166

3 Virginia Chemicals Inc
3340 West Norfolk Rd
Portsmouth Virginia 23703

10 SHIPPING INFORMATION

10 1 **Grades or Purity**
Data not available

10 2 **Storage Temperature:**
Data not available

10 3 **Inert Atmosphere** Data not available

10 4 **Venting** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-P-Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Flammable Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 99 lb

13 3 **Boiling Point at 1 atm.**
274 1°F = 134 5°C = 407 7°K

13 4 **Freezing Point:** 0 1°F = −17 7°C = 255 5°K

13 5 **Critical Temperature:**
648°F = 342°C = 615°K

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 0 865 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization:**
158 Btu/lb = 87 6 cal/g = 3 67 × 10⁵ J/kg

13 13 **Heat of Combustion:** (est) −18 000 Btu/lb
= −10 000 cal/g = −420 × 10⁵ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** (est) 4 Btu/lb
= −2 cal/g = −0 1 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 4 and 5

NOTES

CYP — CYCLOPENTANE

Common Synonyms			
Pentamethylene	Water: liquid	Colorless	Mild, sweet odor
	Floats on water. Flammable, irritating vapor is produced		

[illegible]

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause dizziness, nausea, vomiting, difficult breathing or loss of consciousness
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible] CONSCIOUS [illegible] milk
DO NOT INDUCE VOMITING

Water Pollution

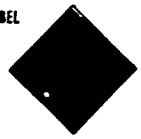
Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Evacuate area
Disperse and flush

2 LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Pentamethylene
3 2 **Coast Guard Compatibility Classification** Saturated hydrocarbon
3 3 **Chemical Formula:** C_5H_{10}
3 4 **IMCO/United Nations Numerical Designation.** 3 1-1146

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Like gasoline, mild sweet

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Hydrocarbon canister, supplied air, or hose mask, rubber or plastic gloves, chemical goggles or face shield
5 2 **Symptoms Following Exposure:** Inhalation causes dizziness, nausea, and vomiting; concentrated vapor may cause unconsciousness and collapse. Vapor causes slight smarting of eyes. Contact with liquid causes irritation of eyes and may irritate skin if allowed to remain. Ingestion causes irritation of stomach. Aspiration produces severe lung irritation and rapidly developing pulmonary edema; central nervous system excitement followed by depression
5 3 **Treatment for Exposure:** INHALATION: remove to fresh air; if breathing stops, apply artificial respiration and administer oxygen. EYES: flush with water for at least 15 min; call a physician. SKIN: flush well with water, then wash with soap and water. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. ASPIRATION: enforce bed rest, give oxygen, get medical attention
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits:** 300 ppm for 60 min
5 6 **Toxicity by Ingestion.** Grade 2; LD_{50} 0.5 to 5 g/kg
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** <20°F C.C.
6 2 **Flammable Limits in Air:** (approx.) LFL 1.4%, UFL 8.7%
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Containers may explode
6 7 **Ignition Temperature:** 716°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** 7.9 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Phillips Petroleum Company
Chemical Department
Special Products Division
Bartlesville, Okla. 74004

2 Aldrich Chemical Co.
940 West St. Paul Avenue
Milwaukee, Wis. 53233

3 Pfaltz & Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity.** Commercial 60% (remainder consists of hydrocarbons of similar boiling point). Research 99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U-A-W

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 70.1
13 3 **Boiling Point at 1 atm.** 120.7°F = 49.3°C = 322.5°K
13 4 **Freezing Point:** −137.0°F = −93.9°C = −179.3°K
13 5 **Critical Temperature:** 461.5°F = 238.6°C = 511.8°K
13 6 **Critical Pressure:** 654 psia = 44.4 atm = 4.51 MN/m
13 7 **Specific Gravity:** 0.74 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 23 dynes/cm = 0.023 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** (est.) 28 dynes/cm = 0.028 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** 2.4
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.1217
13 12 **Latent Heat of Vaporization:** 170 Btu/lb = 94 cal/g = 3.9 × 10⁵ J/kg
13 13 **Heat of Combustion:** −19,990 Btu/lb = −11,110 cal/g = −46.5 × 10⁶ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CPR	CYCLOPROPANE

Common Synonyms			
Trimethylene	Liquefied gas	Colorless	Mild sweet odor
	Floats and boils on water	Flammable visible vapor cloud is produced	

[illegible]

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

[illegible]

Exposure

[illegible]

VAPOR
If inhaled will cause difficult breathing

[illegible]

LIQUID
Will cause frostbite

[illegible]

Water Pollution

Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Evacuate area

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Trimethylene
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** C_3H_6
3 4 **IMCO/United Nations Numerical Designation:** [illegible]/1027

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquefied gas
4 2 **Color:** Colorless
4 3 **Odor:** Sweet slightly pungent not irritating characteristic odor, like light petroleum solvent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus for high concentrations of vapor safety goggles or face shield
5 2 **Symptoms Following Exposure:** Inhalation causes some analgesia anesthesia pupil dilation shallow depth of respirations decreasing muscle tone Contact with liquid may cause frostbite
5 3 **Treatment for Exposure:** INHALATION remove promptly to fresh air if symptoms of asphyxiation persist administer artificial respiration and oxygen treat symptomatically thereafter SKIN if frostbite has occurred apply warm water treat burn
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 400 ppm (suggested)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity** None
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Flammable gas
6 2 **Flammable Limits in Air:** 2.4% - 10.3%
6 3 **Fire Extinguishing Agents:** Shut off flow of gas
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire:** Containers may explode
6 7 **Ignition Temperature:** 532°F
6 8 **Electrical Hazard:** Class I Group C
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** None
8 2 **Waterfowl Toxicity** None
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Airco Inc
Ohio Medical Products Division
3030 Airco Drive
Madison Wis 53701

2 Matheson Gas Products Co
East Rutherford N J 07073

3 Air Products and Chemicals Inc
Specialty Gas Department
P O Box 538
Allentown, Pa 18105

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99.5+% USP
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-B C D E-F G

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable compressed gas
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas
13 2 **Molecular Weight:** 42.1
13 3 **Boiling Point at 1 atm:** −27.2°F = −32.9°C = 240.3°K
13 4 **Freezing Point:** −197.3°F = −127.4°C = 145.8°K
13 5 **Critical Temperature:** 256.5°F = 124.7°C = 397.9°K
13 6 **Critical Pressure:** 798 psia = 54.2 atm = 5.50 MN/m
13 7 **Specific Gravity:** 0.676 at −33°C (liquid)
13 8 **Liquid Surface Tension:** 22 dynes/cm = 0.022 N/m at −40°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity** 1.48
13 11 **Ratio of Specific Heats of Vapor (Gas).** 1.1790
13 12 **Latent Heat of Vaporization.** 203 Btu/lb = 113 cal/g = 4.73 × 10⁵ J/kg
13 13 **Heat of Combustion:** −21 247 Btu/lb = −11 804 cal/g = −493.88 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(continued on pages 5 and 6)

NOTES

CMP	p-CYMENE

Common Synonyms			
p-Isopropyltoluene 1-Methyl-4-isopropylbenzene Cymol Methylpropylbenzene Isopropylcresol	Liquid Floats on water	Colorless	Mild pleasant odor

Fire	**Combustible**
Exposure	**LIQUID** **Irritating to skin and eyes**
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cymol p-Isopropyltoluene Isopropyltoluol 1 Methyl-4 isopropylbenzene Methyl propyl benzene

3 2 **Coast Guard Compatibility Classification:** Aromatic hydrocarbon

3 3 **Chemical Formula:** p-$CH_3C_6H_4CH(CH_3)_2$

3 4 **IMCO/United Nations Numerical Designation:** 3 3 2046

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild pleasant aromatic solvent type

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained or air-line breathing apparatus solvent resistant rubber gloves chemical splash goggles

5 2 **Symptoms Following Exposure:** Inhalation causes impairment of coordination headache Contact with liquid causes mild irritation of eyes and skin Ingestion causes irritation of mouth and stomach

5 3 **Treatment for Exposure:** INHALATION remove victim from contaminated area administer artificial respiration if necessary call physician EYES flush with water for 15 min call a physician SKIN wipe off liquid wash well with soap and water INGESTION induce vomiting get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral rat LD_{50} = 4 750 mg/kg Oral human TD_{Lo} (lowest toxic dose) = 56 mg/kg (affects central nervous system)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain, may cause smarting [illegible] skin

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 140°F O C 117°F C C

6 2 **Flammable Limits in Air:** 0 7% 5 6%

6 3 **Fire Extinguishing Agents:** Foam dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 817°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 0 1 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Hercules Incorporated
Organics Department
Wilmington Del 19899

2 Eastman Kodak Co
Eastman Organic Chemicals
Rochester N Y 14650

3 Aldrich Chemical Co
940 West St Paul Avenue
Milwaukee Wis 53233

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 95+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 134 2

13 3 **Boiling Point at 1 atm:** 352°F = 177°C = 450°K

13 4 **Freezing Point:** −90 2°F = −67 9°C = 205 3°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 857 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 28 09 dynes/cm = 0 028 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** 36 41 dynes/cm = 0 0364 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 122 Btu/lb = 67 8 cal/g = 2 84 × 10 J/kg

13 13 **Heat of Combustion:** −18 800 Btu/lb = −10 440 cal/g = −43 7 × 10 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

DIP

DALAPON

Common Synonyms			
2,2 Dichloropropanoic acid 2,2 Dichloropropionic acid	Liquid	Colorless	Acrid odor
	Sinks and mixes with water		

Avoid contact with liquid and vapor

Fire	Combustible
Exposure	**CALL FOR MEDICAL AID** **VAPOR** Irritating to eyes, nose and throat **LIQUID** Will burn skin and eyes Harmful if swallowed **DO NOT INDUCE VOMITING**
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2,2 Dichloropropanoic acid, alpha, alpha-Dichloropropionic acid, 2,2-Dichloropropionic acid

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** CH_3CCl_2COOH

3.4 **IMCO/United Nations Numerical Designation:** 8 1760

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Acrid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing including goggles, gloves and boots, self-contained breathing apparatus

5.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of nose, mouth and lungs. Ingestion causes severe irritation of mouth and stomach. Contact with eyes or skin causes irritation and burns

5.3 **Treatment for Exposure:** INHALATION: move to fresh air, if patient is not breathing give artificial respiration, keep patient quiet, get medical attention. INGESTION: give large amounts of water, get medical attention. EYES: flush with water for at least 15 min, get medical attention. SKIN: flush with water, get medical attention if irritation persists

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 3.65 g/kg (mouse), 7.57 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 2500 mg/m³

6. FIRE HAZARDS

6.1 **Flash Point:** Data not available

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Irritating fumes of hydrochloric acid may form in fire

6.6 **Behavior in Fire:** Volatilizes with steam

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly to form hydrochloric and pyruvic acids. The reaction is not hazardous

7.2 **Reactivity with Common Materials:** Very corrosive to aluminum and copper alloys. Flammable and explosive hydrogen gas may form in enclosed spaces

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute sodium bicarbonate or soda ash solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
105 ppm/96 hr/bluegill/TL_m/fresh water
1 ppm/48 hr/brown shrimp/TL_m/salt water

8.2 **Waterfowl Toxicity:** > 5,000 ppm LC_{50}

8.3 **Biological Oxygen Demand (BOD)**
0.64 lb/lb/5 days, unacclimated seed
0.32 lb/lb/5 days, acclimated seed

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Dow Chemical Co
Midland, Mich 48640

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical grade 90%, solid formulations of sodium and magnesium salts are sometimes referred to as Dalapon and are much less corrosive

10.2 **Storage Temperature:** 70–90°F

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 143

13.3 **Boiling Point at 1 atm:** 374°F = 190°C = 463°K

13.4 **Freezing Point:** 46°F = 8°C = 281°K

13.5 **Critical Temperature:** Not available

13.6 **Critical Pressure:** Data not available

13.7 **Specific Gravity:** 1.39 at 23°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 4.9

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Data not available

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

DDD	DDD

Common Synonyms		
TDE 1,1 Dichloro-2,2 bis(p-chlorophenyl) ethane Dichlorodiphenyldichloroethane	Solid	White
	Sinks in water	

[illegible]

Fire	Combustible Irritating gases may be produced when heated [illegible]
Exposure	CALL FOR MEDICAL AID **DUST** Irritating to eyes, nose and throat Harmful if inhaled [illegible] **SOLID** Irritating to skin and eyes. Harmful if swallowed [illegible] IF INHALED [illegible] IF SWALLOWED [illegible] CONSCIOUS [illegible] water [illegible] IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1,1 Dichloro-2 2 bis (p-chlorophenyl) ethane, Dichlorodiphenyldichloroethane, TDE

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $(4\,ClC_6H_4)\,CH\,CHCl$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion causes vomiting and elevated symptoms similar to those caused by DDT Contact with eyes causes irritation

5 3 **Treatment for Exposure:** INGESTION treatment should be given by a physician and is similar to that given following ingestion of DDT EYES flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 1 2 g/kg (mouse) 3 4 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
<2 6 ppm/96 hr catfish TL_m fresh water
0 15 0 2 ppm 48 hr brown shrimp TL_m salt water
0 0068 ppm 24 hr brown shrimp TLC_{50} salt water

8 2 **Waterfowl Toxicity:** 4 600-5 200 ppm LC_{50}

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** High

9. SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee, Wis 53233

2 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford, Conn 06902

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 320

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 234°F = 112°C = 385°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 476 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heat of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DDT	DDT

Common Synonyms: Dichlorodiphenyltrichloroethane; p,p' DDT	Solid; Colorless; Odorless; Sinks in water

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

SOLIDS
Irritating to skin and eyes.
If swallowed will cause nausea, vomiting, headache, or loss of consciousness.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Should be removed

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dichlorodiphenyltrichloroethane; p,p' DDT; 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $(p\text{-}ClC_6H_4)_2CHCCl_3$

3.4 **IMCO United Nations Numerical Designation:** 3

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Data not available

5.2 **Symptoms Following Exposure:** Very large doses are followed promptly by vomiting, diarrhea, local gastric irritation, delayed emesis or diarrhea may occur. With smaller doses symptoms usually appear 2 hours after ingestion. These include tingling of lips, tongue, and face, malaise, headache, sore throat, fatigue, coarse tremors of neck, head, and eyelids, apprehension, ataxia, and confusion. Convulsions may alternate with periods of coma and partial paralysis. Vital signs are essentially normal but in severe poisoning the pulse may be irregular and abnormally slow. Ventricular fibrillation and sudden death may occur at any time during acute phase. Pulmonary edema usually indicates solvent aspiration.

5.3 **Treatment for Exposure:** INGESTION: Treatment should be done by a physician. It usually includes gastric lavage and administration of saline cathartic, phenobarbital and parenteral fluids. Patient should be kept quiet and under observation for at least 24 hours.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 3 LD50 to 500 mg/kg (rats)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. Repeated or prolonged contact to remain may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** 16.2°F (-9°C)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases may be generated

6.6 **Behavior in Fire:** Melts and burns

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.0039 ppm, 24 hr, bass, TL_m, fresh water
0.0018 ppm, 96 hr, bass, TL_m, fresh water
0.0028 ppm, 48 hr, redfish, SD_{50}, salt water

8.2 **Waterfowl Toxicity:** 2240 mg/kg

8.3 **Biological Oxygen Demand (BOD):** Not pertinent

8.4 **Food Chain Concentration Potential:** High

9 SELECTED MANUFACTURERS

1. Lebanon Chemical Corp, Lebanon, Pa 17042
2. Montrose Chemical Corp of Calif, 5801 South Vigil Ave, Los Angeles, Calif 90003

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-A

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 354.5

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** 226.1°F = 108.5°C = 381.7°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.56 at 15°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

DBR	DECABORANE

Common Synonyms	Solid	White	Sharp odor
	Floats on water		

[illegible]

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
[illegible]

Exposure

[illegible]

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
[illegible]

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
water contaminant - potion
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $B_{10}H_{14}$

3.4 **IMCO/United Nations Numerical Designation:** 4.1 1868

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus or positive pressure hose mask, rubber boots or overshoes, clothing made of material resistant to decaborane, rubber gloves, chemical-type goggles or face shield

5.2 **Symptoms Following Exposure:** (The onset of symptoms is frequently delayed until one or two days after exposure.) Inhalation or ingestion causes headache, nausea, light headedness, drowsiness, nervousness, lack of coordination, and tremor, muscle spasms and generalized convulsions may occur. Dust irritates eyes and skin and may give same systemic symptoms as for inhalation of left on skin

5.3 **Treatment for Exposure:** Get medical attention after all exposures to this compound. Symptoms may be delayed for 48 hours. INHALATION: move patient to fresh air. Keep him warm and quiet. EYES: flush with water for at least 15 min. SKIN: immediately wash with soap and plenty of water. INGESTION: if victim is conscious, give a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. *Note to physician:* Treat symptomatically. administration of methocarbamol or other muscle relaxant may be helpful immediately following exposure and in the absence of symptoms

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 40 mg/kg (mouse)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** (Flammable solid) 176°F C.C.

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, and carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Halogenated extinguishing agents

6.5 **Special Hazards of Combustion Products:** May give toxic fumes of unburned material

6.6 **Behavior in Fire:** May explode when hot. Burns with a green-colored flame

6.7 **Ignition Temperature:** 300°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly to form flammable hydrogen gas, which can accumulate in closed area

7.2 **Reactivity with Common Materials:** Corrosive to natural rubber, some synthetic rubbers, some greases, and some lubricants

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with 3% aqueous ammonia solution, then with water. Methyl alcohol may also be used

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Water Marine Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Callery Chemical Company, Callery, Pa. 16024
2. Stream Chemicals Inc., 150 Andover St., Danvers, Mass. 01923
3. K & K Laboratories Inc., 121 Express Street, Plainview, N.Y. 11803

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 95+%, High purity 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

H RR

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable solid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 122.3

13.3 **Boiling Point at 1 atm:** 415°F = 213°C = 486°K

13.4 **Freezing Point:** 210°F = 99°C = 372°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.94 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** −28,699 Btu/lb = −15,944 cal/g = −66.7 × 10³ J/kg

13.14 **Heat of Decomposition:** −279 Btu/lb = −155 cal/g = −6.49 × 10³ J/kg

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

5. HEALTH HAZARDS (Cont'd.)

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 0.05 ppm

DHN	DECAHYDRONAPHTHALENE

Common Synonyms			
Bicyclo [4 4 0] decane Naphthalane Perhydronaphthalene Dec Decalin	Liquid	Colorless	Turpentine-like odor
	Floats on water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes If swallowed will cause headache, nausea, or vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Bicyclo [4 4 0] decane, Naphthalane, Perhydronaphthalene, Dec, Decalin, Decalin, Naphthane, cis or trans Decahydronaphthalene

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_{10}H_{18}$

3 4 **IMCO/United Nations Numerical Designation:** 3 3 1144

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Aromatic like turpentine, mild characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air mask or self-contained breathing apparatus if in enclosed tank, rubber gloves or protective cream, goggles or face shield

5 2 **Symptoms Following Exposure:** Inhalation or ingestion irritates nose and throat, causes nausea, headache, vomiting, urine may become blue. Irritates eyes. Liquid defats skin and causes cracking and secondary infection, eczema may develop

5 3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES: flush with water for at least 15 min. SKIN: wash with water and mild soap. INGESTION: give emetic such as warm salt water, followed by a mild cathartic, direct physician to conserve liver and kidneys function

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm (suggested)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 4 170 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 134°F C.C.

6 2 **Flammable Limits in Air:** 0.7% - 4.9%

6 3 **Fire Extinguishing Agents:** Water, foam, dry chem, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 482°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 5.9 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Progil Inc
509 Madison Avenue
New York, N.Y. 10022

2 E I duPont de Nemours & Co
Organic Chemicals Department
Dyes and Chemicals Division
Wilmington, Del 19898

3 Eastman Kodak Co
Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical mixture of cis-(35%) and trans-(65%) isomers. Properties of all such mixtures are very similar. Spectro grade

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T 1

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification Health	Classification Danger
Health Hazard (Blue)	0	2
Flammability (Red)	2	2
Reactivity (Yellow)	0	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 138.2

13 3 **Boiling Point at 1 atm:** 383°F = 195°C = 468°K

13 4 **Freezing Point:** −44°F = −42°C = 231°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.89 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 30 dynes/cm = 0.030 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** 51.5 dynes/cm = 0.0515 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 130 Btu/lb = 72 cal/g = 3.0 × 10⁵ J/kg

13 13 **Heat of Combustion:** −19,200 Btu/lb = −11,700 cal/g = −44.7 × 10⁶ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 3 and 4)

NOTES

DAL	DECALDEHYDE

Common Synonyms: Decanal, Caprinaldehyde, Capraldehyde	Liquid	Colorless to light yellow	Pleasant odor
	Floats on water. Freezing point in 64° F		

[illegible]

Fire	Combustible [illegible]
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Aldehyde [illegible]
Caprinaldehyde
Capraldehyde
Decanal
n-Decylaldehyde

3.2 **Coast Guard Compatibility Classification:** Aldehyde

3.3 **Chemical Formula:** $CH_3(CH_2)_8CHO$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale yellow

4.3 **Odor:** Pleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing and chemical goggles

5.2 **Symptoms Following Exposure:** On direct contact, [illegible] produce eye and skin [illegible] low general toxicity

5.3 **Treatment for Exposure:** CONTACT WITH EYES AND SKIN [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 0; LD_{50} 33.3 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Skin effects thought to be minor

5.10 **Odor Threshold:** 0.168 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 185° F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Givaudan Corp.
Aroma Chemicals Division
Clifton, N. J. 07014

2. International Flavors and Fragrances, Inc.
Union Beach, N. J. 07735

3. E. Ritter and Co.
4001 Goodwin Ave.
Los Angeles, Calif. 90039

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A T U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** 28.0 dynes/cm = 0.0280 N/m at 24°C

13.9 **Liquid-Water Interfacial Tension:** 16.9 dynes/cm = 0.0169 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

REVISED 1978

DCE	1-DECENE

Common Synonyms: alpha-Decene

Water Appearance: Colorless — Odor: Fishnet odor

Floats on water

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook (CG-446-2)

Mechanical (containment)

Should be recovered

Chemical and physical treatment

2. LABELS

No hazardous materials labels required by Coast Guard Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** alpha-Decene

3.2 **Coast Guard Compatibility Classification:** Oil's

3.3 **Chemical Formula:** $CH_2=CH(CH_2)_7CH_3$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild pleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical splash goggles and impervious face shield

5.2 **Symptoms Following Exposure:** Vapors may produce slight irritation of eyes and respiratory tract. Prolonged exposure may produce nausea and high concentration

5.3 **Treatment for Exposure:** CONTACT WITH EYES OR SKIN: Affected eyes should be washed with plenty of water. Skin areas should be washed with soap and water. Contaminated clothing should be considered hazardous

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Slight irritation of eyes and respiratory system at high concentrations. Irritation is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Moderate irritant. If spilled on clothing and allowed to remain, may cause burning and reddening of the skin

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:** Not reactive

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Gulf Oil Corp.
   Gulf Oil Chemicals Co.
   Petrochemicals Division
   Cedar Bayou, Texas 77526
2. The Humphrey Chemical Co.
   Devine St.
   North Haven, Conn. 06473
3. Phillips Petroleum Co.
   Bartlesville, Okla. 74004

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 90%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG-446-3)

A T T

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible] °C = [illegible] K

13.4 **Freezing Point:** [illegible] °C = [illegible] K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (Liquid)

13.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 28 dynes/cm = 0.028 N/m at 22.2°C

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g

13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on back page

NOTES

REVISED 1974

DAN	n-DECYL ALCOHOL

Common Synonyms
1-Decanol
Nonylcarbinol
Capric alcohol

LIQUID — Colorless to light yellow — Faint alcohol odor

Floats on water. Freezing point is 44° F

Fire

Combustible

Exposure

LIQUID
Irritating to eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floating to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Decanol, Decyl alcohol, Capric alcohol, 1-Decanol, Nonylcarbinol
3.2 **Coast Guard Compatibility Classification:** Visible
3.3 **Chemical Formula:** $CH_3(CH_2)_9OH$
3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to light yellow
4.3 **Odor:** Faint alcohol

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles
5.2 **Symptoms Following Exposure:** Irritation and burning of the eyes and mucous membranes
5.3 **Treatment for Exposure:** CONTACT WITH EYES: Flush with water for 15 min
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Grade 1 (Slightly toxic)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** None
5.9 **Liquid or Solid Irritant Characteristics:** Not approximately hazardous. Prolonged contact may cause irritation
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 180°F (82°C)
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** [illegible] days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Continental Oil
Conoco Chemicals Division
Eastern Plaza Bldg
Saddle Brook, NJ 07662

The Procter and Gamble Co
[illegible]
Cincinnati, Ohio [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

N 2 1

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poison	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	2
Reactivity	
Other Chemical	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not rated

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible] °K
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** [illegible] °K
13.6 **Critical Pressure:** [illegible] MN/m²
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** 28.9 dynes/cm = 0.0289 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** 15,000 Btu/lb = 9400 cal/g = 418 × 10³ J/kg
13.14 **Heat of Decomposition:** [illegible]
13.15 **Heat of Solution:** [illegible]
13.16 **Heat of Polymerization:** [illegible]

NOTES

REVISED 1978

DBZ — n-DECYLBENZENE

Common Synonyms
1 Phenyldecane
Decylbenzene

Liquid — White

Floats on water

[illegible]

Fire

Combustible
[illegible]

Exposure

CAUTION MODERATE

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
[illegible]
Flush the affected areas with water
IF IN EYES [illegible] water
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Decylbenzene, 1 Phenyldecane
3 2 **Coast Guard Compatibility Classification.** Aromatic hydrocarbon
3 3 **Chemical Formula:** $C_6H_5(CH_2)_9CH_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure** Inhalation of vapor causes slight irritation of nose and throat Aspiration of liquid into lungs causes coughing distress and pulmonary edema Ingestion causes irritation of stomach Contact with vapor or liquid causes irritation of eyes and mild irritation of skin
5 3 **Treatment for Exposure** INHALATION move to fresh air INGESTION do NOT induce vomiting call a doctor EYES flush with water SKIN wipe off flush with water, wash with soap and water ASPIRATION enforce bed rest administer oxygen call a doctor
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 225°F C C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents.** Dry chemical carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products.**
6 6 **Behavior in Fire**
6 7 **Ignition Temperature.** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate** 5 04 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 The Humphrey Chemical Co
Devine Street
North Haven Conn 06473

2 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 2 8
13 3 **Boiling Point at 1 atm:** 572°F = 300°C = 573°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 0 855 at 20°C (liquid)
13 8 **Liquid Surface Tension.** 29 95 dynes/cm = 0 02995 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** 1[illegible] 8 Btu/lb = 57 67 cal/g = 2 413 × 10³ J/kg
13 13 **Heat of Combustion** ~18 400 Btu/lb = ~10 200 cal/g = 427 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

DEMETON

Common Synonyms			
O,O-[Diethyl O(and S)-[2 (ethylthio) ethyl] phosphorothioates	Liquid	Yellowish brown	Unpleasant odor
	Sinks in water		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY

Fire

Solution in a combustible solvent
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
If inhaled will cause headache or difficult breathing

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant, high flammability
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** O,O-Diethyl-O (and S)-[2 (ethylthio) ethyl] phosphorothioates
Mixture of O- and S [2 (Ethylthio) ethyl] phosphorothioic acid, O O diethyl ester
Systox and thiosystox mixture

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** $C_8H_{19}O_3PS_2$ $C_8H_{19}O_3PS$ mixture

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Amber

4 3 **Odor** Offensive sulfur compound odor

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic vapor respirator in confined areas rubber or latex gloves, splash goggles, rubber boots

5 2 **Symptoms Following Exposure:** Inhalation causes headache vertigo blurred vision lachrymation salivation sweating, muscular weakness and ataxia dyspnea, diarrhea abdominal cramps vomiting coma, pulmonary edema and death Ingestion causes nausea vomiting muscle twitching, coma Contact with eyes or skin causes irritation

5 3 **Treatment for Exposure:** *Speed is essential Call a physician after all overexposure to demeton* INHALATION move to fresh air, if needed, begin artificial respiration INGESTION administer milk water or salt-water and induce vomiting repeatedly EYES flush with water for at least 15 min SKIN flood and wash exposed skin areas thoroughly with water remove contaminated clothing under a shower wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 1 mg/m³

5 5 **Short-Term Inhalation Limits:** 0 5 mg/m³ 30 min

5 6 **Toxicity by Ingestion.** Grade 4 oral LD_{50} = 1 7 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** 113°F C C

6 2 **Flammable Limits in Air** 1 0 [illegible] Vol

6 3 **Fire Extinguishing Agents.** Dry chemical foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective on fire

6 5 **Special Hazards of Combustion Products** Irritating fumes of sulfur dioxide and phosphoric acid may form in fire

6 6 **Behavior in Fire:** Compound may volatilize and form toxic fumes Vapor of solvent is heavier than air and may travel considerable distance to a source of ignition and flash back

6 7 **Ignition Temperature:** 867 F (xylene solvent)

6 8 **Electrical Hazard** (xylene) Class I, Group D

6 9 **Burning Rate.** 5 8 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** May attack some forms of plastics

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** 0 1 ppm/2 8 hr bluegill/reduction of enzyme in brain fresh water

8 2 **Waterfowl Toxicity** 7 15 mg/kg

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Chemagro
Division of Bayer Chem Corp
Kansas City Mo 64120

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 25% 66% solution in xylenes which are combustible solvents

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting.** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A X-Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poison Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 258

13 3 **Boiling Point at 1 atm.** >284°F = >140°C = >413°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 1 1 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

DES	2,4-D ESTERS

Common Synonyms Butyl 2,4 Dichlorophenoxyacetate Isopropyl 2 4 dichlorophenoxy acetate 2 4 Dichlorophenoxyacetic acid butyl ester 2,4-Dichlorophenoxyacetic acid [illegible]	Liquid	Yellowish brown	Fuel oil like odor
	Sinks in water		

Stop discharge if possible. Keep people away.
Stop if [illegible] Collect spent effluent.
Avoid [illegible] self fog [illegible]
Isolate [illegible] and material.
Notify [illegible] agencies.

Fire	**Combustible** **Irritating gases may be produced when heated** [illegible]
Exposure	CALL FOR MEDICAL AID **LIQUID** **Irritating to skin and eyes** **Harmful if swallowed** Remove [illegible] Flush affected [illegible] with lots of water IF IN EYES [illegible] water IF SWALLOWED [illegible] CONSCIOUS [illegible] milk water [illegible] IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS [illegible]
Water Pollution	**Dangerous to aquatic life in high concentrations** **May be dangerous if it enters water intakes** [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Should be removed
Chemical and physical treatment.

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Butoxyethyl 2,4 dichlorophenoxyacetate Butyl 2 4 dichlorophenoxyacetate, 2 4 Dichlorophenoxyacetic acid butoxyethyl ester, 2,4-Dichlorophenoxyacetic acid butyl ester 2 4 Dichlorophenoxyacetic acid isopropyl ester Isopropyl 2 4 dichlorophenoxy acetate

3 2 **Coast Guard Compatibility Classification:** Not listed

(Continued on page 4)

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Brown amber

4 3 **Odor:** May have odor of fuel oil

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Face shield or goggles rubber gloves

5 2 **Symptoms Following Exposure:** Contact with eyes may cause mild irritation

5 3 **Treatment for Exposure:** INGESTION if large amounts are swallowed induce vomiting and get medical help EYES flush with plenty of water and see a doctor SKIN flush with water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 2 or 3 LD_{50} 320 617 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** > 175°F (C.O.C.)

6 2 **Flammable Limits in Air.** Data not available

6 3 **Fire Extinguishing Agents.** Foam, dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products.** Irritating hydrogen chloride vapor may form in fire

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
350 ppm/24 hr/bass bluegill/50% kill fresh water
1 0 [illegible] 50 ppm/96 hr/oyster 59% shell growth disease/salt water

8 2 **Waterfowl Toxicity:** LD_{50} 2025 0 mg/kg

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Amchem Products Inc
Brookside Ave
Ambler Pa 19002

2 Chipman Division of Rhodia Inc
23 Belmont Drive
Somerset N J 08873

3 The Dow Chemical Co
Midland Mich 48640

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Technical 99% 64% in petroleum oil

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X-X-Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 234 291

13 3 **Boiling Point at 1 atm** Very high

13 4 **Freezing Point.** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 088 1 237 at 20°C (liquid)

13 8 **Liquid Surface Tension** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

3 CHEMICAL DESIGNATIONS (Cont'd)

3 3 **Chemical Formula.**
2 4 $Cl_2C_6H_3OCH_2COOR$, where
$R = C_4H_9$, C_8H_{17} or $CH_3CH(OC_4H_9)$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

DTS	DEXTROSE SOLUTION

Common Synonyms	Watery liquid	Colorless	Odorless
Glucose solution Corn sugar solution Grape sugar solution	Sinks and mixes with water		

[illegible]

Fire	Not flammable
Exposure	Not harmful
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.**
Corn sugar solution
Glucose solution
Grape sugar solution

3 2 **Coast Guard Compatibility Classification:**
Miscellaneous water solutions

3 3 **Chemical Formula:**
$C_6H_{12}O_6 \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color** Clear colorless

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** None needed

5 2 **Symptoms Following Exposure** Nontoxic

5 2 **Treatment for Exposure:** None needed

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion** None

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics.** None

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air**
Not flammable

6 3 **Fire Extinguishing Agents.**
Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products.**
Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature.** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization.**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
53% 5 days 99% (theor) 5 days

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 CPC International Inc
Argo Ill 60502

2 A E Staley Mfg Co
Decatur Ill 62529

3 Standard Brands Inc
Clinton Corn Processing Division
Clinton Iowa 52732

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 65 69% solids

10 2 **Storage Temperature** 130 to 145 F

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm**
Liquid

13 2 **Molecular Weight.** Not pertinent

13 3 **Boiling Point at 1 atm.**
>212 F = >100 C = >373 K

13 4 **Freezing Point:** <32 F = <0 C = <273 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** (est) 1 20 at 20°C (liquid)

13 8 **Liquid Surface Tension.**
(est) 60 dynes/cm = 0 06 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization.**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

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DAA — DIACETONE ALCOHOL

Common Synonyms
4-Hydroxy-4-methyl-2-pentanone
Diacetone

Watery liquid — Colorless to light yellow — mild pleasant odor

Floats and mixes with water

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Diacetone
4 Hydroxy-4 methyl
2 pentanone
Tyranton

3 2 **Coast Guard Compatibility Classification:** Alcohol

3 3 **Chemical Formula:** $CH_3COHCH_2COCH_3$

3 4 **IMCO/United Nations Numerical Designation** 3 3 1148

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless to yellow

4 3 **Odor:** Mild pleasant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Air pack or organic canister rubber gloves goggles

5 2 **Symptoms Following Exposure:** Vapor is irritating to the mucous membrane of the eye and respiratory tract Inhalation can cause dizziness nausea some anesthesia Very high concentrations have a narcotic effect The liquid is not highly irritating to the skin but can cause dermatitis

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air Give artificial respiration if breathing has stopped CONTACT WITH EYES OR SKIN wash affected skin areas with water flush eyes with water and get medical care if discomfort persists

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 50 ppm

5 5 **Short-Term Inhalation Limits.** 150 ppm for 30 min

5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0 stc 5 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics.** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 142°F (C.C.) 12°F (C.C.)

6 2 **Flammable Limits in Air:** 1.8% 6.9%

6 3 **Fire Extinguishing Agents:** Dry chemical alcohol foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** 1118 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Celanese Corp
Celanese Chemical Co Division
245 Park Ave
New York N Y 10017

2 Shell Chemical Co
Industrial Chemicals Division
Houston Texas 77001

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99 0%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

*3 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 116 16

13 3 **Boiling Point at 1 atm:** 336 6°F = 169 2°C = 442 4°K

13 4 **Freezing Point:** −45 0°F = −42 8°C = 230 4°K

13 5 **Critical Temperature:** 633°F = 334°C = 607°K

13 6 **Critical Pressure** 380 psia = 36 atm = 3 6 MN/m²

13 7 **Specific Gravity:** 0 938 at 50°C (liquid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 052

13 12 **Latent Heat of Vaporization:** 180 Btu/lb = 88 cal/g = 3 6 × 10⁵ J/kg

13 13 **Heat of Combustion.** (est.) −13 000 Btu/lb = −7 250 cal/g = −303 × 10⁵ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(* Asterisked items are new)

NOTES

REVISED 1978

DAP	Di-n-AMYL PHTHALATE

Common Synonyms			
Phthalic acid dipentyl ester Diamyl phthalate Phthalic acid diamyl ester Dipentyl phthalate	Liquid Floats on water	Wate	Odorless

	[illegible]
Fire	Combustible [illegible]
Exposure	[illegible] **VAPOR** Irritating to eyes, nose and throat If inhaled will cause headache, coughing or difficult breathing [illegible] **LIQUID** Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Diamyl phthalate Dipentyl phthalate Phthalic acid, diamyl ester, Phthalic acid, dipentyl ester

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_6H_4(COOC_5H_{11})_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation of vapors from very hot material may cause headache drowsiness, and convulsions Hot vapors may irritate eyes

5 3 **Treatment for Exposure:** INHALATION move to fresh air EYES flush with water SKIN wipe off flush with water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity:** Causes birth defects in rats (skeletal and gross abnormalities)

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 245°F C C

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents:** Foam dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** [illegible]

6 6 **Behavior in Fire:** [illegible]

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential:** [illegible]

9. SELECTED MANUFACTURERS

1 Eastman Organic Chemicals
Rochester, N Y 14650

2 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford, Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 306

13 3 **Boiling Point at 1 atm:** Very high

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 82 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 31 5 dynes/cm = 0 0315 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 140 Btu/lb = 76 cal/g = 3.2×10^5 J/kg

13 13 **Heat of Combustion:** −13,900 Btu/lb = −7 720 cal/g = −323 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next Sheet

NOTES

DZN	DIAZINON

Common Synonyms		
O O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate O O-Diethyl O-(2-isopropyl-4-methyl-6-pyrimidyl) thiophosphate Alfa-tox Spectracide Sarolex	Liquid Sinks in water	Light to dark brown

[illegible]

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

[illegible]
LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning (poison water contaminant, high flammability of solution)
Restrict access
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Coast Guard Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** O O Diethyl O (2 isopropyl 6-methyl 4 pyrimidinyl) phosphorothioate O O Diethyl O 2 isopropyl 4 methyl 6-pyrimidyl thiophosphate Diethyl 2 isopropyl 4 methyl 6 pyrimidyl thionophosphate Alfa tox Sarolex Spectracide

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** [illegible]

3 4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid or liquid solution

4 2 **Color:** Amber to dark brown

4 3 **Odor:** Data not available

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves protective clothing

5 2 **Symptoms Following Exposure:** Ingestion or prolonged inhalation of mist causes headache giddiness blurred vision nervousness weakness cramps diarrhea uncomfort in the chest sweating miosis tearing salivation and other excessive respiratory tract secretion vomiting cyanosis papilledema uncontrollable muscle twitches convulsions coma loss of reflexes and loss of sphincter control Liquid irritates eyes and skin

5 3 **Treatment for Exposure:** INHALATION remove to fresh air keep warm get medical attention at once EYES flush with plenty of water for at least 15 min and get medical attention SKIN [illegible] contaminated area with soap and water INGESTION get medical attention at once give water slurry of charcoal do NOT give milk or alcohol

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 76 mg/kg (rat)

5 7 **Late Toxicity:** May be [illegible]

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 82 [illegible] C C (solutions only pure liquid difficult to burn)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** (for solutions) Foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Oxides of sulfur and of phosphorus are generated in fires

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** (for solutions) 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
0 025 ppm 96 hr, stonefly nymph/TL_m/fresh water
30 μg/l/48 hr bluegill TL_m fresh water (becomes bound to soil when used according to directions)

8 2 **Waterfowl Toxicity**
LD_{50} = 3 54 mg/kg
LC_{50} = 5 days 90 ppm mallard duck
LC_{50} = 7 days, 68 ppm quail

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

Ciba Geigy Corporation
Agricultural Division
P O Box 11422
Greensboro N C 27409

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical wettable powders, a variety of emulsifiable solutions in combustible solvents

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-X-Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM A

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 304 4

13 3 **Boiling Point at 1 atm:** Very high decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 11 at 20°C (liquid)

13 8 **Liquid Surface Tension:** (est) 35 dynes/cm = 0 035 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension:** (est) 40 dynes/cm = 0 040 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est) −12 000 Btu/lb = −6,500 cal/g = −270 X 10 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and A

NOTES

DPO	DIBENZOYL PEROXIDE

Common Synonyms Benzoyl peroxide Benzoyl superoxide Lucidol Oxylite BPO BP	Solid powder or granules White Odorless Sinks in water
[illegible]	
Fire	**FLAMMABLE.** **MAY EXPLODE IF SUBJECTED TO HEAT, SHOCK OR FRICTION** May cause fire and explode on contact with combustibles [illegible]
Exposure	[illegible] **SOLID** **Irritating to skin and eyes** **Harmful if swallowed** [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning high flammability
Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**

Benzoyl peroxide	BPO
Benzoyl superoxide	Lucidol 70
BP	Oxylite

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_6H_5CO_2O_2CO_2C_6H_5$

3 4 **IMCO United Nations Numerical Designation:** 5 2 1521

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety goggles face shield rubber gloves

5 2 **Symptoms Following Exposure:** CONTACT WITH EYES OR SKIN irritates eyes Prolonged contact may irritate skin

5 3 **Treatment for Exposure:** INGESTION administer an emetic to induce vomiting and call a physician CONTACT WITH EYES OR SKIN do not use oils or ointments flush eyes with plenty of water and get medical attention wash skin with plenty of soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion.** Grade 2 LD 0 5 to 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Highly flammable solid explosion sensitive to shock heat and friction

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Difficult to extinguish once ignited Use water spray to cool surrounding area

6 4 **Fire Extinguishing Agents Not to be Used:** Do not use hand extinguishers

6 5 **Special Hazards of Combustion Products:** Suffocating smoke evolved

6 6 **Behavior in Fire:** May explode

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Special care must be taken to avoid contamination with combustible materials (wood paper etc) Various inorganic and organic acids alkalies alcohols amines easily oxidizable materials such as ethers or materials used as accelerators in polymerization reactions

7 3 **Stability During Transport:** Extremely explosion sensitive to shock impact blows heat and friction Has been reported to explode for apparently no specific reason Self reactive

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Pennwalt Corp
Lucidol Division
1740 Military Rd
Buffalo N Y 14240

2 Reichold Chemicals Inc
Specialty Chemicals Division
Austin Texas 78712

3 Witco Chemical Corp
U S Peroxygen Division
850 Morton Ave
Richmond Calif 94804

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98% (dry) 70 75% (wet) various pastes of dibenzoyl peroxide and liquid plasticizers such as tricresyl phosphate silicone oil

10 2 **Storage Temperature:** 65 85°F

10 3 **Inert Atmosphere:** Data not available

10 4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Organic Peroxide

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	1
	OXY

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 242 2

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** 217°F = 103°C = 376 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 334 at 15 C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 4

NOTES

REVISED 1978

DBA	Di-n-BUTYLAMINE

Common Synonyms	
Dibutylamine 1-Butanamine, N-butyl-	Liquid Colorless Weak ammonia fishy odor Floats and mixes with water

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause headache, coughing or difficult breathing LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contaminant
Restrict access
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1-Butanamine, N-butyl-
Dibutylamine

3.2 **Coast Guard Compatibility Classification:** Aliphatic amine

3.3 **Chemical Formula:** $(C_4H_9)_2NH$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Weak ammonia fishy

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose, throat and lungs, coughing, nausea, headache. Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. Contact with skin causes irritation and dermatitis

5.3 **Treatment for Exposure:** INHALATION: move from exposure if breathing has stopped, start artificial respiration. INGESTION: give large amount of water. EYES: irrigate with water for 15 min, get medical attention for possible eye damage. SKIN: wash with large amounts of water for 15 min

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 300 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact or prolonged contact. Injurious to the eyes

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 125°F (O.C.)

6.2 **Flammable Limits in Air:** 1.1% (LFL)

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 5.84 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May corrode some metals and attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibition of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

2. Pennwalt Corporation
Three Parkway
Philadelphia, Pa. 19102

3. Virginia Chemicals, Inc
340 West Norfolk Road
Portsmouth, Va. 23703

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X T U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	4
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 129.25

13.3 **Boiling Point at 1 atm:** 419.1°F = 159.6°C = 432.8°K

13.4 **Freezing Point:** −80°F = −62°C = 211°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.759 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 24.76 dynes/cm = 0.02476 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 4.5

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 130 Btu/lb = 72.3 cal/g = 3.03 × 10³ J/kg

13.13 **Heat of Combustion:** −18,800 Btu/lb = −10,440 cal/g = −436.8 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DBE	DI-n-BUTYL ETHER

Common Synonyms			
n-Dibutyl ether n-Butyl ether Butyl ether 1-Butoxy butane Dibutyl ether	Liquid	Colorless	Mild pleasant odor
	Floats on water. Flammable. Irritating vapor is produced		

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** n-Dibutyl ether, n-Butyl ether, Butyl ether, 1-Butoxybutane, Dibutyl ether, Dibutyloxide

3.2 **Coast Guard Compatibility Classification:** Ethers (1)

3.3 **Chemical Formula:** $C_8H_{18}OC_4H_9$

3.4 **IMCO/United Nations Numerical Designation:** 3.3, 1149

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild etherlike

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Liquid irritates eyes and may irritate skin on prolonged contact. Ingestion causes irritation of mouth and stomach.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES: after contact with liquid flush with water for at least 15 min. SKIN: wipe off, wash well with soap and water. INGESTION: induce vomiting.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 oral LD_{50} = 7,400 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 92°F (O.C.)

6.2 **Flammable Limits in Air:** 1.5% - 7.6%

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** 362°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Publicker Industries Inc.
   1429 Walnut Street
   Philadelphia, Pa. 19102
2. Union Carbide Corporation
   Chemicals and Plastics Division
   270 Park Avenue
   New York, N.Y. 10017
3. MC&B Manufacturing Chemists
   2909 Highland Ave.
   Norwood, Ohio 45212

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arresters

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

X T U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 130.2

13.3 **Boiling Point at 1 atm:** 288°F = 142°C = 415°K

13.4 **Freezing Point:** −139.7°F = −95.4°C = 177.8°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.76 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 23 dynes/cm = 0.023 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 4.5

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0434

13.12 **Latent Heat of Vaporization:** 120 Btu/lb = 68 cal/g = 2.8 × 10⁵ J/kg

13.13 **Heat of Combustion:** −17,670 Btu/lb = −9,820 cal/g = −411 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

DBK — Di-n-BUTYL KETONE

Common Synonyms		
5-Nonanone	Liquid Floats on water Freezing point is 21°F	Colorless to light yellow

[illegible]

Fire	Combustible [illegible]
Exposure	CALL FOR MEDICAL AID **VAPOR** Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing. [illegible] **LIQUID** Irritating to skin and eyes. If swallowed will cause nausea and vomiting [illegible] IF IN EYES [illegible] IF SWALLOWED [illegible] IF SWALLOWED [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 5-Nonanone

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $CH_3(CH_2)_3COCH_2CH_2CH_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** White to light yellow

4.3 **Odor:** Data not available

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, administer artificial respiration if needed. EYES: flush with water for at least 15 min. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Data not available

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastman Organic Chemicals
   343 State Street
   Rochester, N.Y. 14650
2. Aldrich Chemical Co.
   940 W. Saint Paul Ave.
   Milwaukee, Wis. 53233
3. Pfaltz and Bauer, Inc.
   375 Fairfield Ave.
   Stamford, Conn. 06902

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 98+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-1-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 142

13.3 **Boiling Point at 1 atm:** 370°F = 188°C = 461°K

13.4 **Freezing Point:** 21°F = −6°C = 267°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.822 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 26.60 dynes/cm = 0.0266 N/m at 21.1°C

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 161 Btu/lb = 89 cal/g = 3.75 × 10⁵ J/kg

13.13 **Heat of Combustion:** 16,080 Btu/lb = 8,930 cal/g = 3.74 × 10⁷ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DBT	DIBUTYLPHENOL

Common Synonyms			
2,6-Di-tert-butylphenol	Solid or liquid	Colorless to light yellow	Odorless
	Floats on water. Freezing point is 97°F		

Fire	Combustible
Exposure	LIQUID OR SOLID Will burn skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2,6-Di-tert-butylphenol

3.2 **Coast Guard Compatibility Classification:** Phenols (15)

3.3 **Chemical Formula:** 2,6-$(CH_3)_3C_6H_2OH$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid

4.2 **Color:** Colorless to light straw

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Irritates eyes and on prolonged contact skin. Ingestion causes irritation of mouth and stomach

5.3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off and wash well with soap and water. INGESTION: induce vomiting, get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} (2,6-Di-tert-butylphenol) = 1.32 g/kg rat

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** >200°F (C.O.C.)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Ethyl Corporation
   Industrial Chemicals Division
   Ethyl Tower
   451 Florida
   Baton Rouge, La. 70801
2. Eastman Kodak Co.
   Eastman Organic Chemicals
   Rochester, N.Y. 14650
3. Aldrich Chemical Co.
   940 West St. Paul Ave.
   Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient (solid) 100°F (liquid)

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X T I H

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 206.3

13.3 **Boiling Point at 1 atm:** 497°F = 253°C = 526°K

13.4 **Freezing Point:** 97°F = 36°C = 309°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.914 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** red (-) 19,100 Btu/lb = -9,500 cal/g = -410 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DPA	DIBUTYL PHTHALATE

Common Synonyms
DBP
Butyl phthalate
Phthalic acid dibutyl ester

Oily liquid — Colorless — Odorless

Sinks slowly in water

Fire	Combustible
Exposure	LIQUID No appreciable harm
Water Pollution	Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: DBP
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula:
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating

12.3 NFPA Hazard Classifications:

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

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DBO	o-DICHLOROBENZENE

Common Synonyms 1,2-Dichlorobenzene Orthodichlorobenzene	Liquid Sinks in water	Colorless	Pleasant odor

Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
1,2-Dichlorobenzene
Dowtherm E
Orthodichlorobenzene

3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3.3 **Chemical Formula:**

3.4 **IMCO United Nations Numerical Designation:**

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:**

4.3 **Odor:**

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:**

5.2 **Symptoms Following Exposure:**

5.3 **Treatment for Exposure:** INHALATION INGESTION EYES AND SKIN

5.4 **Toxicity by Inhalation (Threshold Limit Value):**

5.5 **Short-Term Inhalation Limits:**

5.6 **Toxicity by Ingestion:**

5.7 **Late Toxicity:** Causes kidney and liver damage in rats. Effects unknown in humans

5.8 **Vapor (Gas) Irritant Characteristics:**

5.9 **Liquid or Solid Irritant Characteristics:**

5.10 **Odor Threshold:**

6 FIRE HAZARDS

6.1 **Flash Point:**

6.2 **Flammable Limits in Air:**

6.3 **Fire Extinguishing Agents:**

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:**

6.8 **Electrical Hazard:**

6.9 **Burning Rate:**

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:**

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:**

7.4 **Neutralizing Agents for Acids and Caustics:**

7.5 **Polymerization:**

7.6 **Inhibitor of Polymerization:**

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**

8.2 **Waterfowl Toxicity:**

8.3 **Biological Oxygen Demand (BOD):**

8.4 **Food Chain Concentration Potential:**

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**

10.2 **Storage Temperature:**

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Water Pollution	
Reactivity	

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard Rating	
Flammability Rating	
Reactivity Rating	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:**

13.2 **Molecular Weight:**

13.3 **Boiling Point at 1 atm:**

13.4 **Freezing Point:**

13.5 **Critical Temperature:**

13.6 **Critical Pressure:**

13.7 **Specific Gravity:**

13.8 **Liquid Surface Tension:**

13.9 **Liquid-Water Interfacial Tension:**

13.10 **Vapor (Gas) Specific Gravity:**

13.11 **Ratio of Specific Heats of Vapor (Gas):**

13.12 **Latent Heat of Vaporization:**

13.13 **Heat of Combustion:**

13.14 **Heat of Decomposition:**

13.15 **Heat of Solution:**

13.16 **Heat of Polymerization:**

10 SHIPPING INFORMATION (Cont'd)

10.3 **Inert Atmosphere:**

10.4 **Venting:**

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DBP	p-DICHLOROBENZENE

Common Synonyms			
Paradichlorobenzene Dichlorosse Paradi	Solid crystals Sinks in water	White to clear	Mothballs odor

Avoid contact with solid
all fire departments
Isolate [illegible]
[illegible]

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE
Wear [illegible]
Extinguish with water dry chemical foam [illegible]
[illegible] water

Exposure

CALL FOR MEDICAL AID
SOLID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
EYES [illegible] with clear water
SWALLOWED [illegible] CONSCIOUS [illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-[illegible]

Issue warning [illegible] water contaminant
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**

Dichloroxide	Paradow
Paradi	Paramoth
Paradichlorobenzene	Santochlor

3 2 **Coast Guard Compatibility Classification**
Halogenated hydrocarbon

3 3 **Chemical Formula:** p-$C_6H_4Cl_2$

3 4 **IMCO/United Nations Numerical Designation:** 9 0 1592

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Full face mask fitted with organic vapor canister for concentrations over [illegible] ppm; clean protective clothing; eye protection

5 2 **Symptoms Following Exposure** INHALATION irritation of upper respiratory tract; over exposure may cause depression and injury to liver and kidney EYE CONTACT pain and mild irritation

5 3 **Treatment for Exposure** INHALATION if any ill effect develop remove patient to fresh air and get medical attention If breathing stops [illegible] artificial respiration EYES flush with plenty of water and get medical attention if ill effects develop SKIN AND INGESTION no problem likely

5 4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible] ppm

5 5 **Short-Term Inhalation Limits:** 50 ppm for 60 min

5 6 **Toxicity by Ingestion** Grade 2 LD_{50} 0 [illegible] to [illegible] g/kg

5 7 **Late Toxicity.** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Vapors cause moderate irritation such that a person can [illegible] and high concentrations unpleasant The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold** 1 [illegible] 30 ppm

6 FIRE HAZARDS

6 1 **Flash Point** 150 F (C.C.) 150 F (C.C.)

6 2 **Flammable Limits in Air**
Data not available

6 3 **Fire Extinguishing Agents** Water
foam carbon dioxide or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products**
Vapors are irritating Toxic chlorine
hydrogen chloride and phosgene gases
may be generated in fires

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:**
Data not available

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** 1 3 mm min (approx)

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials**
No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
50 ppm * fish lethal fresh water
500 mg L 48 hr rainbow trout TLm fresh water
*Portions interval specified

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
Data not available

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland Mich 48640

2 PPG Industries Inc
Industrial Chemical Division
New Martinsville W Va 26155

3 Standard Chlorine Chemical Co
1015 28 Belleville Turnpike
Kearny N J 07032

10 SHIPPING INFORMATION

10 1 **Grades or Purity.** Solid
[illegible] grades chemical purity close to 100
Liquid 1 2 orthodichlorobenzene

10 2 **Storage Temperature**
Data not available

10 3 **Inert Atmosphere** Data not available

10 4 **Venting.** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3[illegible]

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
GRM A

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm**
Solid

13 2 **Molecular Weight:** 147 0

13 3 **Boiling Point at 1 atm**
345 6 F = 174 2 C = 447 4 K

13 4 **Freezing Point:** 130 F = 53 C = 326 K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity.** 1 458 at 20 C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued next page

NOTES

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DZP	DI-(p-CHLOROBENZOYL) PEROXIDE

Common Synonyms			
Bis(p-chlorobenzoyl) peroxide p-Chlorobenzoyl peroxide p,p'-Chlorobenzoyl peroxide Di(4-chlorobenzoyl) peroxide	Solid or paste Sinks in water	White	Odorless

[illegible]

Fire

May explode on contact with combustibles
POISONOUS GASES ARE PRODUCED IN FIRE
[illegible]

Exposure

[illegible]
SOLID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning oxidizing material
water contaminant
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Bis (p-chlorobenzoyl) peroxide, p-Chlorobenzoyl peroxide, p,p'-Dichlorobenzoyl peroxide, Di (4-chlorobenzoyl) peroxide, Cadox PS

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula.** $(p\text{-}ClC_6H_4COO)_2$

3 4 **IMCO/United Nations Numerical Designation:** 1/0149 (> 70%) 5.2 (54) (> 10% water or > 30% water)

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid or paste in silicone fluid and dibutyl phthalate

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves, protective clothing

5 2 **Symptoms Following Exposure:** Irritates eyes and (on prolonged contact) skin. Ingestion causes irritation of mouth and stomach

5 3 **Treatment for Exposure:** EYES wash with water for at least 15 min, consult a doctor. SKIN wash with soap and water. INGESTION induce vomiting and call a doctor

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air.** Not pertinent

6 3 **Fire Extinguishing Agents:** Flood with water or use dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic chlorinated biphenyls are formed in fires

6 6 **Behavior in Fire:** Solid may explode. Burns very rapidly when ignited. Smoke is unusually heavy when paste form is involved

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May react vigorously with combustible materials

7 3 **Stability During Transport** Stable if below 80°F

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** Data not available

9. SELECTED MANUFACTURERS

Noury Chemical Corp
Burt, New York 14028

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Dry, wet with more than 20% water, 50% paste with silicone fluid

10 2 **Storage Temperature:** Below 80°F

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Organic Peroxide

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 311.1

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** > 1.1 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** (est.) −9 000 Btu/lb = −5 000 cal/g = −210 × 10³ J/kg

13 14 **Heat of Decomposition.** Data not available

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

DCB — DICHLOROBUTENE

Common Synonyms

1,4-Dichloro-2-butene
2-Butylene dichloride
1,4-Dichloro-2-butylene
cis-1,4-dichloro-2-butene
trans-1,4-dichloro-2-butene

Liquid — Colorless — Sweet odor

Sinks and mixes slowly with water

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — corrosive water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** 1,4-Dichloro-2-butene; 2-Butylene dichloride; 1,4-Dichloro-2-butylene; cis-1,4-Dichloro-2-butene; trans-1,4-Dichloro-2-butene

3.2 **Coast Guard Compatibility Classification** Halogenated compounds (5)

3.3 **Chemical Formula** $ClCH_2CH{=}CHCH_2Cl$

3.4 **IMCO/United Nations Numerical Designation:** 8 (1760)

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic sweet pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, chemical splash goggles, rubber boots and apron, barrier cream, organic canister mask

5.2 **Symptoms Following Exposure.** Inhalation of vapor irritates nose and throat. Contact with eyes causes intense irritation and tears. Contact of liquid with skin causes severe blistering and dermatitis. Ingestion causes severe irritation of mouth and stomach

5.3 **Treatment for Exposure.** INHALATION: remove from exposure, provide low pressure oxygen if required, keep under observation until edema is ruled out. EYES: irrigate immediately for 15 min, call physician. SKIN: wash immediately and thoroughly with soap and water, treat as a chemical burn. INGESTION: induce vomiting, call physician

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion.** Grade 3, oral LD_{50} (1,4-dichloro-2-butene) = 85 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Data not available

6.2 **Flammable Limits in Air.** [illegible] 4

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Decomposition vapors contain phosgene and hydrogen chloride gases, both are toxic and irritating

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature.** Data not available

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate** 2.6 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly to form hydrochloric acid

7.2 **Reactivity with Common Materials** Corrodes metal when wet

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Petro Tex Chemical Corporation
   5000 Park Place Boulevard
   Houston, Texas 77017
2. Platz and Bauer, Inc.
   126-04 Northern Boulevard
   Flushing, N.Y. 11368
3. Eastman Kodak Co.
   Eastman Organic Chemicals
   Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Cis/trans equilibrium mixture 98+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open/flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

A X Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight.** 125.0

13.3 **Boiling Point at 1 atm:**
314°F = 156°C = 429°K

13.4 **Freezing Point**
cis: −54°F = −48°C = 225°K
trans: 37°F = 3°C = 276°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 1.112 at 20°C (liquid)

13.8 **Liquid Surface Tension.** (est.)
24 dynes/cm = 0.024 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.)
30 dynes/cm = 0.030 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 4

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0874

13.12 **Latent Heat of Vaporization:** (est.)
130 Btu/lb = 73 cal/g = 3.[illegible] × 10[illegible] J/kg

13.13 **Heat of Combustion.** 17,500 Btu/lb
= 9,720 cal/g = 40.7 × 10[illegible] J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

DCF	DICHLORODIFLUOROMETHANE

Common Synonyms			
Arcton 6 Eskimon 12 F-12 Freon 12 Genetron 12 Isotron 12	Compressed gas	Colorless	Faint odor
	Visible vapor cloud is produced		

Step 1 Fire Hazards
Notify Health Department [illegible]

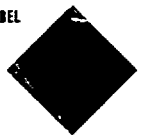
Fire	Not flammable [illegible]
Exposure	CALL FOR MEDICAL AID VAPOR Not irritating to eyes, nose or throat If inhaled, will cause dizziness, difficult breathing [illegible]
Water Pollution	Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Eskimon 12, Genetron 12, F-12, Halon 122, Freon 12, Isotron 12, Frigen 12, Freon 12

3 2 **Coast Guard Compatibility Classification** Halogenated hydrocarbon

3 3 **Chemical Formula:** CCl_2F_2

3 4 **INCO [illegible]ed Nations Numerical Designation.** 2 0 1028

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied compressed gas

4 2 **Color:** Colorless

4 3 **Odor:** Odorless, slight characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Rubber gloves, monogoggles

5 2 **Symptoms Following Exposure:** INHALATION: some narcosis when 10% or more is breathed

5 3 **Treatment for Exposure:** Remove patient to [illegible] contaminated area and apply artificial respiration if breathing has stopped. Call a physician immediately. Oxygen may be given

5 4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5 5 **Short-Term Inhalation Limits** 5000 ppm for 60 min

5 6 **Toxicity by Ingestion:** Not pertinent

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics.** None except at very high concentrations which may irritate lungs

5 9 **Liquid or Solid Irritant Characteristics.** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly

5 10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Although nonflammable, dissociation products generated in a fire may be irritating or toxic

6 6 **Behavior in Fire:** Helps extinguish fire

6 7 **Ignition Temperature.** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Not pertinent

8 2 **Waterfowl Toxicity:** Not pertinent

8 3 **Biological Oxygen Demand (BOD)** Not pertinent

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Division
Baton Rouge, La 70821

2 E. I. du Pont de Nemours & Co. Inc
Freon Products Division
Wilmington, Del 19898

3 Pennwalt Corp
Chemical Division
Calvert City, Ky 42029

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99.5% (vol.)

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A C E J

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Nonflammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Gas

13 2 **Molecular Weight** 120.91

13 3 **Boiling Point at 1 atm.** −21.6°F = −29.8°C = 243.4°K

13 4 **Freezing Point:** −251.9°F = −157.7°C = 115.5°K

13 5 **Critical Temperature** 233.2°F = 111.8°C = 385.0°K

13 6 **Critical Pressure** 598 psia = 40.7 atm = 4.12 MN/m²

13 7 **Specific Gravity:** 1.38 at 15°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 4.2

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.129

13 12 **Latent Heat of Vaporization** 140 Btu/lb = 77.9 cal/g = 3.26 × 10⁵ J/kg

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on next page)

NOTES

REVISED 1978

DEL	1,2-DICHLOROETHYLENE

Common Synonyms

Acetylene dichloride
sym-dichloroethylene
Dioform
cis-1 2-dichloroethylene
trans-1 2-dichloroethylene

Liquid Colorless Sweet pleasant odor

Sinks in water Flammable irritating vapor is produced

[illegible]

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

[illegible]

Exposure

[illegible]

VAPOR
If inhaled will cause dizziness, nausea, vomiting, or difficult breathing

[illegible]

LIQUID
Harmful if swallowed

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

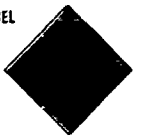
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Evacuate area
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Acetylene dichloride
sym Dichloroethylene Dioform
cis or trans 1 2 Dichloroethylene

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** CHCl=CHCl

3 4 **IMCO/United Nations Numerical Designation:** 3 2 1150

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Ethereal slightly acrid pleasant chloroform like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, safety goggles air supply mask or self contained breathing apparatus

5 2 **Symptoms Following Exposure:** Inhalation causes nausea vomiting weakness tremor epigastric cramps central nervous depression Contact with liquid causes irritation of eyes and (on prolonged contact) skin Ingestion causes slight depression to deep narcosis

5 3 **Treatment for Exposure:** INHALATION remove from further exposure if breathing is difficult give oxygen if victim is not breathing give artificial respiration preferably mouth to mouth give oxygen when breathing is resumed call a physician EYES flush with water for at least 15 min SKIN wash well with soap and water INGESTION give gastric lavage and cathartics

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 200 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 770 mg/kg (rat)

5 7 **Late Toxicity:** Produces liver and kidney injury in experimental animals

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** [illegible] F C C

6 2 **Flammable Limits in Air:** [illegible]

6 3 **Fire Extinguishing Agents:** Dry chemical foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products.** Phosgene and hydrogen chloride fumes may form in fires

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate:** 2 6 mm/min

7 CHEMICAL REACTIVITY

Reactivity with Water: No reaction

Reactivity with Common Materials: No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Will not occur under ordinary conditions of shipment The reaction is not vigorous

7 6 **Inhibitor of Polymerization:** None used

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Eastman Kodak Co
Eastman Organic Chemicals
Rochester N Y 14650

2 Dynamit Nobel AG
105 Stonehurst Court
Northvale N J 07647

3 Pfaltz and Bauer Inc
126-04 Northern Boulevard
Flushing, N Y 11368

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

X X Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 97 0

13 3 **Boiling Point at 1 atm:**
cis 140°F = 60°C = 333°K
trans 118°F = 48°C = 321°K

13 4 **Freezing Point:**
cis −114°F = −81°C = 192°K
trans −58°F = −50°C = 223°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 1 2 at 25°C (liquid)

13 8 **Liquid Surface Tension:**
24 dynes/cm = 0 024 N/m at 29°C

13 9 **Liquid-Water Interfacial Tension.** (est)
30 dynes/cm = 0 030 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 3 34

13 11 **Ratio of Specific Heats of Vapor (Gas)**
1 1468

13 12 **Latent Heat of Vaporization.** 130 Btu/lb
= 72 cal/g = 3 0 × 10³ J/kg

13 13 **Heat of Combustion:** −4 847 2 Btu/lb
= −2 692 9 cal/g = −112 67 × 10³ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

DEE — DICHLOROETHYL ETHER

Common Synonyms

Bis(2 chloroethyl) ether
2 2 Dichloroethyl ether
Dichloroether
Di (2 chloroethyl) ether
Chlorex

Liquid — Colorless — Sweet pleasant odor

Sinks and mixes slowly with water

AVOID CONTACT WITH BODY KEEP PEOPLE AWAY

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CATEGORY III

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eye

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2 LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Bis(2 chloroethyl) ether 2 2' Dichloroethyl ether Dichlorodiethyl ether, Di (2 chloroethyl) ether, Chlorex, DCEE, beta, beta'-Dichloroethyl ether

3 2 **Coast Guard Compatibility Classification** Halogenated hydrocarbon

3 3 **Chemical Formula:** $(ClCH_2CH_2)_2O$

3 4 **IMCO/United Nations Numerical Designation:** 3 3 1916

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color.** Colorless

4 3 **Odor:** Sweet like chloroform

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves protective clothing

5 2 **Symptoms Following Exposure:** Inhalation of vapor causes irritation of nose coughing nausea Liquid irritates eyes and causes mild irritation of skin (Can be absorbed in toxic amounts through the skin) Ingestion causes irritation of mouth and stomach symptoms of systemic poisoning

5 3 **Treatment for Exposure:** INHALATION remove from exposure support respiration call physician if needed EYES irrigate with copious quantities of water for 15 min call physician SKIN wipe off wash well with soap and water INGESTION induce vomiting get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 5 ppm

5 5 **Short-Term Inhalation Limits.** 35 ppm for 30 min

5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 75 mg kg (rats)

5 7 **Late Toxicity:** Said to be carcinogenic

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure may cause second degree burns on long exposure

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 180°F (C.C.) 131°F (C.C.)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents** Water foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** May form phosgene or hydrogen chloride in fires

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 696 F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 2 4 mm min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Nisso Petrochemical Industries Co Ltd
Tokyo Japan

2 Aldrich Chemical Co Inc
940 West St Paul Avenue
Milwaukee Wis 53233

3 Eastman Kodak Co
Eastman Organic Chemicals
Rochester N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A P Q X Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 143 0

13 3 **Boiling Point at 1 atm:** 353°F = 178°C = 451 K

13 4 **Freezing Point.** −62°F = −52 C = 221 K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 22 at 20 C (liquid)

13 8 **Liquid Surface Tension** 37 9 dynes cm = 0 037 N m at 19 C

13 9 **Liquid-Water Interfacial Tension:** (est) 40 dynes cm = 0 040 N m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 4 93

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 0743

13 12 **Latent Heat of Vaporization** 133 Btu lb = 79 cal g = 3 3 × 10⁵ J kg

13 13 **Heat of Combustion:** (est) −7 530 Btu lb = −4 1 0 cal g = −1 75 × 10 J kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

DCM — DICHLOROMETHANE

Common Synonyms
Methylene chloride
Methylene dichloride

Watery liquid — Colorless — Sweet pleasant odor

Sinks in water. Irritating vapor is produced

[illegible]

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED
[illegible]

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
If inhaled will cause nausea and dizziness
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Methylene chloride
Methylene dichloride

3 2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3 3 **Chemical Formula:** CH_2Cl_2

3 4 **IMCO United Nations Numerical Designation:** 9 0 1593

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pleasant aromatic like chloroform, sweet ethereal

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic vapor canister mask, safety glasses, protective clothing

5 2 **Symptoms Following Exposure** INHALATION: anesthetic effect, nausea and drunkenness. CONTACT WITH SKIN AND EYES: skin irritation, irritation of eyes and nose

5 3 **Treatment for Exposure.** INHALATION: [illegible] INGESTION: [illegible] CONTACT WITH SKIN AND EYES: [illegible]

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 500 ppm

5 5 **Short-Term Inhalation Limits** 1000 ppm for 60 min

5 6 **Toxicity by Ingestion** Grade 2 LD_{50} 0.85 to 2 g/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause mild irritation in such but people will find high concentrations unpleasant. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5 10 **Odor Threshold** 200-307 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable under conditions likely to be encountered

6 2 **Flammable Limits in Air:** 12 – 19%

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products:** Dissociation products generated in a fire may be irritating or toxic

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 1184°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Not pertinent

8 2 **Waterfowl Toxicity:** Not pertinent

8 3 **Biological Oxygen Demand (BOD)** Not pertinent

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Ascon Chemical Corp
Westlake, La 70669

2 Dow Chemical Co
Midland, Mich 48640

3 [illegible] Corp
Industrial Chemicals Division
481 Florida St
Baton Rouge, La 70801

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Acetone grade, technical grade

10 2 **Storage Temperature:** Data not available

10 3 **Inert Atmosphere:** Inerted

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-2

A P X

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** ORM A

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight.** 84.93

13 3 **Boiling Point at 1 atm:** 104°F = 39°C = 313.0 K

13 4 **Freezing Point** −142°F = −96°C = 177.5 K

13 5 **Critical Temperature:** 473°F = 245°C = 518 K

13 6 **Critical Pressure** 898 psia = 60.9 atm = 6.17 MN/m²

13 7 **Specific Gravity:** 1.322 at 20°C (liquid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 2.9

13 11 **Ratio of Specific Heats of Vapor (Gas)** [illegible]

13 12 **Latent Heat of Vaporization.** 142 Btu/lb = 78.7 cal/g = 3.30 × 10⁵ J/kg

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued under Notes

NOTES

REVISED 1978

DCP	2,4-DICHLOROPHENOL

Common Synonyms	Solid crystals · Colorless · Medicinal odor Sinks in water
	Avoid contact with solid and dust. Keep people away. Wear goggles, self-contained breathing apparatus and rubber [illegible] including gloves. [illegible] fire department. Isolate and remove discharged material. Notify local Health and Pollution Control agencies.
Fire	Combustible **POISONOUS GASES ARE PRODUCED IN FIRE** Wear goggles, self-contained breathing apparatus, rubber boots and gloves including gloves. Extinguish with dry chemical, carbon dioxide, foam. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID **SOLID OR DUST** **Will burn skin and eyes** **Poisonous if swallowed** Remove contaminated clothing. Flush affected area with plenty of water. IF IN EYES: Hold eyelids open, flush with plenty of water. IF SWALLOWED: Induce vomiting. CONSCIOUS: Have [illegible] drink water or milk.
Water Pollution	**Effect of low concentrations on aquatic life is unknown** **May be dangerous if it enters water intakes** Notify [illegible] of downstream [illegible]. Notify [illegible] water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning, water contamination.
Should be removed.
Chemical and physical treatment.

2. LABELS

Not hazardous as required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** None [illegible] synonyms.

3.2 **Coast Guard Compatibility Classification** Not applicable.

3.3 **Chemical Formula:** $HOC_6H_3Cl_2$

3.4 **IMCO United Nations Numerical Designation** n.l. 2020

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid

4.2 **Color:** White

4.3 **Odor:** Strong, [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator, [illegible] approved respirator, [illegible] chemical goggles.

5.2 **Symptoms Following Exposure:** Tremors, convulsions, shortness of breath, irritation of respiratory system.

5.3 **Treatment for Exposure:** Inhalation — rest. Ingestion — drink water, epsom salt solution.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent.

5.5 **Short-Term Inhalation Limits:** Data not available.

5.6 **Toxicity by Ingestion:** Grade 3 [illegible]

5.7 **Late Toxicity:** Data not available.

5.8 **Vapor (Gas) Irritant Characteristics** Not pertinent.

5.9 **Liquid or Solid Irritant Characteristics** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.

5.10 **Odor Threshold** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point:** 200°F (O.C.) [illegible] (C.C.)

6.2 **Flammable Limits in Air:** Data not available.

6.3 **Fire Extinguishing Agents** Water, foam, carbon dioxide, dry chemical.

6.4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing.

6.5 **Special Hazards of Combustion Products** Toxic gases can be produced.

6.6 **Behavior in Fire** Sublimes and burns.

6.7 **Ignition Temperature:** Data not available.

6.8 **Electrical Hazard:** Not pertinent.

6.9 **Burning Rate** Not pertinent.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.

7.2 **Reactivity with Common Materials** May react vigorously with oxidizing materials.

7.3 **Stability During Transport:** Stable.

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent.

7.5 **Polymerization:** Not pertinent.

7.6 **Inhibitor of Polymerization.** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
5 ppm/3 hours/rainbow trout/killed/fresh water
5 ppm/12 hours/bluegills/killed/fresh water

8.2 **Waterfowl Toxicity:** Data not available.

8.3 **Biological Oxygen Demand (BOD)** [illegible] 5 days.

8.4 **Food Chain Concentration Potential.** Data not available.

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640

2. Monsanto Co.
Monsanto Industrial Chemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available.

10.2 **Storage Temperature:** Data not available.

10.3 **Inert Atmosphere:** Data not available.

10.4 **Venting:** Data not available.

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed.

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.

12.3 **NFPA Hazard Classifications:** Not listed.

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight.** 163.01

13.3 **Boiling Point at 1 atm:** 421°F = 216°C = 489 K

13.4 **Freezing Point:** 110°F = 43°C = 316°K

13.5 **Critical Temperature:** Not pertinent.

13.6 **Critical Pressure:** Not pertinent.

13.7 **Specific Gravity:** 1.40 at 15°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent.

13.9 **Liquid-Water Interfacial Tension:** Not pertinent.

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.

13.12 **Latent Heat of Vaporization:** Not pertinent.

13.13 **Heat of Combustion** Not pertinent.

13.14 **Heat of Decomposition.** Not pertinent.

13.15 **Heat of Solution:** Not pertinent.

13.16 **Heat of Polymerization** Not pertinent.

Continued on next page

NOTES

REVISED 1976

DCA	2,4-DICHLOROPHENOXYACETIC ACID

Common Synonyms			
2 4 D	Solid	White to tan	Odorless
	Sinks in water		

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	CALL FOR MEDICAL AID SOLID POISONOUS IF SWALLOWED
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning – poison water
contain part
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard data required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2 4 D

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $2,4\text{-}Cl_2C_6H_3OCH_2COO^-$

3 4 **IMCO/United Nations Numerical Designation:** 6 1 2609

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White to tan

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective dust mask rubber gloves chemical goggles

5 2 **Symptoms Following Exposure:** Dust may irritate eyes Ingestion causes gastroentric distress diarrhea mild central nervous system depression dysphagia and possible transient liver and kidney injury

5 3 **Treatment for Exposure:** EYES flush with water for at least 15 min SKIN wash well with soap and water INGESTION induce vomiting and follow with gastric lavage and supportive therapy

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 oral rat LD_{50} = 375 mg/kg (rat) 50 mg/kg (human)

5 7 **Late Toxicity:** Causes birth defects in some laboratory animals

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents** Water foam

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Toxic and irritating hydrogen chloride or phosgene gases may form

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water rinse with sodium bicarbonate or lime solution

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** No pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Approx 48 hr killifish/50% kill salt water 375 mg/L 48 hr bluegill TL_{50} fresh water

8 2 **Waterfowl Toxicity:** LD_{50} = ~2000 mg/kg

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** No buildup in food chain

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland Mich 48640

2 Phodia Inc
Chipman Division
120 Jersey Ave
New Brunswick N J 08903

3 Monsanto Co
800 N Lindbergh Boulevard
St Louis Mo 63166

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM A

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 221 0

13 3 **Boiling Point at 1 atm:** Very high

13 4 **Freezing Point:** 286 F = 141°C = 414°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 563 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** (est) = −7 700 Btu/lb = −4 300 cal/g = −180 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

DPP	DICHLOROPROPANE

Common Synonyms
Propylene dichloride
1,2-dichloropropane

Watery liquid | Colorless | Sweet odor

Sinks in water. Flammable. Irritating vapors is produced

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

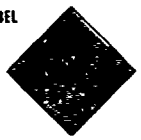
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Issue warning: high flammability
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
1,2-Dichloropropane
Propylene dichloride

3.2 **Coast Guard Compatibility Classification:**
Halogenated hydrocarbon

3.3 **Chemical Formula:** $CH_3CHClCH_2Cl$

3.4 **IMCO United Nations Numerical Designation:** 3,2,1279

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sweet

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied or contained area, rubber gloves, chemical goggles, protective outer clothing and rubber footwear

5.2 **Symptoms Following Exposure:** Contact with liquid causes severe irritation

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air. CONTACT WITH SKIN OR EYES: wash with thoroughly clean soap and water. Flush eyes with water. Seek medical advice

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 75 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD_{50} 0.5-5.0 g/kg (guinea pig)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** A pungent vapor that may cause lachrymation and irritation of the eyes and respiratory system at a few hundred ppm concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Repeated or prolonged contact may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 60 F (CC) 70 F (OC)

6.2 **Flammable Limits in Air:**
3.4 - 14.5

6.3 **Fire Extinguishing Agents**
Foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used**
Not particular

6.5 **Special Hazards of Combustion Products**
Toxic and irritating gases may be generated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 610 °F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Test 3.2 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
160 ppm/crustacea TL_m salt water

8.2 **Waterfowl Toxicity**
Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Mich. 48640

Jefferson Chemical Co. Inc.
3340 Richmond Ave.
Houston, Texas 77002

Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
Refined

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

X X X

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm**
Liquid

13.2 **Molecular Weight** 112.9

13.3 **Boiling Point at 1 atm:**
206 F = 96.4 C = 369.6 K

13.4 **Freezing Point**
-148 F = -100 C = 173 K

13.5 **Critical Temperature:** No pertinent

13.6 **Critical Pressure:** No pertinent

13.7 **Specific Gravity:** 1.159 at 20 C (water)

13.8 **Liquid Surface Tension.**
29 dynes/cm = 0.029 N/m = 29 N/m

13.9 **Liquid-Water Interfacial Tension**
37.9 dynes/cm = 0.0379 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:** 3.9

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.094

13.12 **Latent Heat of Vaporization.**
122 Btu/lb = 67.5 cal/g = 2.82 × 10⁵ J/kg

13.13 **Heat of Combustion:** Test = 7300 Btu/lb = 4100 cal/g = 17.0 × 10⁶ J/kg

13.14 **Heat of Decomposition** No pertinent

13.15 **Heat of Solution.** No pertinent

13.16 **Heat of Polymerization** No pertinent

NOTES

REVISED 1978

DPR	DICHLOROPROPENE

Common Synonyms 1,3-dichloropropene Telone	Liquid Colorless Sweet odor Sinks in water. Flammable, irritating vapor is produced

[illegible]

Fire	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat [illegible] LIQUID Will burn skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Dispersed and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** 1,3-Dichloropropene, Telone

3.2 **Coast Guard Compatibility Classification** Substituted allyl

3.3 **Chemical Formula:** $C_3H_4Cl_2$

3.4 **IMCO United Nations Numerical Designation.** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor.** Sweet [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure** INHALATION [illegible] INGESTION [illegible] CONTACT WITH SKIN OR EYES [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value).** [illegible]

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by ingestion** Grade 3 [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics.** [illegible]

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents.** [illegible] dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases may be generated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** (est.) 3.4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Mich. 48640

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-1

A-X-Y

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	[illegible]
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irr.	[illegible]
Poisons	[illegible]
Water Pollution	
Human Toxicity	[illegible]
Aquatic Toxicity	[illegible]
Aesthetic Effect	[illegible]
Reactivity	
Other Chemicals	[illegible]
Water	[illegible]
Self Reaction	[illegible]

12.3 **NFPA Hazard Classifications.** Not used

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** 170°F = [illegible]°C = [illegible]°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.2 at 20°C (liquid)

13.8 **Liquid Surface Tension.** 31.2 dynes/cm = 0.0312 N/m at 24°C

13.9 **Liquid-Water Interfacial Tension:** 23.8 dynes/cm = 0.0238 N/m at 24°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.1[illegible]

13.12 **Latent Heat of Vaporization:** (est.) 113 Btu/lb = 62.8 cal/g = 2.63 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) 6900 Btu/lb = 3900 cal/g = 1.60 × 10⁷ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

DTM	4,4'-DICHLORO-alpha-TRICHLOROMETHYLBENZHYDROL

Common Synonyms
Dicofol
Kelthanethanol
Kelthane
1,1-Bis(p-chlorophenyl)-2,2,2-trichloroethanol

Solid powder or liquid (solution) | Solid is white to grey; liquid is brown | Solid is odorless; liquid has odor of solvent

May float or sink in water

[illegible]

Fire

LIQUID SOLVENT MAY BE FLAMMABLE
SOLID IS COMBUSTIBLE
Irritating gases may be produced when heated
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

[illegible]

DUST
Irritating to eyes, nose and throat
If inhaled will cause headache or dizziness
[illegible]

LIQUID OR SOLID
Irritating to skin and eyes
If swallowed will cause headache, nausea or dizziness
[illegible]

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning; water contaminant higher than maximum allowable limits
Mechanical containment (liquid only)
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,1-Bis(p-chlorophenyl)-2,2,2-trichloroethanol; Dicofol; p,p'-dichlorobenzilic trichloromethylcarbinol; Dicofol; Kelthane; Kelthanethanol

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $(ClC_6H_4)_2COHCCl_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Powder, semi-solid or liquid

4.2 **Color:** White to grey; solid: red to black; semi-solid: brown; liquid

4.3 **Odor:** Solids have slight characteristic odor; liquid has odor of the solvent xylene

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus if exposed to vapor; rubber gloves; splash goggles

5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes nausea, headache, weakness, convulsions, possible kidney and liver damage. Contact with eyes causes irritation

5.3 **Treatment for Exposure:** INHALATION: move to fresh air; apply artificial respiration and oxygen if indicated. EYES: wash for 15 min with water; call a physician. SKIN: wash well with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = [illegible] mg/kg (rats); [illegible] mg/kg (oral, rats)

5.7 **Late Toxicity:** Suppresses immune reactions in rats

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible] (xylene)

6.2 **Flammable Limits in Air:** [illegible] (for xylene solution)

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fire

6.6 **Behavior in Fire:** Xylene solvent vapors may travel; [illegible] ignition and flashback

6.7 **Ignition Temperature:** [illegible] (for xylene solution)

6.8 **Electrical Hazard:** (xylene) Class I, Group D

6.9 **Burning Rate:** (xylene) [illegible] mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Contact with steel at elevated temperature causes formation of toxic chlorine and hydrogen chloride gases. Liquid may attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] (upper 24-hr [illegible] fresh water)

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

Rohm and Haas Co.
Independence Mall West
Philadelphia, Pa. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 82-[illegible]% plus 18% inert solids; [illegible]% solution in xylene, a combustible solvent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open-flame arrester (for liquid forms)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

Liquid: S T E
Solid: H

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid or liquid

13.2 **Molecular Weight:** 370.5

13.3 **Boiling Point at 1 atm:** (Data apply to xylene solution; solid decomposes) 282°F = 139°C = 412 K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** >1.1 at 20°C (solids); <0.9 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page [illegible])

NOTES

DPT	DICYCLOPENTADIENE

Common Synonyms	
Dicy	Liquid or solid crystals Colorless Camphor odor Floats on water. Freezing point is 41° F

[illegible]

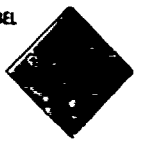
Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area [illegible]
Exposure	[illegible] LIQUID OR SOLID Irritating to skin and eyes [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Dicy
3a,4,7,7a-Tetrahydrodiene
4,7-methanoindene

3.2 **Coast Guard Compatibility Classification:**
Oleins

3.3 **Chemical Formula:** $C_{10}H_{12}$

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** [illegible]

4.3 **Odor:** Camphor [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** INHALATION [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 0.82 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** 0.003 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** [illegible]

7.3 **Stability During Transport:** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** [illegible]

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook [illegible]

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
[illegible]	
Health	
Vapor Irritation	
Liquid or Solid Irritant	
Poison	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	
Reactivity	
Other Chemical	
Water	
Self Reaction	

12.3 **NFPA Hazard Classifications:**
Not [illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** [illegible]

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page [illegible])

NOTES

REVISED 1978

DED	DIELDRIN

Chemical Synonyms
HEOD
endo,exo-1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4,5,8-dimethanonaphthalene

Solid — Light brown — Mild chemical odor

Sinks in water

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause headache, dizziness, or loss of consciousness

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
If swallowed will cause headache, nausea, dizziness, vomiting, or loss of consciousness

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning — water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** HEOD endo,exo-1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4,5,8-dimethanonaphthalene

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_{12}H_8Cl_6O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Buff to light brown

4.3 **Odor:** Mild chemical

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** U.S. Bureau of Mines approved respirator, clean rubber gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Inhalation, ingestion, or skin contact causes irritation to membranes and mucous membrane, nausea, vomiting, headache, staggering, tremors. Contact with eyes causes irritation

5.3 **Treatment for Exposure:** INHALATION: move to fresh air, give oxygen and artificial respiration as required. INGESTION: induce vomiting and get medical attention. EYES: flush with plenty of water, get medical attention. SKIN: flush with plenty of water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.25 mg/m³

5.5 **Short-Term Inhalation Limits:** 1 mg/m³ for 30 min

5.6 **Toxicity by Ingestion:** Grade 4. Oral LD_{50} = 46 mg/kg (rats); 65 mg/kg (mice)

5.7 **Late Toxicity:** Banned by EPA in October 1974 because of suspected carcinogenic hazard to human health as a potential carcinogen in man

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and left and is wet, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** [illegible] ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen chloride fumes may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.002 mg/L (water fleas) [illegible] fresh water
[illegible] ppm (minnows) [illegible] fresh water
0.000 ppm (killifish) [illegible] salt water
0.025 - 0.00 ppm (brown shrimp) [illegible] salt water

8.2 **Waterfowl Toxicity:** [illegible] mg/kg

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** High

9. SELECTED MANUFACTURERS

Shell Chemical Co.
Agricultural Div.
2401 Crow Canyon Rd.
San Ramon, Calif. 94583

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical [illegible]
HEOD [illegible] emulsifiable concentrates in petroleum hydrocarbons which are combustible

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester) (for liquid forms)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-A

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classification:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 380.91

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** 329°F to 176°F (165 - 249°C)

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (water)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

continued on page [illegible]

NOTES

DEA	DIETHANOLAMINE

Common Synonyms			
2,2'-Iminodiethanol Bis (2-hydroxyethyl) amine	Oily liquid or solid crystals Solid is white	Liquid is colorless	Slight dead fish or ammonia odor

Salt and mixes with water

[illegible]

Fire

Combustible

[illegible]

Exposure

[illegible]

LIQUID
Irritating to skin and eyes

[illegible]

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Bis(2-hydroxyethyl) amine
DEA
2,2'-Dihydroxydiethylamine
Di(2-hydroxyethyl)amine
2,2'-Iminodiethanol

3 2 **Coast Guard Compatibility Classification**
Alkanolamine

3 3 **Chemical Formula** $(HOCH_2CH_2)_2NH$

3 4 **IMCO, United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild ammoniacal fishy characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Full face mask or mine vapor mask only if required; coveralls, body cover clothing, chemical goggles

5 2 **Symptoms Following Exposure** Irritation of eyes and skin. Breathing vapors may cause coughing, smothering sensation, nausea, headache

5 3 **Treatment for Exposure** INHALATION: no problem likely. Get medical attention if effects develop. INGESTION: induce vomiting if large amounts are swallowed, and call a physician. Treat symptomatically. Not known antidote. EYES: flush with plenty of water for at least 15 min and get medical attention promptly. SKIN: flush with plenty of water. Wash contaminated clothing before reuse

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2 LD50 0.5 to 5 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Vapor will cause moderate irritation such that personnel will avoid high concentrations unless in emergency. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics** Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure

5 10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** 400 F OC

6 2 **Flammable Limits in Air**
1.6 vol% LEL, 9.8 vol% UEL

6 3 **Fire Extinguishing Agents** Water, alcohol foam, carbon dioxide, dry chemical

6 4 **Fire Extinguishing Agents Not to be Used** Addition of water may cause frothing

6 5 **Special Hazards of Combustion Products** Irritating vapors are generated when heated

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** 1225 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** 0.74 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Flush with water

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.**
2100 ppm/24 hr sunfish bluegill 11 ppm freshwater

8 2 **Waterfowl Toxicity**
Data not available

8 3 **Biological Oxygen Demand (BOD)**
10 theo 5 days

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Jefferson Chemical Co. Inc
3338 Richmond Ave
Houston, Texas 77082

2 Olin Corp
Chemicals Division
120 Long Ridge Rd
Stamford, Conn 06904

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity** 88-99.8

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

-APQ

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight** 105.14

13 3 **Boiling Point at 1 atm**
268.4 F = 268.4 C = 541.6 K

13 4 **Freezing Point.** 82.4 F = 28 C = 301 K

13 5 **Critical Temperature**
656 F = 442 C = 715 K

13 6 **Critical Pressure**
470 psia = 32 atm = 3.2 MN/m²

13 7 **Specific Gravity** 1.095 at 28 C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
0.83

13 12 **Latent Heat of Vaporization.**
266.3 Btu/lb = 148 cal/g = 6.20 × 10⁵ J/kg

13 13 **Heat of Combustion** -10,790 Btu/lb
= -6000 cal/g = -251 × 10³ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution**
[illegible] = 13 Btu/lb = 7 cal/g
= 0.3 × 10³ J/kg

13 16 **Heat of Polymerization** Not pertinent

[illegible]

NOTES

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DEN	# DIETHYLAMINE

Common Synonyms			
DEN	Watery liquid	Colorless	Fishy, ammonia odor
	Floats and mixes with water. Flammable, irritating vapor is produced		

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
Irritating vapors are produced when heated
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled
[illegible]

LIQUID
Will burn eyes
Harmful if swallowed
[illegible]

Water Pollution

Harmful to aquatic life in very low concentrations
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning – high flammability
Evacuate area
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** DEN
3.2 **Coast Guard Compatibility Classification**
Aliphatic amine
3.3 **Chemical Formula** $(CH_3CH_2)_2NH$
3.4 **IMCO/United Nations Numerical Designation** 3.1 1154

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor** Ammoniacal, sharp, fishy

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Chemical safety goggles, rubber gloves, and apron
5.2 **Symptoms Following Exposure** Irritation and burning of eyes, skin, and respiratory system. High concentration of vapor causes asphyxiation
5.3 **Treatment for Exposure:** In case of contact, flush skin or eyes with plenty of water for at least 15 min. For eyes, get medical advice
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 25 ppm
5.5 **Short-Term Inhalation Limits** 100 ppm for 30 min
5.6 **Toxicity by Ingestion** Grade 2, 0.5 to 5 g/kg (rats)
5.7 **Late Toxicity** None
5.8 **Vapor (Gas) Irritant Characteristics** Vapor is moderately irritating such that people will not willingly remain in moderate to high vapor concentrations
5.9 **Liquid or Solid Irritant Characteristics** Minimum hazard if pollution clothing and allowed to remain, causes smarting and reddening of the skin
5.10 **Odor Threshold** 0.14 ppm

6. FIRE HAZARDS

6.1 **Flash Point.** 5°F (-15°C)
6.2 **Flammable Limits in Air.**
1.8% – 10.1%
6.3 **Fire Extinguishing Agents** Dry chemical, carbon dioxide, or alcohol foam
6.4 **Fire Extinguishing Agents Not to be Used**
Data not available
6.5 **Special Hazards of Combustion Products**
Vapors are irritating
6.6 **Behavior in Fire** Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature.** 594°F
6.8 **Electrical Hazard** Data not available
6.9 **Burning Rate** 0.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials**
No hazardous reaction
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization**
Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity**
85 mg/L/48 hr creek chub/TLm fresh water
8.2 **Waterfowl Toxicity.**
Data not available
8.3 **Biological Oxygen Demand (BOD):**
Data not available
8.4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals, Inc.
Allentown, Pa. 18105
2. E. I. duPont de Nemours & Co., Inc.
Industrial and Biochemicals Dept.
Wilmington, Del. 19898
3. Pennwalt Corp.
Chemical Division
4658 Biddle Ave.
Wyandotte, Mich. 48193

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
Technical 99%
10.2 **Storage Temperature.**
Data not available
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V P Q R S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**
Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight:** 73.14
13.3 **Boiling Point at 1 atm:**
132°F = 55.5°C = 328.7 K
13.4 **Freezing Point:**
−57.6°F = −49.8°C = 223.4 K
13.5 **Critical Temperature:**
434.3°F = 223.5°C = 496.7 K
13.6 **Critical Pressure:**
538 psia = 36.6 atm = 3.71 MN/m²
13.7 **Specific Gravity:** 0.708 at 20°C (liquid)
13.8 **Liquid Surface Tension:**
29.08 dynes/cm = 0.02908 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension**
Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.5
13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.079
13.12 **Latent Heat of Vaporization**
170 Btu/lb = 93 cal/g = 3.9 × 10⁵ J/kg
13.13 **Heat of Combustion** −17,980 Btu/lb
= −9994 cal/g = −41.8 × 10⁶ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution** −202 Btu/lb
= −112 cal/g = −0.9 × 10⁶ J/kg
13.16 **Heat of Polymerization** Not pertinent

Continued on page [illegible]

NOTES

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DEB	DiETHYLBENZENE

Common Synonyms	Liquid Colorless Sweet, gasoline-like odor Floats on water
	[illegible]
Fire	Combustible [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms

3 2 **Coast Guard Compatibility Classification** Aromatic hydrocarbon

3 3 **Chemical Formula:** $C_6H_4(C_2H_5)_2$

3 4 **IMCO/United Nations Numerical Designation:** 3 3/2049

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Characteristic aromatic like benzene like toluene

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus safety goggles

5 2 **Symptoms Following Exposure:** High vapor concentrations produce eye and respiratory tract irritation dizziness depression Liquid irritates and may blister skin can cause corneal injury to eye

5 3 **Treatment for Exposure** INHALATION remove to fresh air and start artificial respiration INGESTION do NOT induce vomiting call a doctor CONTACT WITH EYES AND SKIN flush with water for 15 min Wash skin with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral rat LD_{50} = 1 2 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 135°F C C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Foam water carbon dioxide or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 743°F (ortho)

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 American Petrofina Inc
Cosden Oil & Chemical Co Division
Big Spring Texas 79720

2 Dow Chemical Co
Midland Mich 48640

3 Sinclair Koppers Co
Koppers Bldg
Pittsburgh Pa 15219

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical (mixture of isomers)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 134 21

13 3 **Boiling Point at 1 atm:** 356°F = 180°C = 453°K

13 4 **Freezing Point** <160°F = <70°C = <343°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 86 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 30 dynes/cm = 0 030 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization** 140 Btu/lb = 77 cal/g = 3 2 × 10^5 J/kg

13 13 **Heat of Combustion:** 17,800 Btu/lb = -9890 cal/g = -414 × 10^5 J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on p. [illegible]

NOTES

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DEC	DIETHYL CARBONATE

Common Synonyms Ethyl carbonate Carbonic acid diethyl ester	Watery liquid Colorless Pleasant odor Floats on water Flammable irritating vapor is produced

Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPORS Irritating to eyes nose and throat If inhaled will cause headache dizziness nausea or loss of consciousness LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4

Disperse and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Carbonic acid diethyl ester
Ethyl carbonate
Fufin

3 2 **Coast Guard Compatibility Classification**
Ester

3 3 **Chemical Formula** $(CH_3CH_2O)_2$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color** Colorless

4 3 **Odor** Pleasant ethereal mild and nonresidual

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Protective clothing rubber gloves and goggles organic vapor canister or air mask

5 2 **Symptoms Following Exposure.** High vapor concentration can cause headache irritation of eyes and respiratory tract dizziness nausea weakness loss of consciousness

5 3 **Treatment for Exposure:** INHALATION remove from exposure administer artificial respiration and oxygen if needed EYES flash with water [illegible]

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity** None

5 8 **Vapor (Gas) Irritant Characteristics** Vapors may cause slight stinging of eyes

5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 115°F O.C. 77°F C.C.

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents.** Foam carbon dioxide dry chemical

6 4 **Fire Extinguishing Agents Not to be Used** Water

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** 3.4 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** Too slow to be hazardous

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Chemetron Corp
Organic Chemicals Division
[illegible] Texas [illegible]

2 FMC Corp
Organic Chemicals Division
633 Third Ave
New York N.Y. 10012

10 SHIPPING INFORMATION

10 1 **Grades or Purity** 99-100

10 2 **Storage Temperature** Data not available

10 3 **Inert Atmosphere** Data not available

10 4 **Venting** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight** 118.13

13 3 **Boiling Point at 1 atm** 260.2 F = 126.8 C = 400.0 K

13 4 **Freezing Point** −45 F = −43 C = 230 K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 0.975 – 2.0 C (liquid)

13 8 **Liquid Surface Tension** 26.6 dynes/cm = 0.0266 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension** 12.86 dynes/cm = 0.0[illegible] N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** [illegible]

13 12 **Latent Heat of Vaporization** 150 Btu/lb = 73 cal/g = [illegible] × 10 J/kg

13 13 **Heat of Combustion** −9760 Btu/lb = −5420 cal/g = −227 × 10 J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

DEG	DIETHYLENE GLYCOL

Common Synonyms
DEG
2,2-Oxybisethanol
Diglycol
β,β′-Dihydroxydiethyl ether

Oily liquid — Colorless — Odorless

Sinks and mixes with water

Fire

Combustible

Exposure

Not harmful

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Bis(2-hydroxyethyl)ether
Diglycol
β,β′-Dihydroxydiethyl ether
2-(2-Hydroxyethoxy)-ethanol
2,2′-oxybisethanol

3.2 **Coast Guard Compatibility Classification**
Glycol

3.3 **Chemical Formula**
$(HOCH_2CH_2)_2O$

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Practically odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Full face mask with canister for short exposure to high vapor levels, rubber gloves, goggles

5.2 **Symptoms Following Exposure:** Ingestion of large amounts may cause degeneration of kidneys and liver and ultimately death. Liquid may cause slight skin irritation

5.3 **Treatment for Exposure** INHALATION: no problem likely. If any ill effects develop, get medical attention. INGESTION: induce vomiting if ingested. No known antidote. Treat symptoms. In EYE AND SKIN: flush with water. If any ill effects occur, get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm (suggested)

5.5 **Short-Term Inhalation Limits** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 0 LD50 (rat) 12,500 mg/kg

5.7 **Late Toxicity:** Kidney and liver damage

5.8 **Vapor (Gas) Irritant Characteristics** None

5.9 **Liquid or Solid Irritant Characteristics** None

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** 255°F C.C.

6.2 **Flammable Limits in Air.**
1.6 — 10%

6.3 **Fire Extinguishing Agents** Alcohol foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature** 444°F

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** 1.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
> 42,000 ppm 96 hr. mosquito fish, TL m, fresh water

8.2 **Waterfowl Toxicity:**
Data not available

8.3 **Biological Oxygen Demand (BOD)**
6 — 5 days

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640
2. Jefferson Chemical Co., Inc.
1336 Richmond Ave.
Houston, Texas 77052
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity.** Regular grade, polyester grade

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-5

VPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	1
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 106.12

13.3 **Boiling Point at 1 atm**
472°F = 244°C = 517°K

13.4 **Freezing Point** 30°F = -1°C = 273°K

13.5 **Critical Temperature.**
750°F = 399°C = 672°K

13.6 **Critical Pressure**
Estimated = 46 atm = 7 MN/m²

13.7 **Specific Gravity** 1.118 at 20°C (liquid)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization**
270 Btu/lb = 150 cal/g = 6.3 × 10⁵ J/kg

13.13 **Heat of Combustion** = 9,017 Btu/lb
= 5,343 cal/g = 22.3 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

DGD	DIETHYLENE GLYCOL DIMETHYL ETHER

Common Synonyms	
Poly Solv Bis(2 methoxyethyl)-ether Diglyme	Watery liquid Colorless Pleasant odor Floats and mixes with water

Stop discharge if possible
[illegible]

Fire	Combustible [illegible]
Exposure	[illegible] LIQUID If swallowed will cause nausea, vomiting or loss of consciousness [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**
Bis(2 methoxyethyl)-ether
Diglyme
Poly Solv

3 2 **Coast Guard Compatibility Classification**
Alcohol glycol glycol ether

3 3 **Chemical Formula**
$(CH_3OCH_2CH_2)_2O$

3 4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild ethereal

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Vinyl (not rubber) gloves safety goggles

5 2 **Symptoms Following Exposure.** INGESTION (severe cases) nausea vomiting abdominal cramps weakness progressing to coma

5 3 **Treatment for Exposure.** INGESTION give water and induce vomiting oxygen and artificial respiration as needed

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** None

5 9 **Liquid or Solid Irritant Characteristics** None

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 188 F O C

6 2 **Flammable Limits in Air**
Data not available

6 3 **Fire Extinguishing Agents.**
Dry chemical foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6 5 **Special Hazards of Combustion Products.**
Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature**
Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials**
No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
Data not available

8 2 **Waterfowl Toxicity**
Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Olin Corp
Chemicals Division
120 Long Ridge Rd
Stamford Conn 06904

The Ansul Co
Chemical Division
101 Stanton St
Marinette Wis 54143

10 SHIPPING INFORMATION

10 1 **Grades or Purity**
Technical

10 2 **Storage Temperature**
Data not available

10 3 **Inert Atmosphere** Data not available

10 4 **Venting** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3)

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 134 12

13 3 **Boiling Point at 1 atm:**
324°F = 162°C = 435°K

13 4 **Freezing Point**
−94°F = −70°C = 203°K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 0.945 at 20°C (liquid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization**
130 Btu/lb = 74 cal/g = [illegible] × 10⁻³ kg

13 13 **Heat of Combustion:** [illegible] Btu/lb = −6 260 cal/g = −262 × 10⁻³ kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

DME	DIETHYLENEGLYCOL MONOBUTYL ETHER

Common Synonyms			
2-(2-Butoxyethoxy)-ethanol Butoxyethoxyethanol Butyl "Carbitol" Dowanol DB Poly-solv DB	Liquid	Colorless	Mild pleasant odor
	Mixes with water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Butoxydiethylene glycol, Butoxydiglycol, Diglycol monobutyl ether, Butyl "Carbitol", Dowanol DB, Poly-Solv DB

3.2 **Coast Guard Compatibility Classification:** Glycol ether

3.3 **Chemical Formula:** $C_4H_9OCH_2CH_2OCH_2CH_2OH$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild characteristic pleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety goggles or face shield

5.2 **Symptoms Following Exposure:** Inhalation for brief periods has no significant effect. Contact with liquid causes moderate irritation of eyes and corneal injury. Prolonged contact with skin causes only minor irritation.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air; if ill effects are observed, call a doctor. EYES: immediately flush with plenty of water for at least 15 min. SKIN: wash well with soap and water. INGESTION: give large amounts of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 2 g/kg (guinea pig)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 240 F (O.C.), 172 F (C.C.)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, alcohol foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 442°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 3.3 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 44% of theoretical in 5 days

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
   Chemicals and Plastics Division
   270 Park Avenue
   New York, N.Y. 10017
2. Shell Chemical Company
   Industrial Chemicals Division
   One Shell Plaza
   Houston, Texas 77001
3. Jefferson Chemical Company, Inc.
   260 Madison Avenue
   New York, N.Y. 10016

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

V P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid or Solid Irritant	1
Poisons	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	1
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 162.2

*13.3 **Boiling Point at 1 atm:** 448 F = 231 C = 504 K

13.4 **Freezing Point:** −40 F = −40 C = 233 K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.9561 @ 20 C (liquid)

13.8 **Liquid Surface Tension:** 34 dynes/cm = 0.034 N/m @ 25 C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 100 Btu/lb = 74 cal/g = 3.1 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) −4,000 Btu/lb = −7,500 cal/g = −31.4 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) −36 Btu/lb = −20 cal/g = −0.84 × 10⁶ J/kg

*13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DEM	DIETHYLENEGLYCOL MONOBUTYL ETHER ACETATE

Common Synonyms		
2-(2-Butoxyethoxy) ethanol acetate 2-(2-Butoxyethoxy) ethyl acetate Diglycol monobutyl ether acetate Butyl "Carbitol" acetate	Liquid Colorless Mild odor Floats and mixes slowly with water	

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning - water contaminant
Dissolve and flush

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-(2-Butoxyethoxy) ethyl acetate, Diglycol monobutyl ether acetate, Butyl Carbitol acetate, Ektasolve DB Acetate

3.2 **Coast Guard Compatibility Classification.** Ester (13)

3.3 **Chemical Formula:**
$CH_3OCH_2CH_2OCH_2CH_2OCOCH_3$

3.4 **IMCO/United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild - mercaptal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Face shield or safety glasses, protective gloves, a mask for prolonged exposure to vapor

5.2 **Symptoms Following Exposure:** Prolonged breathing of vapor may cause irritation and nausea. Contact with liquid may cause mild irritation of eyes and skin. Can be absorbed through skin in toxic amounts

5.3 **Treatment for Exposure:** INHALATION - move victim to fresh air. If breathing has stopped administer artificial respiration. EYES - flush with water for at least 15 min. SKIN - wash skin with large amounts of water or 15 min. soap phase, and if needed. INGESTION - induce vomiting, get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Because of high boiling point (246 C) hazards from inhalation are minimal

5.6 **Toxicity by Ingestion.** Grade 2 oral LD_{50} = 2.34 g/kg (guinea pig)

5.7 **Late Toxicity:** Kidney damage noted in animals following repeated contact with skin

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 240 F OC

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents.** Water, alcohol foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 563 F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate.** [illegible] min/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2. Eastman Chemical Products, Inc.
Kingsport, Tenn. 37662

3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

XPQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 204.[illegible]

13.3 **Boiling Point at 1 atm:**
[illegible] F = 246 C = [illegible] K

13.4 **Freezing Point:** [illegible] F = [illegible] C = 240 K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20 C (liquid)

13.8 **Liquid Surface Tension:** (est.)
22 dynes/cm = 0.022 N/m at 20 C

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization.** [illegible] Btu/lb
= [illegible] cal/g = [illegible] J/kg

13.13 **Heat of Combustion:** (est.) = [illegible] Btu/lb
= [illegible] cal/g = [illegible] J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) = [illegible] Btu/lb
= [illegible] cal/g = [illegible] J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

DGE	DIETHYLENE GLYCOL MONOETHYL ETHER

Common Synonyms Poly Sols DE Dowanol DE Carbitol 2(2ethoxyethoxy)ethanol	Liquid Colorless Fruity odor Floats and mixes with water
[illegible]	
Fire	Combustible
Exposure	LIQUID Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Dispose and flush

2 LABELS

[illegible]

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** [illegible]

3.2 **Coast Guard Compatibility Classification** [illegible]

3.3 **Chemical Formula:** CH CH OCH CH OCH CH OH

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** SKIN AND EYES [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits** [illegible]

5.6 **Toxicity by Ingestion** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics.** [illegible]

5.9 **Liquid or Solid Irritant Characteristics** [illegible]

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point** [illegible]

6.2 **Flammable Limits in Air.** [illegible]

6.3 **Fire Extinguishing Agents** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 400 F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** 2.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** [illegible]

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	[illegible]
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poison	0
Water Pollution	
Human Toxicity	[illegible]
Aquatic Toxicity	[illegible]
Aesthetic Effect	
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	[illegible]

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.** [illegible]

13.4 **Freezing Point.** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (liquid)

13.8 **Liquid Surface Tension.** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization.** [illegible]

13.13 **Heat of Combustion:** 11,390 Btu/lb = -6330 cal/g = 265 × 10 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

DGM	DIETHYLENE GLYCOL MONOMETHYL ETHER

Common Synonyms Poly-Solv DM Dowanol DM 2-(2-methoxyethoxy)-ethanol Methyl Carbitol	Liquid — Colorless — Pleasant odor Floats and mixes with water
[illegible]	
Fire	Combustible [illegible]
Exposure	[illegible] LIQUID Irritating to eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Disperse and flush

2. LABELS

[illegible]

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diethylene glycol methyl eth[illegible]
Dowanol DM
2-(2-Methoxyethoxy)-ethanol
Methyl Carbitol
Poly-Solv DM

3.2 **Coast Guard Compatibility Classification:** Glycol ethe[illegible]

3.3 **Chemical Formula:** $CH_3OCH_2CH_2OCH_2CH_2OH$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** SKIN OR EYES [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits** [illegible]

5.6 **Toxicity by Ingestion** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics** [illegible]

5.9 **Liquid or Solid Irritant Characteristics** [illegible]

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point.** 200 F OC

6.2 **Flammable Limits in Air:** LFL – 1.2%

6.3 **Fire Extinguishing Agents:** Water, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 34% of theoretical in 5 days

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

[illegible]

Jefferson Chemical
[illegible] Richmond Ave
Houston, Tex. [illegible]

Union Carbide Corp.
Chemicals & Plastics Div.
270 Park Ave
New York, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
[illegible]	
Health	
Vapor [illegible]	[illegible]
Liquid [illegible]	
Physical	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	[illegible]
Reactivity	
Other Chemical	[illegible]
Water	
Self Reaction	

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm** [illegible]

13.4 **Freezing Point** [illegible]

13.5 **Critical Temperature** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas)** [illegible]

13.12 **Latent Heat of Vaporization** [illegible]

13.13 **Heat of Combustion** 10,830 Btu/lb = 6020 cal/g = 252 × 10³ J/kg

13.14 **Heat of Decomposition** [illegible]

13.15 **Heat of Solution** [illegible]

13.16 **Heat of Polymerization** [illegible]

[illegible]

NOTES

REVISED 1978

DET	DIETHYLENETRIAMINE

Common Synonyms
2,2 Diaminodiethylamine
Bis (2 aminoethyl) amine

Liquid — Colorless to yellow — Ammonia odor

Floats and mixes with water

Fire

Combustible

Exposure

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intake

1 RESPONSE TO DISCHARGE

See Response Methods Handbook

Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Bis 2 aminoethylamine
2,2 Diaminodiethylamine

3.2 **Coast Guard Compatibility Classification.**
Amine

3.3 **Chemical Formula.**
$NH_2CH_2CH_2NHCH_2CH_2NH_2$

3.4 **IMCO United Nations Numerical Designation:** Not assigned

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to light amber yellow
4.3 **Odor:** Strong ammoniacal to fishy ammoniacal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Amine respirator, safety goggles, rubber gloves, splash resistant gloves

5.2 **Symptoms Following Exposure:** Prolonged breathing of vapor may cause asthma. Liquid burns skin and eyes. Allergic rash can form

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. INGESTION: DO NOT induce vomiting, give large quantities of water, give activated charcoal, use pump of stomach and equal amount of water, get medical attention. SKIN CONTACT: flush with plenty of water. EYE CONTACT: flush with plenty of water for at least 15 min and get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 500 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns in short exposure and may cause secondary burns during exposure

5.10 **Odor Threshold:** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 200°F (93°C)

6.2 **Flammable Limits in Air:**
[illegible]

6.3 **Fire Extinguishing Agents:** Water spray, alcohol foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products.** Irritating vapors are generated when heated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No hazardous reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
>10 ppm/24 hr/brine shrimp/TL_m

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential**
23% of theoretical in 5 days/freshwater acclimated seed

9 SELECTED MANUFACTURERS

1. Dow Chemical Co
Midland, Mich 48640
2. Jefferson Chemical Co Inc
[illegible] Blackmond Ave
Houston, Texas 77002
3. Union Carbide Corp
Chemicals and Plastic Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.5%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

VPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Corrosive Material

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effects	
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:**
[illegible] °C ([illegible] K)

13.4 **Freezing Point:** [illegible] °C ([illegible] K)

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).**
Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** [illegible] Btu/lb
[illegible] × 10³ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:**
[illegible] Btu/lb
[illegible] × 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

DEP	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID

Common Synonyms 2-Ethyl 1-hexanol hydrogen phosphate Bis(2-ethylhexyl) hydrogen phosphate Di(2-ethylhexyl) phosphate Di(2-ethylhexyl) acid phosphate	Liquid Floats on water	Light yellow	Odorless

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning - corrosive water contaminant

Restrict access

Mechanical containment

Should be removed

Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Bis(2-ethylhexyl) hydrogen phosphate; D(2-ethylhexyl) phosphate; D(2-ethylhexyl) acid phosphate; DEHPA

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $[CH_3(CH_2)_3CH(C_2H_5)CH_2O]_2POOH$

3.4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Amber

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves, protect against splashing

5.2 **Symptoms Following Exposure:** Contact with liquid [illegible] and may cause severe eye burns; consult an eye specialist. May causes skin irritation or burns. Ingestion produces [illegible] similar to those caused by strong vinegar

5.3 **Treatment for Exposure:** EYES: immediately flush with plenty of water for at least [illegible] minutes; see a physician. SKIN: immediately flush with plenty of water for at least [illegible] minutes. INGESTION: induce vomiting and call a physician

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD [illegible] rat

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are irritating to the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** Causes stinging, [illegible] the skin and first degree burns in short exposure and may cause second degree burns in long exposure

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] F O.C.

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Irritating phosphorus oxides may be released

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Mildly corrosive to most metals; may form flammable hydrogen gas

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 92+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X E 1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	[illegible]
Poisons	[illegible]
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	[illegible]
Reactivity	
Other Chemicals	
Water	0
Self Reaction	[illegible]

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Decomposes

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (liquid)

13.8 **Liquid Surface Tension:** [illegible] 20 dynes/cm = 0.020 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** [illegible] 30 dynes/cm = 0.030 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

DPH	DIETHYL PHTHALATE

Common Synonyms: Phthalic acid diethyl ester; Ethyl phthalate; 1,2-Benzenedicarboxylic acid diethyl ester	Liquid	White	Mild chemical odor
	Sinks in water. Freezing point is [illegible]		

Fire	Combustible. Irritating fumes may be produced when heated.
Exposure	LIQUID. Not harmful.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Should be removed. Chemical and physical treatment.

2. LABELS

No hazard label required [illegible] Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2-Benzenedicarboxylic acid diethyl ester; Ethyl phthalate; Phthalic acid diethyl ester

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_{12}H_{14}O_4$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Slightly characteristic ester odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles, face shield

5.2 **Symptoms Following Exposure:** Symptoms subsiding [illegible] exposure

5.3 **Treatment for Exposure:** INHALATION: remove [illegible] EYES: flush with water. SKIN: flush with water, wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade [illegible] LD_{50} [illegible] mg/kg

5.7 **Late Toxicity:** Prolonged inhalation [illegible] may produce [illegible] damage

5.8 **Vapor (Gas) Irritant Characteristics:** Unknown

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Irritating vapors of unburned chemical may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 1.2 ppm [illegible] goldfish killed, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastman Chemical Products Inc., Kingsport, Tenn. [illegible]
2. Monsanto Company, 800 North Lindbergh Blvd., St. Louis, Mo. [illegible]
3. Aldrich Chemical Co., 940 W. Saint Paul Ave., Milwaukee, Wis. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 222

13.3 **Boiling Point at 1 atm:** [illegible] °C = [illegible] K

13.4 **Freezing Point:** [illegible] °C = [illegible] K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (liquid)

13.8 **Liquid Surface Tension:** [illegible] dynes/cm = [illegible] N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** [illegible] dynes/cm = [illegible] N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg

13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on next page)

NOTES

DEZ	DIETHYLZINC

Common Synonyms	
Zinc diethyl Diethylzinc Zinc ethyl	Water-white liquid Colorless IGNITES WHEN EXPOSED TO AIR. Flammable irritating vapor is produced

Fire	IGNITES WHEN EXPOSED TO AIR
Exposure	VAPOR OR DUST Irritating to eyes, nose and throat If inhaled will cause headache or difficult breathing LIQUID Will burn skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	effect of low concentrations on aquatic life is unknown May be dangerous if it covers water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning. Keep flammables away.
Remove sources.
Evacuate area.

2. LABELS

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Zinc diethyl, Diethylzinc, Zinc ethyl

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C_4H_{10}Zn$

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Not pertinent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Cartridge type or fresh air mask for fumes or vapors. PVC fire retardant or asbestos gloves, full face shield, safety glasses or goggles, fire retardant coveralls as standard wear; for special cases use asbestos coat or fire suit.

5.2 **Symptoms Following Exposure:** Inhalation: [illegible] Eyes: immediately and severely irritated or damaged. Most [illegible] may be warned by prompt recognition of irritation of the nasal zone immediately [illegible] Ingestion: nausea, vomiting, cramps and diarrhea may follow. Contaminated clothing may become soaked.

5.3 **Treatment for Exposure:** INHALATION: [illegible] immediately get medical attention. [illegible] should be given. [illegible] INGESTION: [illegible] NOT induce vomiting. [illegible] large amounts of water or milk immediately. [illegible] get medical attention.

Continued on page 6

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (pyrophoric liquid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Dry chemical, sand or powdered limestone

6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam, halogenated agents, carbon dioxide

6.5 **Special Hazards of Combustion Products:** Yields zinc oxide fumes when burned; can cause metal fume fever

6.6 **Behavior in Fire:** Reacts spontaneously with air, water and moisture with evolution of flammable ethane gas. Contact with water applied to advance fires intensifies the fire

6.7 **Ignition Temperature:** Below 0°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to form flammable ethane gas

7.2 **Reactivity with Common Materials:** Will react with surface moisture generating flammable ethane gas

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Not pertinent

8.2 **Waterfowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Ethyl Corporation
Industrial Chemicals Division
Ethyl Tower
451 Florida
Baton Rouge, La. 70801

Texas Alkyls, Incorporated
P.O. Box [illegible]
Deer Park, Texas 77536

Venture Chemicals
Alkyl Products
P.O. Box [illegible]
Bayport, Maryland [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Normally shipped as 15% by weight solution in high purity solvent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Inert with dry nitrogen gas

10.4 **Venting:** Safety valve

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A O Z

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (liquid)

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7

5 HEALTH HAZARDS (Cont'd.)

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Lethal Toxicity:** Not pertinent

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

DFE	1,1-DIFLUOROETHANE

Common Synonyms Ethylidene fluoride Ethylidene difluoride Refrigerant 152a	Liquefied compressed gas — Colorless Sinks and boils in water. Flammable, irritating vapor is produced. Visible vapor cloud is produced. Boiling point is 76°F
[illegible]	
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat Harmful if inhaled [illegible] LIQUID Will burn eyes Will cause frostbite Harmful if swallowed [illegible]
Water Pollution	Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — high flammability
Restrict access
Evacuate area

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Ethylidene difluoride
Ethylidene fluoride, Refrigerant 152a

3.2 **Coast Guard Compatibility Classification**
Not listed

3.3 **Chemical Formula.** CH_3CHF_2

3.4 **IMCO/United Nations Numerical Designation** 2/1030

4 OBSERVABLE CHARACTERISTICS*

4.1 **Physical State (as shipped):**
Liquefied compressed gas

4.2 **Color** Colorless

4.3 **Odor.** Faint

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment*** Individual breathing devices with air supply, neoprene gloves, protective clothing, eye protection

5.2 **Symptoms Following Exposure:** Inhalation of concentrated gas will cause suffocation. Contact with liquid can damage eyes because of low temperature. Frostbite may result from contact with liquid

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, use artificial respiration if necessary. EYES: get medical attention if liquid has entered eyes. SKIN: soak in lukewarm water (for frostbite)

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion.** Not pertinent (boils at 24°C)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics*** Data not available

5.10 **Odor Threshold*** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent

6.2 **Flammable Limits in Air*** 3.7% - 18%

6.3 **Fire Extinguishing Agents.** Shut off gas source, use water to cool adjacent combustibles

6.4 **Fire Extinguishing Agents Not to be Used***

6.5 **Special Hazards of Combustion Products**
Irritating hydrogen fluoride fumes may form in fire

6.6 **Behavior in Fire:** Containers may explode. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate*** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials**

7.3 **Stability During Transport*** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization*** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity*** Data not available

8.2 **Waterfowl Toxicity*** Data not available

8.3 **Biological Oxygen Demand (BOD)** None

8.4 **Food Chain Concentration Potential.**
None

9. SELECTED MANUFACTURERS

E. I. du Pont de Nemours & Co. (Inc.)
Freon Products Div.
Wilmington, Del. 19898

10 SHIPPING INFORMATION

10.1 **Grades or Purity*** Commercial

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere.** No requirement

10.4 **Venting** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B C D E F G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations***
Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation*** Not listed

12.3 **NFPA Hazard Classifications**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm**
Gas

13.2 **Molecular Weight:** 66.05

13.3 **Boiling Point at 1 atm.**
$-12.3°F = -11.3°C = 248.3°K$

13.4 **Freezing Point.**
$-179°F = -117°C = 156°K$

13.5 **Critical Temperature**
$236.3°F = 113.5°C = 386.6°K$

13.6 **Critical Pressure***
$652\ psia = 44.37\ atm = 4.50\ MN/m^2$

13.7 **Specific Gravity** 0.98 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
$11.25\ dynes/cm = 0.01125\ N/m$ at 20°C

13.9 **Liquid-Water Interfacial Tension**
Data not available

13.10 **Vapor (Gas) Specific Gravity.** 2.3

13.11 **Ratio of Specific Heats of Vapor (Gas)***
1.141

13.12 **Latent Heat of Vaporization** $140.5\ Btu/lb = 78.03\ cal/g = 3.268 \times 10^5\ J/kg$

13.13 **Heat of Combustion*** $2,956\ Btu/lb = 4,420\ cal/g = 18.5 \times 10^5\ J/kg$

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization*** Not pertinent

Continued on page 5 and 6

NOTES

DFA	DIFLUOROPHOSPHORIC ACID, ANHYDROUS

Common Synonyms	
Difluorophosphorus acid	Liquid Colorless Sharp irritating odor Reacts violently with water Irritating gas is produced on contact with water

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	VAPOR Irritating to eyes, nose and throat LIQUID Will burn skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning persons corrosive water contaminant
Restrict access
Evacuate area
Disperse and flush with care

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Difluorophosphorus acid
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** HOPOF
3 4 **IMCO/United Nations Numerical Designation:** N 1768

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color.** Colorless
4 3 **Odor:** Sharp very irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Air line mask or self contained breathing apparatus full protective clothing
5 2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory tract Contact with liquid causes severe irritation of eyes and skin Ingestion causes severe burns in mouth and stomach
5 3 **Treatment for Exposure** Get medical attention as soon as possible following exposure to this compound INHALATION remove from exposure and support respiration EYES wash with copious volumes of water for at least 15 min SKIN wash with large amounts of water for 15 min INGESTION if victim is conscious have him drink large amounts of water followed by milk or milk of magnesia
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion** Data not available
5 7 **Late Toxicity** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant The effect is temporary
5 9 **Liquid or Solid Irritant Characteristics** Severe skin irritant Causes second and third degree burns on short contact and is very injurious to the eyes
5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Do not use water on adjacent fires
6 5 **Special Hazards of Combustion Products:** Irritating and toxic fumes of hydrogen fluoride and phosphoric acid may be formed in fires
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts vigorously to form corrosive and toxic hydrofluoric acid
7 2 **Reactivity with Common Materials** In the presence of moisture is corrosive to glass other siliceous materials and most metals
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water rinse with sodium bicarbonate or lime solution
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Ozark Mahoning Company
820 South Boulder
Tulsa Okla 74119

2 Plantz and Bauer Inc
126-04 Northern Boulevard
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity** FP Acid No 2 90+ Commercial 96+ plus 3% monofluorophosphoric acid
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting.** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A O

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	2
Liquid or Solid Irritant	4
Poisons	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	
Water	1
Self Reaction	0

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight** 103 0
13 3 **Boiling Point at 1 atm:** 241 F = 116 C = 389 K
13 4 **Freezing Point** −149 F = −95 C = 178 K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 553 at 25 C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** 140 Btu/lb = [illegible] cal/g = 3 2 × 10 J/kg
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Data not available
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page [illegible])

NOTES

DHP — DIHEPTYL PHTHALATE

Common Synonyms			
Phthalic acid, diheptyl ester	Liquid	White	Odorless
	May float or sink in water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Phthalic acid, diheptyl ester
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula:** $C_6H_4(COOC_7H_{15})_2$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation of vapors from very hot material may cause headache, drowsiness and convulsions Contact with eyes may cause irritation
5 3 **Treatment for Exposure:** INHALATION move to fresh air EYES flush with water SKIN wipe off flush with water wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Data not available
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents** Foam dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6 5 **Special Hazards of Combustion Products**
6 6 **Behavior in Fire**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials:** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 K & K Laboratories Inc
121 Express Street
Plainview N Y 11803

2 Research Organic/Inorganic Chemical Corp
11686 Sheldon
Sun Valley Calif 91352

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-T-U-X-Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight:** 362
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point.** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** (est) 1 0 at 20°C (liquid)
13 8 **Liquid Surface Tension** Data not available
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Data not available
13 13 **Heat of Combustion:** (est) = 18 850 Btu/lb = −9 370 cal/g = −392 × 10³ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

DBC	DIISOBUTYLCARBINOL

Common Synonyms 2,6-Dimethyl-4-heptanol	Oily liquid Colorless Floats on water

Stop discharge if possible
Call fire department
[illegible]
Not [illegible] Health and [illegible]

Fire	**Combustible** Extinguish with dry chemical, alcohol foam or carbon dioxide Cool exposed containers with water
Exposure	CALL FOR MEDICAL AID *LIQUID* Harmful if swallowed IF SWALLOWED and victim is CONSCIOUS have victim drink water [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify local health and wildlife officials Notify [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms**
2,6-Dimethyl-4-heptanol

3 2 **Coast Guard Compatibility Classification**
Alcohol

3 3 **Chemical Formula**
$[(CH_3)_2CHCH_2]_2CHOH$

3 4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Air supplied mask for prolonged exposure, plastic gloves, goggles

5 2 **Symptoms Following Exposure** None expected

5 3 **Treatment for Exposure:** SKIN AND EYES flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits** Not pertinent

5 6 **Toxicity by Ingestion:** [illegible]

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** None

5 9 **Liquid or Solid Irritant Characteristics:** None

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** [illegible]

6 2 **Flammable Limits in Air:**
[illegible]

6 3 **Fire Extinguishing Agents.** Carbon dioxide, dry chemical, alcohol foam

6 4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6 5 **Special Hazards of Combustion Products:**
Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 494°F (calc.)

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD):**
Data not available

8 4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98.0%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3)

[illegible]

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 144.26

13 3 **Boiling Point at 1 atm:**
382°F = 178°C = 451°K

13 4 **Freezing Point:**
−88°F = −68°C = 208°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.812 at 20°C (liquid)

13 8 **Liquid Surface Tension.**
Data not available

13 9 **Liquid-Water Interfacial Tension:**
Data not available

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization.**
140 Btu/lb = 76 cal/g = 3.2 × 10⁵ J/kg

13 13 **Heat of Combustion** (est.) = 17,400 Btu/lb = −9,680 cal/g = −405 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

DBL	DIISOBUTYLENE

Common Synonyms	
2,4,4-Trimethyl-1-pentene	Liquid — Colorless — Gasoline like odor Floats on water. Flammable. Irritating vapor is produced

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALIFORNIA MAP

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness
[illegible]

LIQUID
Irritating to skin and eyes
If swallowed, will cause nausea or vomiting
[illegible]
IF EYES hold open and irrigate with plenty of water
IF SWALLOWED [illegible] CONSULT a physician immediately
DO NOT INDUCE VOMITING

Water Pollution

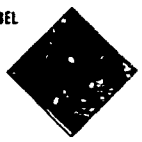
Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

[illegible]

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
2,4,4-Trimethyl-1-pentene

3.2 **Coast Guard Compatibility Classification**
Oxidizer

3.3 **Chemical Formula**
$(CH_3)_3CCH_2C(CH_3)=CH_2$

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color** Colorless

4.3 **Odor** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** [illegible]

5.2 **Symptoms Following Exposure** [illegible]

5.3 **Treatment for Exposure** INHALATION [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits** [illegible]

5.6 **Toxicity by Ingestion** [illegible]

5.7 **Late Toxicity:** Liver and kidney damage in exp. animals

5.8 **Vapor (Gas) Irritant Characteristics** [illegible]

5.9 **Liquid or Solid Irritant Characteristics** [illegible]

5.10 **Odor Threshold** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used.** [illegible]

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** [illegible]

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).**
Data not available

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. B.F. Goodrich Co.
6100 Oak Tree Blvd
Cleveland, Ohio 44131
2. Petro Tex Chemical Corp.
8600 Park Place
Houston, Texas 77017
3. Texaco Inc.
135 East 42nd St.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
Research grade, 99.6+; Pure grade, 99.9; Technical grade, 98.7

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

X F U A W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** 112.22

13.3 **Boiling Point at 1 atm.**
[illegible]

13.4 **Freezing Point**
[illegible]

13.5 **Critical Temperature**
[illegible]

13.6 **Critical Pressure.**
[illegible]

13.7 **Specific Gravity** [illegible]

13.8 **Liquid Surface Tension**
[illegible]

13.9 **Liquid-Water Interfacial Tension**
Data not available

13.10 **Vapor (Gas) Specific Gravity**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
[illegible]

13.12 **Latent Heat of Vaporization**
[illegible]

13.13 **Heat of Combustion** [illegible]

13.14 **Heat of Decomposition** [illegible]

13.15 **Heat of Solution** [illegible]

13.16 **Heat of Polymerization** [illegible]

[illegible]

NOTES

REVISED 1978

DIK — DIISOBUTYL KETONE

Common Synonyms
2 6 Dimethyl 4 heptane
5 Diisopropylacetone
Isovalerone
DIBK

Liquid — Colorless — Mild sweet odor

Floats on water

Fire

Combustible

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing.

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting.

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** DIBK
Diisopropylacetone 2 6 Dimethyl 4 heptanone Isovalerone

3 2 **Coast Guard Compatibility Classification:** Ketone

3 3 **Chemical Formula:** $(CH_3)_2CHCH_2COCH_2CH(CH_3)_2$ or $C_9H_{18}O$

3 4 **IMCO/United Nations Numerical Designation:** 3 3 1157

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild characteristic ketonic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air supplied mask in confined areas plastic gloves face shield and safety glasses

5 2 **Symptoms Following Exposure:** Inhalation of vapor causes irritation of nose and throat Ingestion causes irritation of mouth and stomach Vapor irritates eyes Contact with liquid irritates skin

5 3 **Treatment for Exposure:** INHALATION move to fresh air give oxygen if breathing is difficult call a physician EYES flush with plenty of water SKIN wipe off flush with plenty of water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm

5 5 **Short-Term Inhalation Limits:** 50 ppm 30 min

5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 1 4 g kg (mouse) 5 75 g kg (rat)

5 7 **Late Toxicity:** Causes increased liver and kidney weights in rats decreased liver weights in guinea pigs

5 8 **Vapor (Gas) Irritating Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 131°F (C) 120°F (C)

6 2 **Flammable Limits in Air:** 0 8% 7 1% at 200°

6 3 **Fire Extinguishing Agents** Foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products**

6 6 **Behavior in Fire**

6 7 **Ignition Temperature:** 745

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 65 ppm 24 hr brine shrimp TL_m

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** % of theoretical in 5 days fresh water

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Union Carbide Corp
Chemicals and Plastics Div
270 Park Avenue
New York N Y 10017

2 Eastman Chemical Products Inc
Kingsport Tenn 37662

3 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 2)

A T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 142 23

13 3 **Boiling Point at 1 atm.** 325°F = 163°C = 436°K

13 4 **Freezing Point** −43°F = −42 C = 231°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 806 at 20 C (liquid)

13 8 **Liquid Surface Tension:** 23 92 dynes cm = 0 02392 N m at 22°C

13 9 **Liquid-Water Interfacial Tension.** Data not available

13 10 **Vapor (Gas) Specific Gravity:** 4 9

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization.** 121 Btu lb = 67 cal g = 2 8 × 10 J kg

13 13 **Heat of Combustion:** 16 049 Btu lb = 8 910 cal g = 3 72 × 10 J kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 of 8

NOTES

DID — DIISODECYL PHTHALATE

Common Synonyms
Phthalic acid, bis (8-methyl-nonyl) ester
Phthalic acid, diisodecyl ester
Plasticizer DDP

Liquid — Colorless

May float or sink in water

Fire

Combustible

Exposure

LIQUID
Not harmful.

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Phthalic acid bis(8 methylnonyl) ester, Phthalic acid diisodecyl ester, Plasticizer DDP
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula:** $C_{28}H_{46}O_4$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Faint

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** No symptoms reported for any rate of exposure
5 3 **Treatment for Exposure:** INGESTION: call physician. EYES: flush with water, call physician. SKIN: wipe off, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 450°F, 232°C
6 2 **Flammable Limits in Air:** LEL 0.27% at 508°F
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** 758°F
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Eastman Chemical Co
Kingsport, Tenn 37662

2 W. R. Grace & Co
Hatco Chemical Div
King George Post Rd
Fords, N. J. 08863

3 Pfaltz and Bauer, Inc
375 Fairfield Ave
Stamford, Conn 06902

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 446.7 (theor.)
13 3 **Boiling Point at 1 atm:** Very high
13 4 **Freezing Point:** −58°F = −50°C = 223°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.96 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Data not available
13 13 **Heat of Combustion:** (est.) −16,800 Btu/lb = −9,270 cal/g = −386 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

DIP	DIISOPROPANOLAMINE

Common Synonyms
1,1' Iminodi-2-Propanol
2,2'-Dihydroxydipropylamine

Liquid or solid crystals — Liquid is colorless, Solid is white to light yellow — Dead fish or ammonia odor

Liquid floats and mixes with water
Solid sinks and mixes in water

Fire

Combustible

Exposure

CALL FOR MEDICAL AID

LIQUID OR SOLID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
2,2' Dihydroxydipropylamine
1,1' Iminodi-2-propanol

3.2 **Coast Guard Compatibility Classification:** Alkanolamine

3.3 **Chemical Formula:** $(CH_3CHOHCH_2)_2NH$

3.4 **IMCO United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid or solid

4.2 **Color:** Colorless

4.3 **Odor:** Fishy ammoniacal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible] Liquid will burn eyes and skin

5.3 **Treatment for Exposure:** INHALATION [illegible] INGESTION [illegible] INJECTION [illegible] EYE AND SKIN [illegible] 15 min. For eyes, get medical [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 2 [illegible]

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation to exposed personnel will [illegible] The [illegible] components

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and [illegible] burns on short exposure and [illegible] on prolonged or repeated exposure

5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** 260°F (O.C.)

6.2 **Flammable Limits in Air:** [illegible] (calc.) [illegible] (est.)

6.3 **Fire Extinguishing Agents:** Water, alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 500°F (calc.)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich. 48640

2 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 97%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	2
Poisons	[illegible]
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid or solid

13.2 **Molecular Weight:** 133.19

13.3 **Boiling Point at 1 atm.** 479°F = 248°C = 521°K

13.4 **Freezing Point:** 108°F = 42°C = 315°K

13.5 **Critical Temperature** [illegible]

13.6 **Critical Pressure** [illegible]

13.7 **Specific Gravity:** 0.99 at 42°C (liquid)

13.8 **Liquid Surface Tension.** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization.** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** Not pertinent

(Continued on reverse side)

NOTES

REVISED 1978

DIA	# DIISOPROPYLAMINE

Common Synonyms	Liquid	Colorless	Fishy odor
	Floats and mixes with water		

[illegible]

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

LIQUID
Will burn eyes
Irritating to eyes
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability, water contaminant, air contaminant
Restrict access
Disperse and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Alpha amine
3.3 **Chemical Formula:** $(CH_3)_2CH)_2NH$ or $C_6H_{15}N$
3.4 **IMCO/United Nations Numerical Designation:** 32 1188

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Amine

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask, plastic gloves, goggles, rubber apron
5.2 **Symptoms Following Exposure:** Inhalation of vapors causes irritation, sometimes with nausea and vomiting, can also cause burns to the respiratory system. Ingestion causes irritation of mouth and stomach. Vapor irritates eyes. Liquid causes severe burns like caustic. Contact may also causes burns.
5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air and keep him quiet and comfortable, warm, give oxygen if breathing is difficult, call a physician. INGESTION: induce vomiting by giving a large volume of warm salt water, consult a physician. EYES: *immediately* flush eyes with plenty of water for at least 15 min. Then get medical care. SKIN: flush with water, remove contaminated clothing and wash skin. If there is any redness or evidence of burning consult a physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm
5.5 **Short-Term Inhalation Limits:** Mouse LC_{50} = [illegible] ppm for 20 min
5.6 **Toxicity by Ingestion:** Grade [illegible] Rat LD_{50} = [illegible] g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure, may cause second degree burns on long exposure
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 20°F (O.C.) 35°F (C.C.)
6.2 **Flammable Limits in Air:** 0.8% - 7.1%
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flashback
6.7 **Ignition Temperature:** 600°F
6.8 **Electrical Hazard:** Class I
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** May attack some forms of plastics
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
60 ppm, 24 hr, creek chub, lethal, fresh water
40-60 ppm, * creek chub, critical range, fresh water
* Time period not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corp
Chemicals and Plastics Div
270 Park Avenue
New York, N.Y. 10017
2. Pennwalt Corporation
Three Parkway
Philadelphia, Pa. 19102
3. Virginia Chemicals Inc
3340 W. Norfolk Rd
Portsmouth, Va. 23703

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 100%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q R S

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	-
Aquatic Toxicity	-
Aesthetic Effect	-
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	-
Flammability (Red)	-
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 101.19
13.3 **Boiling Point at 1 atm:** 183.0°F = 83.9°C = 357.1°K
13.4 **Freezing Point:** -141.3°F = -96.3°C = [illegible] K
13.5 **Critical Temperature:** 480.2°F = 249.0°C = 522.2°K
13.6 **Critical Pressure:** test 400 psia = 30 atm = 3 MN/m²
13.7 **Specific Gravity:** 0.717 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 19.6 dynes/cm = 0.0196 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 3.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** est 1.064
13.12 **Latent Heat of Vaporization:** 121 Btu/lb = 67 cal/g = 2.82 × 10⁵ J/kg
13.13 **Heat of Combustion:** -19,500 Btu/lb = -11,000 cal/g = -46.0 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** 240 Btu/lb = 134 cal/g = 1.2 × 10⁶ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

DIH	DIISOPROPYLBENZENE HYDROPEROXIDE

Common Synonyms			
Isopropylcumyl hydroperoxide	Liquid	Colorless to pale yellow	Sharp, unpleasant odor
	May float or sink in water		

Fire	Combustible Will increase the intensity of a fire May cause fire on contact with combustibles Containers may explode in fire
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning - oxidizing material
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Isopropylcumyl hydroperoxide

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:**
$(CH_3)_2CH(C_6H_4)C(CH_3)_2OOH$
$*(CH_3)_2CH(C_6H_4)CH(CH_3)$

3.4 **IMCO/United Nations Numerical Designation:** 5.2 1875

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale yellow

4.3 **Odor:** Sharp, disagreeable

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Solvent resistant gloves, chemical resistant apron, chemical goggles or face shield, self-contained breathing apparatus

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with eyes or skin causes throbbing sensation and irritation

5.3 **Treatment for Exposure:** INHALATION: move to fresh air, call a doctor. EYES: flush with water for 15 min, holding eyelids open, call physician. SKIN: wash several times with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 175°F (C.C.)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Flammable alcohol and ketone gases are formed in fire

6.6 **Behavior in Fire:** Burns with a flare effect. Containers may explode

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Aluminum, copper, brass, lead, zinc salts, mineral acids, oxidizing or reducing agents all can cause rapid decomposition

7.3 **Stability During Transport:** Unstable, slowly evolves oxygen

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Hercules, Inc
Wilmington, Del 19899

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 54.06% (the balance being diisopropylbenzene, a combustible hydrocarbon)

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

3-E-1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Organic Peroxide

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classification:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 254.26

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** <15°F (<-9°C) (<264 K)

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.95 at 15°C (liquids)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Data not available

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page ... and ...

NOTES

DAC	DIMETHYLACETAMIDE

Common Synonyms			
N,N-Dimethylacetamide Acetic acid dimethylamide	Liquid Mixes with water	Colorless	Weak fishy odor

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** N,N-Dimethylacetamide
Acetic acid dimethylamide

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CH_3CON(CH_3)_2$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Weak fishy

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Liquid causes mild irritation of eyes and skin. Ingestion causes depression, lethargy, confusion and disorientation, visual and auditory hallucinations, perceptual distortions, delusions, emotional detachment, and affective blunting

5.3 **Treatment for Exposure:** EYES: flush with plenty of water for 15 min, get medical attention. SKIN: flush with plenty of water for 15 min. INGESTION: induce vomiting and follow with gastric lavage and saline cathartics, treatment for liver and kidney injury is supportive and symptomatic

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1, oral LD_{50} = 5.63 g/kg (rat)

5.7 **Late Toxicity:** May produce chronic liver and kidney damage

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 46.8 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 158°F O.C.

6.2 **Flammable Limits in Air:** 1.8 [illegible]

6.3 **Fire Extinguishing Agents:** Water, dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 914°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 2.8 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. E. I. duPont de Nemours & Co., Inc.
Biochemicals Department
1007 Market Street
Wilmington, Del. 19898

2. BASF Wyandotte Corp.
1609 Biddle Avenue
Wyandotte, Mich. 48192

3. Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrestor)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 87.1

13.3 **Boiling Point at 1 atm:** 331°F = 166°C = 439°K

13.4 **Freezing Point:** −4°F = −20°C = 253°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.943 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 34 dynes/cm = 0.034 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 214 Btu/lb = 1.9 cal/g = 4.98 × 10⁶ J/kg

13.13 **Heat of Combustion:** −17,560 Btu/lb = −6,980 cal/g = −292 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

DMA	DIMETHYLAMINE

Common Synonyms

Liquefied compressed gas Colorless Dead fish or ammonia odor

Floats and boils on water. Flammable. Irritating vapor is produced. Boiling point is 44° F.

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
May explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause difficult breathing
[illegible]

LIQUID
Will burn skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

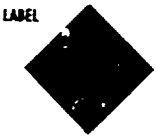
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

[illegible]

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** [illegible]

3.2 **Coast Guard Compatibility Classification:** None

3.3 **Chemical Formula:** $(CH_3)_2NH$

3.4 **IMCO United Nations Numerical Designation:** 2.0 [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Compressed gas

4.2 **Color:** Colorless

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** INHALATION [illegible] EYES [illegible] SKIN [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity** None

5.8 **Vapor (Gas) Irritant Characteristics.** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point.** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Stop flow of gas. Use water spray, carbon dioxide, dry chemical, foam or water solution.

6.4 **Fire Extinguishing Agents Not to be Used:** Do not use foam.

6.5 **Special Hazards of Combustion Products:** Vapors are eye, skin and respiratory irritant.

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials.** No hazardous reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Stopped 24 h, [illegible] fresh water; >100 ppm 48 h, [illegible] salt water

8.2 **Waterfowl Toxicity:** Data not available.

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Commercial Solvents Corp
245 Park Ave
New York, N.Y. 10017

GAF Corp
Chemical Division
Calvert City, Ky. 42029

Pennwalt Corp
Independence Mall West
Philadelphia, Pa. 19105

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** Safety valve

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
[illegible]	4
Health	
Vapor [illegible]	
Liquid or Solid [illegible]	[illegible]
Poison	[illegible]
Water Pollution	
Human Toxicity	
Aquatic Toxicity	[illegible]
Acute Toxicity	2
Reactivity	
Other Chemicals	[illegible]
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 45.08

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point.** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization.** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition** [illegible]

13.15 **Heat of Solution.** [illegible]

13.16 **Heat of Polymerization:** [illegible]

[illegible]

NOTES

REVISED 1978

DMD	DIMETHYLDICHLOROSILANE

Common Synonyms

Liquid Colorless Sharp irritating odor

Reacts violently with water. Irritating gas is produced on contact with water

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

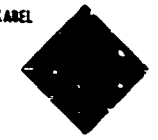
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Isolate area. Keep flammables away
Restrict access
Evacuate area
Disperse and flush with water

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** None common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $(CH_3)_2SiCl_2$
3.4 **IMCO/United Nations Numerical Designation:** 1162

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sharp irritating odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor type respirator, goggles, rubber gloves, chemical resistant aprons, rubber boots or equipment as necessary to prevent skin and eyes
5.2 **Symptoms Following Exposure:** Inhalation: irritation of mucous membranes. Contact with liquid causes severe burns of eyes and skin. Ingestion: burns of the mouth, throat and stomach
5.3 **Treatment for Exposure:** INHALATION: remove from exposure and apply artificial respiration if necessary, provide oxygen, get medical attention immediately. EYES: flush with water for 15 min. Get medical attention immediately. SKIN: flush with water. Get medical attention immediately. INGESTION: if conscious, give large amounts of water. Do not induce vomiting
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 4. Dose: 50 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation to eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes severe and painful burns or corrosive injury. Contact may cause severe injury to the eyes
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam
6.5 **Special Hazards of Combustion Products:** Hydrogen chloride and phosgene gas. Vapor may explode if ignited in an enclosed area
6.6 **Behavior in Fire:** Difficult to extinguish. Reacts violently with water. Cool containers exposed to flames with water from protected location. Use water spray to disperse vapors
6.7 **Ignition Temperature:** Above 70°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently with water. Hydrogen chloride gas is produced. Not stable (hydrolyzable)
7.2 **Reactivity with Common Materials:** Will react with surface moisture, generating hydrogen chloride which is highly corrosive to common materials
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate, lime
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Dow Corning Corporation
Chemicals and Plastics Div.
[illegible] Park Avenue
New York, N.Y. [illegible]

Dow Corning Corporation
P.O. Box [illegible]
Midland, Michigan [illegible]

General Electric Co.
Silicone Products Department
Waterford, N.Y. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** N2 [illegible]
10.4 **Venting:** Pressure vent [illegible]

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

X O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	
Reactivity	
Other Chemicals	
Water	4
Self Reactive	

12.3 **NFPA Hazard Classifications**

Category	Classification
Health (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 129
13.3 **Boiling Point at 1 atm:** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Comments on properties

NOTES

DIM	DIMETHYL ETHER

Common Synonyms			
Methylether	Liquefied gas	Colorless	Pleasant odor
	Floats and boils on water. Flammable. Irritating vapor is produced		

Fire	FLAMMABLE. Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause headache, dizziness, or loss of consciousness LIQUID Irritating to skin and eyes Will cause frostbite
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Markers Handbook CG 446-4)

Issue warning: high flammability.
Restrict access
Evacuate area

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Methylether
Wood ether

3.2 **Coast Guard Compatibility Classification:** Ethers(2)

3.3 **Chemical Formula:** CH_3OCH_3

3.4 **IMCO/United Nations Numerical Designation:** 2-1033

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid under pressure

4.2 **Color:** Colorless

4.3 **Odor:** Chloroform like sweet

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Mask for organic vapor, plastic or rubber gloves, safety goggles

5.2 **Symptoms Following Exposure:** Inhalation produces narcosis and anesthesia at less than that of ether. Shortness of breath, headache, intoxication, loss of consciousness. Liquid or concentrated vapor contact causes frostbite. Contact of liquid with eyes may cause frostbite.

5.3 **Treatment for Exposure:** INHALATION: remove from exposure and support respiration. Administer O2. Flush with water for at least 15 minutes and consult an eye specialist. SKIN: warm tissues by use of warm water or by wrapping the affected parts in blankets.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (flammable gas)

6.2 **Flammable Limits in Air:** 3.4 - 27%

6.3 **Fire Extinguishing Agents:** Let fire burn; shut off gas flow and expose surroundings with water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Containers may explode. Vapors are heavier than air and may travel long distance to a source of ignition and flash back

6.7 **Ignition Temperature:** 662°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 0.9 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2. Matheson Gas Products
East Rutherford, N.J. 07073

3. Phillips and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety vent

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

ABCKLMN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not rated

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 46

13.3 **Boiling Point at 1 atm:** -12.5°F = -24.7°C = 248.5°K

13.4 **Freezing Point:** -229.1°F = -144.1°C = 129.1°K

13.5 **Critical Temperature:** 260.4°F = 126.9°C = 400.1°K

13.6 **Critical Pressure:** 760 psia = 51.6 atm = 5.23 MN/m²

13.7 **Specific Gravity:** 0.668 at -24.7°C (liquid)

13.8 **Liquid Surface Tension:** 21 dynes/cm = 0.021 N/m at -40°C

13.9 **Liquid-Water Interfacial Tension:** 65 dynes/cm = 0.065 N/m at -40°C

13.10 **Vapor (Gas) Specific Gravity:** 1.6

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1455

13.12 **Latent Heat of Vaporization:** 174 Btu/lb = 174 cal/g = 4.85 × 10⁵ J/kg

13.13 **Heat of Combustion:** -14,400 Btu/lb = -7,480 cal/g = -1.3 × 10⁷ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7-2

NOTES

DMF — DIMETHYLFORMAMIDE

Common Synonyms
N,N Dimethylformamide
DMF

Watery liquid — Colorless — Slight ammonia odor

Floats and mixes with water

Fire

Combustible

Exposure

LIQUID
Will burn skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Restrict access
Disperse and flush

2. LABELS

No hazard label is required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
N,N Dimethylformamide
DMF

3.2 **Coast Guard Compatibility Classification**
Amide

3.3 **Chemical Formula**
$HCON(CH_3)_2$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color** Colorless

4.3 **Odor** Slight ammonia odor; essentially odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Safety glasses or face shield, rubber apron and boots

5.2 **Symptoms Following Exposure** Irritation of eyes, skin and nose. May cause nausea

5.3 **Treatment for Exposure.** INHALATION: remove victim to fresh air if he is not breathing, give artificial respiration; for difficult breathing administer oxygen; call physician. SKIN OR EYES: flush with plenty of water while removing contaminated clothing and shoes

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 10 ppm

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion.** Grade 1 LD50 (0.15 g/kg rat)

5.7 **Late Toxicity** Causes abortions in pregnant rats, possibly in humans also

5.8 **Vapor (Gas) Irritant Characteristics** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics** Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure

5.10 **Odor Threshold** 100 ppm

6 FIRE HAZARDS

6.1 **Flash Point** 136°F (OC) 136°F (CC)

6.2 **Flammable Limits in Air.**
2.2 — 15.2

6.3 **Fire Extinguishing Agents.** Water fog, foam, carbon dioxide, or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Vapors are irritating

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** 833°F

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** 2.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity.** Data not available

8.3 **Biological Oxygen Demand (BOD):** 0.9 lb/lb 5 days

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Air Products and Chemicals Inc, Allentown, Pa 18105
2. E. I. duPont de Nemours & Co. Inc, Organic Chemicals Dept, Wilmington, Del 19898
3. Houghton Chemical Co, 52 Cambridge St, Boston, Mass 02134

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Data not available

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 73.09

13.3 **Boiling Point at 1 atm** 307°F = 153°C = 426°K

13.4 **Freezing Point** −98°F = −61°C = 212°K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity** 0.950 at 20°C (liquid)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.101

13.12 **Latent Heat of Vaporization** 248 Btu/lb = 138 cal/g = 5.78 × 10⁵ J/kg

13.13 **Heat of Combustion** −11,280 Btu/lb = −6,267 cal/g = −26.24 × 10⁶ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** −63 Btu/lb = −35 cal/g = −1.5 × 10⁵ J/kg

13.16 **Heat of Polymerization** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

DDW — DIMETHYLHEXANE DIHYDROPEROXIDE, WET

Common Synonyms	
2,5-Dimethylhexane-2,5-dihydroperoxide 2,5-Dihydroperoxy 2,5-dimethylhexane	Wet solid — White May float or sink in water

Stop discharge if possible. Keep people away.
Call fire department.
Avoid contact with spilled material.
Isolate area until gas has dispersed.
Notify appropriate agencies.

Fire	**Not flammable when wet** **Will increase the intensity of a fire** **May explode if exposed to heat or flames** Flush discharge areas with water — prevent fire. Extinguish with dry chemical, carbon dioxide, or foam. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID **VAPOR** **Irritating to eyes, nose and throat** **If inhaled will cause coughing or difficult breathing** If in eyes: hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. **SOLID** **Irritating to skin and eyes** **Harmful if swallowed** Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk (if have victim induce vomiting). IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do not induce vomiting except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify appropriate agencies if water pollution.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — oxidizing material
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2 LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** 2,5-Dihydroperoxy-2,5-dimethylhexane, 2,5-Dimethylhexane-2,5-dihydroperoxide

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula.** $C_8H_{18}O_4$, H_2O

3.4 **IMCO/United Nations Numerical Designation** 5.2 1528

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Wet solid

4.2 **Color:** White

4.3 **Odor.** Data not available

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Contact with eyes or skin causes irritation

5.3 **Treatment for Exposure:** INHALATION: remove from exposure, call a doctor. EYES: wash with large amount of water for at least 15 min. SKIN: wash with large amount of water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent

6.2 **Flammable Limits in Air** Not pertinent

6.3 **Fire Extinguishing Agents** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective on fire

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire** Decomposes violently when heated in fire. Can increase intensity of fire when in contact with combustible material. Containers may explode.

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** Decomposes in contact with many metals and acids

7.3 **Stability During Transport:** Stable below 100°F

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Pennwalt Corporation
   Lucidol Division
   P.O. Box 1048
   Buffalo, N.Y. 14240
2. Witco Chemical Corporation
   U.S. Peroxygen Division
   850 Morton Avenue
   Richmond, Calif. 94804
3. Polysciences, Inc.
   Paul Valley Industrial Park
   Warrington, Pa. 18976

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Approx. 30+% water. The dry chemical is too hazardous to ship.

10.2 **Storage Temperature:** 4-38°C (40-100°F)

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Organic Peroxide

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid

13.2 **Molecular Weight:** 178.2

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** (est.) 1.0 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition** Data not available

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DMH	1,1-DIMETHYLHYDRAZINE

Common Synonyms
UDMH
Dimazine
unsym-Dimethylhydrazine

Watery liquid — Colorless — Fishy or ammonia like odor

Floats and mixes with water

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away
[illegible]

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED WHEN HEATED
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes
[illegible]

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes
Remove contaminated clothing
Flush affected areas with plenty of water
IF INHALED, move to fresh air and if breathing stops, give artificial respiration
IF SWALLOWED, give two glasses of CONSCIOUS victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

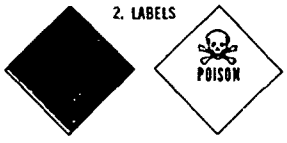
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Restrict access
Evacuate area
Disperse and flush

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dimazine
UDMH
unsym-Dimethylhydrazine

3.2 **Coast Guard Compatibility Classification**
Not applicable

3.3 **Chemical Formula:** $(CH_3)_2N_2H_2$

3.4 **IMCO, United Nations Numerical Designation** 3.2, 1163

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp and ammoniacal, fish

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Rubber gloves, boots, and apron; plastic face shield. Gas masks with ammonia (GMN) canister for 30 min. at 50 ppm. For concentrations 10 times permissible or higher concentrations use self-contained breathing apparatus.

5.2 **Symptoms Following Exposure** Breathing of vapor causes pulmonary irritation, delirium, convulsions, gastrointestinal irritation, tremors, and convulsions. Contact with skin or eyes causes irritation or severe chemical burns. Can be absorbed through skin in toxic quantities; avoid contamination and consult a physician.

5.3 **Treatment for Exposure** INHALATION: [illegible] respiration and oxygen if needed. Watch for signs of pulmonary edema. [illegible] INGESTION: do NOT induce vomiting. Hospitalize. SKIN OR EYES: flood with water. [illegible] alkaline burn.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible] ppm

5.5 **Short-Term Inhalation Limits.** [illegible] ppm for 30 min; [illegible] ppm for 30 min; [illegible] ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade [illegible] LD_{50} [illegible] 500 mg/kg (rat, mouse)

5.7 **Late Toxicity:** Data not available
Mild anemia, upper respiratory irritation, and muscle tremors in dogs following chronic exposure

5.8 **Vapor (Gas) Irritant Characteristics** Vapor is moderately irritating such that personnel will usually tolerate moderate or high concentrations.

5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third degree burns on short contact and is very irritating to the eyes.

5.10 **Odor Threshold:** [illegible] 14 ppm

6 FIRE HAZARDS

6.1 **Flash Point.** 34°F [illegible]

6.2 **Flammable Limits in Air:** 2 [illegible] 95

6.3 **Fire Extinguishing Agents** Flood with water

6.4 **Fire Extinguishing Agents Not to be Used** In large fires, water for carbon dioxide and bicarbonate types may allow flash back and explosive re-ignition

6.5 **Special Hazards of Combustion Products** None

6.6 **Behavior in Fire.** Tends to ignite unless diluted with much water

6.7 **Ignition Temperature** 482–482°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** [illegible] mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials:** Dissolves swells and disintegrates many plastics

7.3 **Stability During Transport** Stable below 1112°F

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** Data not available

9. SELECTED MANUFACTURERS

FMC Corporation
Organic Chemicals Division
633 Third Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Propellant grade 98% min

10.2 **Storage Temperature** Below 120°F

10.3 **Inert Atmosphere** Inerted

10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V P Q R S

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	4

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 60.11

13.3 **Boiling Point at 1 atm.** 146.0°F = 63.3°C = 336.5°K

13.4 **Freezing Point** −71°F = −57°C = 216°K

13.5 **Critical Temperature:** 480°F = 249°C = 522°K

13.6 **Critical Pressure:** 869 psia = 58.5 atm = 5.40 MN/m²

13.7 **Specific Gravity:** 0.791 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 28 dynes/cm = 0.028 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 2.1

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** 261 Btu/lb = 148 cal/g = 6.07 × 10⁵ J/kg

13.13 **Heat of Combustion** −14,170 Btu/lb = −7870 cal/g = −329.3 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution** (est.) −30 Btu/lb = −16 cal/g = −0.6 × 10⁶ J/kg

13.16 **Heat of Polymerization** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

DMP	DIMETHYLPOLYSILOXANE

Common Synonyms	Liquid	Colorless	Odorless
Poly (dimethylsiloxane) Dimethyl silicone oil Silicone fluids Dimethyl silicone fluids	Floats on water		

Fire	Combustible
Exposure	LIQUID Irritating to eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Poly (dimethylsiloxane)
Dimethylsilicone oil Silicone fluids
Dimethyl silicone fluids

3 2 **Coast Guard Compatibility Classification**
Not applicable

3 3 **Chemical Formula**
$(CH_3)_3SiO[Si(CH_3)_2O]_nSi(CH_3)_3$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Safety goggles

5 2 **Symptoms Following Exposure.** Contact of liquid with eyes may cause irritation, but is not a serious disorder. Does not irritate skin. Harmless when ingested

5 3 **Treatment for Exposure** EYES: For eye contact, exposures generally do not require treatment. EYES: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Not pertinent

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity** None

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** 275 [illegible] F C

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents.** Foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** 820-860 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Dow Corning Corporation
South Saginaw Road
Midland Mich 48640

2 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity** A series of compounds having viscosities of from 50 to 100,000 cs is available

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

A F U X-Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight.** Not pertinent

13 3 **Boiling Point at 1 atm**
> 300 F = > 149 C = > 422 K

13 4 **Freezing Point.** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 0.98 at 20 C (liquid)

13 8 **Liquid Surface Tension:**
19.21 dynes/cm = 0.019 0.021 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension.** (est.)
30 dynes/cm = 0.030 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** (est.) = -11,000 Btu/lb = -6,500 cal/g = -260 X 10 J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DSF — DIMETHYL SULFATE

Common Synonyms
Methyl sulfate

Liquid — Colorless — Mild onion odor

Sinks and mixes slowly with water

Fire

Combustible
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Isolate, evacuate, prevent entry
Protect sewers
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** No common synonyms

3.2 **Coast Guard Compatibility Classification:** Later

3.3 **Chemical Formula:** $(CH_3)_2SO_4$

3.4 **IMCO United Nations Numerical Designation:** 6.1 1595

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp characteristic odor; slight, not distinctive, weak onion

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles, self contained breathing apparatus, protective clothing, rubber shoes, rubber aprons, rubber gloves, sports, boots and rubber underwear

5.2 **Symptoms Following Exposure:** Severe irritation to eyes, eyelids, respiratory tract and skin. Dry, painful throat. Lung whitening, spasm, difficulty in breathing, malaise, and fever. Inflammation and edema of lungs

5.3 **Treatment for Exposure:** Contact with dimethyl sulfate liquid or vapor requires immediate contact of all physicians, even if there is no evidence of injury, as symptoms may not appear for several hours. **INHALATION** 20 minutes of exposure immediately, 48 hours, or longer, can cause death. Inhale, cough, and expectorate slime, cough blood, breathe shallow, wheezing, cyanotic, unconscious, convulsions, coma under atmospheric pressure. **INGESTION** do NOT induce vomiting. **SKIN** wash thoroughly with soap and water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 1 ppm

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion** Grade 3 (Moderately toxic)

5.7 **Late Toxicity:** Causes birth defects in rat (malignant tumors in nervous system)

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eyes and throat, and in severe cases lung injury. They cannot be tolerated even at low concentration

5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third degree burns on prolonged contact in a few minutes

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 240 F (O.C.) 182 F (C.C.)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents.** Water, foam, carbon dioxide or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products:** Flammable toxic vapors generated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 370°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Slow; non hazardous reaction

7.2 **Reactivity with Common Materials.** Corrodes metal when wet

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate or lime

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

E. I. duPont de Nemours & Co., Inc.
Industrial and Biochemicals Dept.
Wilmington, Del. 19898

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-Vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A-P-Q-X-Y

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Corrosive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 126.13

13.3 **Boiling Point at 1 atm** 371.9°F = 188.8°C = 462.0°K

13.4 **Freezing Point.** −25.2°F = −31.8°C = 241.4°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.33 at 15°C (liquid)

13.8 **Liquid Surface Tension** 40.1 dynes/cm = 0.0401 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 10.1 dynes/cm = 0.02 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion.** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

(See back of page 1 for details)

NOTES

REVISED 1978

DSL

DIMETHYL SULFIDE

Common Synonyms

Methyl sulfide
2 Thiapropane
Methanethiomethane

Liquid — Colorless to light yellow — Unpleasant odor

Floats and moves slowly with water. Irritating vapor is produced. Boiling point is 99° F.

[illegible]

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — high flammability
Restrict access
Evacuate area
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** DMS
Methanethiomethane
Methyl sulfide
2-Thiapropane

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula** $(CH_3)_2S$

3.4 **IMCO/United Nations Numerical Designation.** 3.1 1264

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color.** Colorless to straw

4.3 **Odor** Ether-like, garlic-like, disagreeable offensive

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Respirator with organic vapor cartridge, rubber or plastic gloves, goggles or face shield

5.2 **Symptoms Following Exposure** Inhalation causes moderate irritation of upper respiratory system. Contact of liquid with eyes causes moderate irritation. Repeated contact with skin may extract oils and results in irritation. Ingestion causes irritation and irritation to mouth and throat.

5.3 **Treatment for Exposure:** INHALATION: if necessary, give artificial respiration, entrance rest and seek medical attention immediately. EYES: flush with water for at least 15 min. If irritation persists, seek medical attention. SKIN: flush with plenty of water and wash thoroughly. Get treatment for any lasting irritation. INGESTION: if large amounts are swallowed, induce vomiting by tickling the back of the throat with the finger or by giving an emetic such as two tablespoonfuls of salt in a glass of warm water. Get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion** Grade 2 oral LD_{50} = 2.35 mg/kg rats

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are moderately irritating to the eyes, but people soon become unusually tolerate moderately high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Liquid causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure.

5.10 **Odor Threshold:** 0.001 ppm

6. FIRE HAZARDS

6.1 **Flash Point** −46 F (−43 C)

6.2 **Flammable Limits in Air** 2.2 — 19.7

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, Kohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6.5 **Special Hazards of Combustion Products** Toxic and irritating sulfur dioxide is formed

6.6 **Behavior in Fire** Vapor is heavier than air and may travel considerable distance to source of ignition and flash back

6.7 **Ignition Temperature** 403 F

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate** 4.8 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Approximately 1 lb/lb

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Croda Zellerbach Corp
Chemical Products Division
Camas, Wash. 98607

2 Phillips Petroleum Company
Chemical Department
Special Products Division
Bartlesville, Okla. 74004

3 United States Steel Corp
USS Chemicals Division
P.O. Box 86
Pittsburgh, Pa. 15230

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99%

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V P Q T U V W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	4
Health	
Vapor Toxicity	
Liquid or Solid Toxicity	3
Poisons	3
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aesthetic Effects	4
Reactivity	
Other Chemicals	
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 62.1

13.3 **Boiling Point at 1 atm:** 99°F = 37°C = 310°K

13.4 **Freezing Point:** −144°F = −98°C = 175°K

13.5 **Critical Temperature** 444°F = 229°C = 502°K

13.6 **Critical Pressure** 826 psia = 56 Latm = 5.69 MN/m²

13.7 **Specific Gravity:** 0.85 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 26.7 dynes/cm = 0.0267 N/m at 11°C

13.9 **Liquid-Water Interfacial Tension** (est.) 30 dynes/cm = 0.030 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 2.14

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.1277 at 16°C

13.12 **Latent Heat of Vaporization** 194 Btu/lb = 108 cal/g = 4.52 × 10⁵ J/kg

13.13 **Heat of Combustion** −13,200 Btu/lb = −7,340 cal/g = −307 × 10⁵ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

DMS	DIMETHYL SULFOXIDE

Common Synonyms Methyl Sulfoxide DMSO	Liquid Colorless Mild garlic odor Sinks and mixes with water

Stop discharge if possible
Call fire department
Avoid [illegible] liquid
[illegible] discharged material
[illegible]

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles, [illegible] and [illegible] apparatus and [illegible] including gloves Extinguish with water [illegible]
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Flush affected areas with plenty of water IF IN EYES hold [illegible] with plenty of water
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** DMSO, Methyl sulfoxide

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** CH_3SOCH_3

3 4 **IMCO United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor** Slight [illegible]

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Butyl rubber gloves, safety goggles, [illegible] or drops are present

5 2 **Symptoms Following Exposure:** Slight eye irritation

5 3 **Treatment for Exposure:** Wash eyes and skin with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Grade 0 above 15 g/kg

5 7 **Late Toxicity:** Causes damage to eye in dogs, pigs, rats and rabbits

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect [illegible] temporary

5 9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain in, may cause [illegible] and reddening of the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 203 F O C [illegible] F C C

6 2 **Flammable Limits in Air:** [illegible]

6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products** Sulfur dioxide, formaldehyde and methyl mercaptan can form

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** [illegible]

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** [illegible] water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

Crown Zellerbach Corp
Chemical Products Division
Bush St
San Francisco, CA [illegible]

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** [illegible]

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-[illegible]

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at 1 atm:** [illegible] K

13 4 **Freezing Point:** [illegible] K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** [illegible] at 20 C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** [illegible]

13 13 **Heat of Combustion:** [illegible]

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** [illegible]

13 16 **Heat of Polymerization.** Not pertinent

[illegible]

NOTES

REVISED 1978

DMT	DIMETHYL TEREPHTHALATE

Common Synonyms	
Terephthalic acid dimethyl ester	Solid or heated liquid — White solid or colorless liquid — Odorless Liquid solidifies. Solid and liquid sink in water

Fire	Combustible
Exposure	DUST Not harmful LIQUID OR SOLID Heated liquid will burn skin and eyes. Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment (if floating)
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Terephthalic acid, dimethyl ester

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $1,4\ CH_3OOC(C_6H_4)COOCH_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid

4.2 **Color:** Colorless

4.3 **Odor:** None, weak aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Molten DMT, goggles, face shield, gauntlets and protective clothing. Solid, dust mask, goggles

5.2 **Symptoms Following Exposure:** Molten DMT will cause severe burns of skin on contact

5.3 **Treatment for Exposure:** EYES: flush dust from eyes with water. SKIN: wash with soap and water. If burned by molten DMT, flush area immediately with cold water for at least 15 min; apply ice pack for at least 30 min; do not try to rub DMT off a burn. Remove clothing. Sub DMT has penetrated, because this will remove underlying skin; seek prompt medical treatment for significant burns

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 4,390 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** 298 F O.C. (molten)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 1,058 F (dust)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Hercules Incorporated
Synthetics Department
910 Market Street
Wilmington, Del. 19899

2. Amoco Chemicals Corporation
200 East Randolph Drive
Chicago, Ill. 60601

3. E. I. du Pont de Nemours & Company, Inc.
Polymer Intermediates Department
Wilmington, Del. 19898

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.9

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Inert gas blanket is advisable

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A T U X Y H

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 194.2

13.3 **Boiling Point at 1 atm:** 540°F = 282°C = 555°K

13.4 **Freezing Point:** 284°F = 140°C = 413°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2 at 70°C (solid), 1.08 at 145°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 12 Btu/lb = 67.2 cal/g = 2.81 × 10⁻³ J/kg

13.13 **Heat of Combustion:** −10,310 Btu/lb = −5,777 cal/g = −2.39 × 10⁻³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DMZ	DIMETHYLZINC

Common Synonyms	
Zinc dimethyl Zinc methyl Methylzinc	Liquid Colorless IGNITES WHEN EXPOSED TO AIR. Reacts violently with water and produces flammable vapor

Fire	IGNITES WHEN EXPOSED TO AIR Irritating gases are produced when heated
Exposure	VAPOR OR MIST Irritating to eyes, nose and throat If inhaled will cause headache, nausea, vomiting or difficult breathing LIQUID Will burn skin and eyes If swallowed will cause nausea, or vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Isolate area, high flammability
Keep in access
Evacuate area

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Zinc dimethyl
Zinc methyl
Methylzinc

3.2 **Coast Guard Compatibility Classification**
Not applicable

3.3 **Chemical Formula.** $(CH_3)_2Zn$

3.4 **IMCO/United Nations Numerical Designation:** 4.2 (1370)

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Not pertinent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Cartridge respirator, fresh [illegible] PVC fire retardant or asbestos aprons, full face shield, safety glasses, [illegible]

5.2 **Symptoms Following Exposure:** Inhalation: [illegible] vapor causes immediate irritation of upper respiratory tract. Excessive or prolonged inhalation of fumes from [illegible] may cause metal fume fever, with thirst, headache, fever, chills, nausea, vomiting, muscular aches, perspiration, cough, [illegible], weakness, and [illegible]. Symptoms usually last 12-24 hrs. Eyes are immediately and severely irritated by liquid, vapor, and dilute solutions. It is reported that high flash point, high water chemical, as permanent damage [illegible]. Skin will undergo thermal and acid burns when chemical reacts with moisture [illegible]. Unless washed quickly, it may be scarred. Fresh [illegible] but [illegible] same precautions as concentrated liquid. Ingestion: which will kill, would cause immediate burns at site of contact. Nausea, vomiting, cramps, and diarrhea may follow. Tissues may [illegible] if not treated.

5.3 **Treatment for Exposure:** INHALATION: highly unlikely, as low for vapor either ignites spontaneously or reacts with moisture to form methane and zinc oxide. Move victim to clean air and administer mouth to mouth resuscitation if breathing has ceased, give oxygen only when authorized by physician, keep victim warm and comfortable, call physician immediately. EYES: immediately flush with large amounts of water for at least 15 min., holding eyelids apart to insure thorough irrigation, use eye instruments only when directed by physician, and do not attempt to neutralize with chemicals, get medical attention as soon as possible. SKIN: immediately flush affected area with large volumes of water, do not attempt to neutralize with chemicals, get medical attention if irritation persists. INGESTION: highly unlikely, as liquid or vapor either

Continued on page 4

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
Ignites spontaneously

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Dry chemical, sand, powdered limestone

6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam, halogenated agents, carbon dioxide

6.5 **Special Hazards of Combustion Products:** Smoke contains zinc oxide which can irritate lungs and cause metal fume fever

6.6 **Behavior in Fire:** Reacts spontaneously with air or oxygen and violently with water, [illegible] contact with water applied to adjacent fires will [illegible]

6.7 **Ignition Temperature:** Below 0°

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously generating flammable methane gas

7.2 **Reactivity with Common Materials:** Will react with surface moisture to generate flammable methane

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Not pertinent

8.2 **Waterfowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

Texas Alkyls, Incorporated
P.O. Box [illegible]
Deer Park, Texas [illegible]

Ventron Corporation
Alfa Products
Beverly, Mass. 01915

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, Electronic

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Dry nitrogen gas

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.**
[illegible] °F = [illegible] °C = [illegible] K

13.4 **Freezing Point:** [illegible] °F = [illegible] °C = [illegible] K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at [illegible] °C (liquid)

13.8 **Liquid Surface Tension:** [illegible]
[illegible] dynes/cm = [illegible] N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization.**
[illegible] Btu/lb = [illegible] cal/g
= [illegible] × 10⁶ J/kg

13.13 **Heat of Combustion.** Data not available

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

5 HEALTH HAZARDS (Cont'd)

[illegible] spontaneously with [illegible] reacts with moisture to form methane and zinc oxide. Do NOT induce vomiting, [illegible] immediately give large amounts of water or milk. If vomiting occurs, give more fluids, when vomit no longer [illegible] may be given for their soothing effect, get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits.** Not pertinent

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** Not pertinent

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Not pertinent

DNT	2,4-DINITROANILINE

Common Synonyms
2,4-Dinitroaniline

Solid powder or crystals Yellow Musty odor

Sinks in water

AVOID CONTACT WITH [illegible]

Fire

Combustible
May explode if subjected to heat or flame
POISONOUS GAS IS PRODUCED WHEN HEATED
[illegible]

Exposure

[illegible]
DUST
POISONOUS IF INHALED
[illegible]
SOLIDS
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2,4-Dinitroaniline
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $NH_2C_6H_3NO_2$-2,4
3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Yellow
4.3 **Odor:** Slight musty

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, [illegible] eye goggles, plastic lab coat, protective shoes
5.2 **Symptoms Following Exposure:** May cause headache, [illegible] mucous membrane
5.3 **Treatment for Exposure:** INHALATION [illegible] INGESTION induce vomiting, give universal antidote, get prompt medical care. CONTACT WITH SKIN AND EYES remove victim from exposure, wash exposed skin with warm water, [illegible] eyes with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Grade 3, oral rate LD_{50} = 418 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure, may cause second degree burns on long exposure
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** [illegible] fires use water, dry chemical, [illegible] dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]
6.5 **Special Hazards of Combustion Products:** [illegible]
6.6 **Behavior in Fire:** May explode
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]
7.2 **Reactivity with Common Materials:** Reacts with oxidizing materials
7.3 **Stability During Transport:** May detonate when heated under confinement
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

American Aniline Products, Inc.
[illegible] McLean Blvd.
Paterson, N.J. [illegible]

American Hoechst Corp.
Chemical and Plastics Division
[illegible]

Martin Marietta Corp.
Southern Dyestuff Co. Division
Charlotte, N.C. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical and Pure
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Solid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

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DNB	m-DINITROBENZENE

Common Synonyms

1,3-Dinitrobenzene
1,3-Dinitrobenzol
m-DNB

Solid | Yellow | Slight odor

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP DO FREE AWAY

Fire

Combustible
May explode if exposed to heat or flames

Exposure

FATAL IF SWALLOWED OR IF SKIN IS EXPOSED

VAPOR OR DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,3-Dinitrobenzene; 1,3-Dinitrobenzol; m-DNB; m-Dinitrobenzene; Dinitrobenzene
3.2 **Coast Guard Compatibility Classification** To be developed
3.3 **Chemical Formula.** $C_6H_4N_2O_4$
3.4 **IMCO/United Nations Numerical Designation:** 6.1 1597

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color** Yellow
4.3 **Odor** Weak

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator, chemical resistant gloves, safety glasses
5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, dizziness, drowsiness and stupor. Exposure to skin causes irritation. Prolonged or repeated exposure may be absorbed in toxic amounts and cause cumulative effects.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, administer oxygen if breathing difficult, methemoglobinemia antidote. EYES: flush with water. SKIN: wash with soap and water. INGESTION: induce vomiting, administer activated charcoal, gastric lavage, administer gastrointestinal purge.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion.** Grade 4 oral LD_{50} 42 mg/kg (rat)
5.7 **Late Toxicity:** May cause liver damage [illegible]
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** Not pertinent (combustible solid)
6.2 **Flammable Limits in Air** Not pertinent
6.3 **Fire Extinguishing Agents** Water, protected foam
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire** May explode
6.7 **Ignition Temperature** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** Nitrogen compounds (methemoglobin) fresh water
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential.** Data not available

9. SELECTED MANUFACTURERS

Aldrich Chemical Co., Inc.
940 West St. Paul Avenue
Milwaukee, Wis. 53233

Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity** Commercial
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

H

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Poisons Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid
13.2 **Molecular Weight** [illegible]
13.3 **Boiling Point at 1 atm** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature.** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity** [illegible]
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization.** Not pertinent
13.13 **Heat of Combustion.** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

DNC	DINITROCRESOLS

Common Synonyms 4,6-Dinitro-o-cresol 1,5-Dinitro-o-cresol 2,6-Dinitro-o-cresol	Solid — Yellow Sinks in water
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire
Exposure	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause loss of consciousness SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED If swallowed will cause nausea, vomiting or loss of consciousness
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Toxic warning: water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2,6-Dinitro-p-cresol
1,5-Dinitro-o-cresol; 4,6-Dinitro-o-cresol

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $CH_3C_6H_2(NO_2)_2OH$

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Yellow

4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles, or face shield, protective clothing, rubber gloves

5.2 **Symptoms Following Exposure:** Very high fever, sweat, nausea, gastrointestinal, and following absorption in the skin: [illegible] Inhalation of dust may cause same symptoms as ingest. Ingestion causes feeling weak, [illegible] nausea and death. [illegible] Contact with skin causes [illegible] and danger [illegible] effects. Note: Some authorities recommend that [illegible] be used to determine [illegible] cumulative. Further [illegible] should be avoided [illegible] milligrams per gram.

5.3 **Treatment for Exposure:** INHALATION: [illegible] and oxygen as [illegible] assists. INGESTION: [illegible] inhalation and give [illegible] water and induce vomiting; get medical attention. EYES: Flush with water [illegible] SKIN: wash [illegible] with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** Grade 4. LD[illegible] 30 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6.6 **Behavior in Fire:** Containers may explode

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
[illegible] 48 hr daphnia [illegible] fresh water
[illegible] 96 hours [illegible] fresh water

8.2 **Waterborne Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Sherwin-Williams Chemicals
P.O. Box 920
Cleveland, Ohio 44110

Pfaltz & Bauer, Inc.
[illegible] Fairfield Ave.
Stamford, Conn. 06902

J. T. Baker Chemical Co.
Phillipsburg, N.J. 08865

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 90-95
Paste containing 85-90% water, paste

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

II

12. HAZARD CLASSIFICATIONS

*2.1 **Code of Federal Regulations:** Not listed

*2.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

*2.3 **NFPA Hazard Classifications:** [illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

*3.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 198

*3.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

*3.4 **Freezing Point:** [illegible]

*3.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

*3.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

*3.10 **Vapor (Gas) Specific Gravity:** Not pertinent

*3.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

*3.12 **Latent Heat of Vaporization:** Not pertinent

*3.13 **Heat of Combustion:** [illegible]

*3.14 **Heat of Decomposition:** Data not available

*3.15 **Heat of Solution:** Not pertinent

*3.16 **Heat of Polymerization:** Not pertinent

Continued on next page

5 HEALTH HAZARDS (Cont'd.)

DNP	2,4-DINITROPHENOL

Common Synonyms Alpha Dinitrophenol 1 Hydroxy 2 4 dinitrobenzene	Solid crystal Yellow Sweet musty odor Sinks in water
Fire	Combustible May explode if subjected to heat or flame POISONOUS GASES PRODUCED WHEN HEATED
Exposure	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED SOLID POISONOUS IF SWALLOWED
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4

Evacuate the area
Remove sources
Stop the discharge
Chemical and physical treatment

2 LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Adipic
Alpha Dinitrophenol
Hydroxy 2 4 dinitrobenzene

3 2 **Coast Guard Compatibility Classification:**
Not applicable

3 3 **Chemical Formula:**
$HOC_6H_3(NO_2)_2$ 2 4

3 4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** Yellow

4 3 **Odor:** Musty sweet

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** [illegible]

5 2 **Symptoms Following Exposure:** [illegible]

5 3 **Treatment for Exposure:** [illegible]

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0 2 mg m^3

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** [illegible]

5 7 **Late Toxicity:** Produces clouding of lens of eye (cataracts) in animals and humans; birth defects in chick embryos

5 8 **Vapor (Gas) Irritant Characteristics:** Not applicable

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure, may cause second-degree burns on long exposure

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Data not available

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water dry chemical carbon dioxide foam

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Vapor irritants

6 6 **Behavior in Fire:** [illegible] explode when heated under confinement

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Reacts with oxidizing materials and combustibles

7 3 **Stability During Transport:** May decompose when heated under confinement

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 30 ppm in the minnow, dead fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 American Aniline Products Inc
29 McLean Blvd
Paterson N J 07504

2 Mallinckrodt Chemical Works
Mallinckrodt Chemical Division
Charlotte N C 28201

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 5

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous liquid, solid Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** [illegible]

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** [illegible]

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

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DTT	2,4-DINITROTOLUENE

Common Synonyms

DNT
2,4-Dinitrotoluol
1-Methyl-2,4-Dinitrobenzene

Solid or heated liquid — Yellow to red solid or yellow liquid — Slight odor

Liquid solidifies. Solid and liquid sink in water

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire

Exposure

LIQUID OR SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

2. LABELS

3. CHEMICAL DESIGNATIONS

3.1 Synonyms: DNT
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula:
3.4 IMCO/United Nations Numerical Designation:

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5. HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: INHALATION SKIN EYES INGESTION
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6. FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8. WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9. SELECTED MANUFACTURERS

10. SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

XXVII

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation:
12.3 NFPA Hazard Classifications:

Category	Classification

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm.
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

DOA	DIOCTYL ADIPATE

Common Synonyms Adipic acid bis(2-ethylhexyl) ester Bis(2-ethylhexyl) adipate	Oily liquid — Colorless — Odorless Floats on water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	**Combustible** Extinguish with foam, dry chemical, carbon dioxide Water may be ineffective
Exposure	CALL FOR MEDICAL AID **LIQUID** **Irritating to eyes** Flush affected area with plenty of water IF IN EYES: Hold eyelids apart, flush with plenty of water
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify Local Health and Wildlife Officials Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Mechanical containment
Chemical and physical treatment

2 LABELS

Not specified. Labels required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
Adipic acid bis(2-ethylhexyl) ester
Adipol 2EH, Di(2-ethylhexyl) adipate
DOA

3.2 **Coast Guard Compatibility Classification**
Later

3.3 **Chemical Formula**
$C_6H_{10}O_4(C_8H_{17})_2$

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Colorless
4.3 **Odor** Mild characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** None required
5.2 **Symptoms Following Exposure** Low toxicity, no serious injuries in industrial handling
5.3 **Treatment for Exposure:** CONTACT WITH EYES: wipe off and wash skin with soap and water. Treat like lubricating oil. Flush eyes with water. Remove to fresh air
5.4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5.5 **Short-Term Inhalation Limits** Not pertinent
5.6 **Toxicity by Ingestion** Grade 1 LD50 [illegible] g/kg
5.7 **Late Toxicity** None
5.8 **Vapor (Gas) Irritant Characteristics** Vapors are irritating to the eyes and throat
5.9 **Liquid or Solid Irritant Characteristics** Moderate hazard. If spilled on clothing and allowed to remain, may cause scalding and adhesion of the skin
5.10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point.** 390°F O.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Data not available
6.4 **Fire Extinguishing Agents Not to be Used** Data not available
6.5 **Special Hazards of Combustion Products:** None
6.6 **Behavior in Fire** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard** Data not available
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction
7.2 **Reactivity with Common Materials** No reaction
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp
Plastics Division
Morristown, N.J. 07960
2. Diamond Shamrock Corp
Nopco Chemicals Division
Morristown, N.J. 07960
3. W. R. Grace & Co
Hatco Chemical Division
Fords, N.J. 08863

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.5%
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting.** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

X F U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** 371
13.3 **Boiling Point at 1 atm** Very high
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure.** Not pertinent
13.7 **Specific Gravity** 0.928 at 20°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 28 dynes/cm = 0.028 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension** (est.) 30 dynes/cm = 0.03 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization.** Not pertinent
13.13 **Heat of Combustion** -15,430 Btu/lb = -8580 cal/g = -359 × 10³ J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5A

NOTES

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DOP	DIOCTYL PHTHALATE

Common Synonyms			
Phthalic acid bis(2-ethylhexyl ester) DOP Bis(2-ethylhexyl) phthalate Di(2-ethylhexyl) phthalate Octoil	Oily liquid Floats on water	Colorless	Slight odor

Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
- Bis(2-ethylhexyl) phthalate
- Di(2-ethylhexyl) phthalate
- DOP
- Octoil
- Phthalic acid bis(2-ethylhexyl) ester

3.2 **Coast Guard Compatibility Classification**
Ester

Continued on page 4

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Colorless
4.3 **Odor** Very slight characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Not required
5.2 **Symptoms Following Exposure.** Produces no ill effects at normal temperatures but may give off irritating vapor at high temperature
5.3 **Treatment for Exposure** Leave contaminated area, wash skin with soap and water, flush eyes with water
5.4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5.5 **Short-Term Inhalation Limits** Not pertinent
5.6 **Toxicity by Ingestion** Grade 0 LD$_{50}$ [illegible]
5.7 **Late Toxicity** Not established
5.8 **Vapor (Gas) Irritant Characteristics** Nonirritating to the eyes and nose
5.9 **Liquid or Solid Irritant Characteristics** No appreciable hazard. Practically harmless [illegible] skin
5.10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** 425 F O C
6.2 **Flammable Limits in Air**
Not pertinent
6.3 **Fire Extinguishing Agents** Dry powder, carbon dioxide, foam
6.4 **Fire Extinguishing Agents Not to be Used**
Water or foam may cause frothing
6.5 **Special Hazards of Combustion Products**
None
6.6 **Behavior in Fire** Not pertinent
6.7 **Ignition Temperature** Data not available
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction
7.2 **Reactivity with Common Materials**
No reaction
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agent for Acids and Caustics** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)**
Data not available
8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp
Plastics Division
Morristown, N J 07960
2. W R Grace & Co
Hatco Chemical Division
Fords, N J 08863
3. Monsanto Corp
Monsanto Industrial Chemicals Co
800 N Lindbergh Blvd
St Louis, Mo 63166

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Data not available
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U X Y

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** 390 [illegible]
13.3 **Boiling Point at 1 atm**
727 F = 386 C = 659 K
13.4 **Freezing Point.** Not pertinent
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity** 0.980 at 25 C (liquid)
13.8 **Liquid Surface Tension**
(est) 15 dynes/cm = 0.015 N/m at 20 C
13.9 **Liquid-Water Interfacial Tension**
(est) 30 dynes/cm = 0.03 N/m at 20 C
13.10 **Vapor (Gas) Specific Gravity**
Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent
13.12 **Latent Heat of Vaporization**
Not pertinent
13.13 **Heat of Combustion** 15,130 Btu/lb = 8410 cal/g = 352 × 10^{3} J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on page 5

3 CHEMICAL DESIGNATIONS (Cont'd)

3.3 **Chemical Formula.**
$C_6H_5COOCH_2CH_2CH_2CH_2CH_2$
3.4 **IMCO United Nations Numerical Designation** Not listed

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DSS	DIOCTYL SODIUM SULFOSUCCINATE

Common Synonyms			
Bis(2-ethylhexyl) sodium sulfosuccinate Aerosol surfactant Alrowet D65 Di(2-ethylhexyl) sulfosuccinate sodium salt Sodium dioctyl sulfosuccinate	Waxy solid or watery solution	Colorless to white	Odorless
	Sinks and mixes slowly with water		

Fire	Not flammable
Exposure	LIQUID OR SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Aerosol Surfactant Alrowet D65 Bis(2-ethylhexyl)sodium sulfosuccinate Di(2-ethylhexyl) sulfosuccinate sodium salt Sodium dioctyl sulfosuccinate

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula.** $C_4H_9OOCCH_2CH_2SO_3NaCOOC_4H_9$

3 4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Waxy solid or water solution

4 2 **Color** Colorless or off white

4 3 **Odor.** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Chemical goggles rubber gloves dust respirator

5 2 **Symptoms Following Exposure** Liquid is strong irritant to eye and may irritate skin by removing natural oils Ingestion causes diarrhea and intestinal blooding

5 3 **Treatment for Exposure** EYES irrigate with copious volumes of water for at least 15 min call physician SKIN rinse off with water INGESTION drink large amounts of water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Not pertinent

5 6 **Toxicity by Ingestion** Grade 2 oral LD_{50} = 1 900 mg kg (rat)

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point.** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire.** Causes foaming and spreading of water Assists in putting out fires by water

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Proctor Chemical Company Inc
P O Box 399
Salisbury N C 28144

2 American Cyanamid Co
Industrial Chemicals and Plastics Division
Wayne N J 07470

3 Ciba Geigy Corporation
Dyes and Specialty Chemicals Division
Bayonne N J 07002

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Since many grades contain inert diluents concentration of compound may be as low as 50% by weight Many are water solutions

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3)

II SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid or liquid

13 2 **Molecular Weight** 444

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point** (solid form) 311 F = 155 C = 428 K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 1 1 at 20 C (solid or liquid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity.** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

DOX	1,4-DIOXANE

Common Synonyms			
Dioxane p-Dioxane	Liquid	Colorless	Slight alcohol odor

Sinks and mixes with water. Flammable, irritating vapor is produced. Freezing point is 53° F

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber clothing.
Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop discharge if possible.
Stay upwind; keep out of low areas; ventilate closed spaces before entering.
Isolate and remove leaking material.
Notify local health and pollution control officials.

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles, self-contained breathing apparatus and rubber clothing.
Extinguish with dry chemical, CO2, foam or water fog.
Water may be ineffective.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled
May cause shock.
If breathing has stopped, give artificial respiration.
If breathing difficult, give oxygen.

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids apart and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water (two glasses at most) and induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting or give anything by mouth.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify public health officials of spill.
Notify operators of water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-2)

Isolate and eliminate high flammability.
Disperse and flush.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diethylene oxide
Dioxan
p-Dioxane

3.2 **Coast Guard Compatibility Classification**
Other

3.3 **Chemical Formula.** $CH_2CH_2OCH_2CH_2O$

3.4 **IMCO United Nations Numerical Designation.** 1.4 [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor** Mild somewhat disagreeable, [illegible] ether-like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** [illegible]

5.2 **Symptoms Following Exposure** No significant [illegible] exposure [illegible] repeated exposure [illegible] irritation and burns [illegible] Dioxane [illegible] delayed. Made [illegible]

5.3 **Treatment for Exposure** INHALATION: [illegible] acetylcholine esterase inhibitors. Give oxygen [illegible] INGESTION: [illegible] SKIN AND EYES: [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits** 100 ppm for 60 min

5.6 **Toxicity by Ingestion** [illegible]

5.7 **Late Toxicity:** Causes cancer in rats

5.8 **Vapor (Gas) Irritant Characteristics** Vapor causes slight [illegible] irritation. Does [illegible]

5.9 **Liquid or Solid Irritant Characteristics** Moderate [illegible] and [illegible]

5.10 **Odor Threshold** 620 mg/m

6 FIRE HAZARDS

6.1 **Flash Point** 54 F (C.C.) 74 F (O.C.)

6.2 **Flammable Limits in Air**
2.0 - 22.0% by vol

6.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to Be Used**
Not pertinent

6.5 **Special Hazards of Combustion Products**
Toxic vapors are released when heated.

6.6 **Behavior in Fire** Vapor may be ignited by sparks and may travel to sources of ignition and flash back.

6.7 **Ignition Temperature:** 356 F

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.**
Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)**
[illegible] 10 days

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

Dow Chemical Co
Midland, Mich 48640

[illegible] Corp
Grant Chemical Division
12418 Scenic Highway
Baton Rouge, La 70821

Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Health	
Vapor Pressure	1
Flammability	1
Reactivity	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aquatic Effect	0
Reactivity	
Other Chemicals	
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight** 88.11

13.3 **Boiling Point at 1 atm**
214.5 F = 101.4 C = 374.5 K

13.4 **Freezing Point**
53.3 F = 11.8 C = 285.0 K

13.5 **Critical Temperature**
587 F = 314 C = 587 K

13.6 **Critical Pressure.**
750 psia = 51.0 atm = 5.2 MN

13.7 **Specific Gravity:** 1.034 at 20 C (liquid)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
[illegible]

13.12 **Latent Heat of Vaporization**
175 Btu/lb = 97.2 cal/g = 4.1 × 10^5 J/kg

13.13 **Heat of Combustion** [illegible] Btu/lb
= -14401 cal/g = -2.9 × 10^7 J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** [illegible] Btu/lb
= [illegible] cal/g = [illegible] J/kg

13.16 **Heat of Polymerization** Not pertinent

(Continued on page [illegible])

NOTES

REVISED 1978

DPN	DIPENTENE

Common Synonyms			
p-Mentha 1,8-diene Limonene Terpinene delta 1,8-Terpodiene Phellandrene	Liquid Floats on water	Colorless to light yellow	Pleasant lemon like odor

Stop leak if possible. Keep people away.
[illegible]

Fire	Combustible Containers may explode in fire [illegible]
Exposure	[illegible] **VAPOR** Irritating to eyes, nose and throat [illegible] **LIQUID** Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

None required by Coast Guard
Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Limonene para Mentha 1,8 diene, Phellandrene, Terpinene, delta 1,8 Terpodiene
3.2 **Coast Guard Compatibility Classification** Olefins (11)
3.3 **Chemical Formula** $C_{10}H_{16}$
3.4 **IMCO/United Nations Numerical Designation** 3 2082

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Colorless to pale yellow
4.3 **Odor** Pleasant pine like terpentine

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Solvent resistant gloves, safety glasses, face shield, self contained breathing apparatus in high vapor concentrations
5.2 **Symptoms Following Exposure** Liquid irritates eyes, prolonged contact with skin causes irritation. Ingestion causes irritation of gastrointestinal tract
5.3 **Treatment for Exposure** INHALATION: remove victim to fresh air, [illegible] necessary call physician. EYES: Flush with water [illegible] call physician. SKIN: wash with soap and water. INGESTION: induce vomiting, call physician
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits** Data not available
5.6 **Toxicity by ingestion** Grade 2 oral LD[illegible] [illegible] g/kg
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Vapor irritation [illegible] system. Present in high vapor [illegible] The effect [illegible]
5.9 **Liquid or Solid Irritant Characteristics** Minimal hazard. Prolonged [illegible] may cause [illegible]
5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 115°F C.C.
6.2 **Flammable Limits in Air** [illegible]
6.3 **Fire Extinguishing Agents** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used** Water is ineffective
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire** Containers may explode
6.7 **Ignition Temperature** 488°F
6.8 **Electrical Hazard** Data not available
6.9 **Burning Rate** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction
7.2 **Reactivity with Common Materials** No reaction
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfow. Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Hercules Incorporated
Organics Department
Wilmington, Del. 19899
2 Reichhold Chemicals Inc
Newport Division
P.O. Box 1435
Pensacola, Fla. 32596
3 SCM Corporation
Glidden Durkee Division
P.O. Box 89
Jacksonville, Fla. 32201

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Several technical grades all having same general properties
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Open vent w/ arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

N.F.I.

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	0
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** 136.2
13.3 **Boiling Point at 1 atm** [illegible]
13.4 **Freezing Point** [illegible]
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity** [illegible] at 20°C (liquid)
13.8 **Liquid Surface Tension** [illegible] 26 dynes/cm = 0.026 N/m at 20
13.9 **Liquid-Water Interfacial Tension** 45 dynes/cm = 0.0245 N/m at [illegible]
13.10 **Vapor (Gas) Specific Gravity** 4.9
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization** [illegible] Btu/lb = [illegible] x 10[illegible] J/kg
13.15 **Heat of Combustion** [illegible] Btu/lb = [illegible] x 10[illegible] J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

(continued on page [illegible])

NOTES

DAM	DIPHENYLAMINE

Common Synonyms			
Anilinobenzene N-Phenylaniline	Solid or liquid	Light tan to brown	Pleasant odor
	Sinks in water		

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat Harmful if inhaled LIQUID OR SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning. Water contamination
Should be removed
Chemical, no physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Anilinobenzene, N-Phenylaniline

3.2 **Coast Guard Compatibility Classification** Data not available

3.3 **Chemical Formula.** $(C_6H_5)_2NH$

3.4 **IMCO/United Nations Numerical Designation** Data not available

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid or liquid

4.2 **Color** Very pale tan, amber, or brown

4.3 **Odor** Characteristic, pleasant

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Respirator, safety goggles, or face shield, rubber gloves

5.2 **Symptoms Following Exposure** Inhalation may irritate mucous membranes. One exposure including ingestion of solid or skin contact may cause fatal pulse, hypertension, and bladder trouble. Contact with dust irritates eyes

5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air. INGESTION: get medical attention, observe for methemoglobinemia. EYE: flush with plenty of water and see physician. SKIN: wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 10 mg/m³

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 1,000 mg/kg (rat)

5.7 **Late Toxicity:** Causes birth defects in rats (polycystic kidneys)

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** (liquid) 307°F O.C.

6.2 **Flammable Limits in Air.** Not pertinent

6.3 **Fire Extinguishing Agents** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen may form in fire

6.6 **Behavior in Fire** Dust may be explosive if mixed with air in critical proportions and in the presence of a source of ignition

6.7 **Ignition Temperature** 1175°F

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials**

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Universal Chemical
Div. of Universal Inc.
Elm Street
Naugatuck, Conn. 06770

2. American Cyanamid Co.
Intermediates Dept.
Bound Brook, N.J. 08805

3. Eastman Kodak Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Technical, sometimes shipped as liquid

10.2 **Storage Temperature** Ambient or slightly elevated for liquid

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid or liquid

13.2 **Molecular Weight:** 169.2

13.3 **Boiling Point at 1 atm:** 576°F = 302°C = 575°K

13.4 **Freezing Point:** 127°F = 53°C = 326°K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.16 at 1°C (liquid)

13.8 **Liquid Surface Tension** 39.3 dynes/cm (at 1.8% N-methyl-2-pyrrolidone)

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion** -16,400 Btu/lb = -9,100 cal/g = -38.1 × 10³ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on next sheet

NOTES

DPD	DIPHENYLDICHLOROSILANE

Common Synonyms	Liquid Colorless Sharp irritating odor
Dichlorodiphenylsilane Dichlorodiphenylsilicane Diphenylsilicon dichloride	Reacts with water Irritating vapor is produced

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	VAPOR Irritating to eyes nose and throat LIQUID Will burn skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning [illegible] water contaminant

Restrict access

Dispose and flush with [illegible]

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Dichlorodiphenylsilane
Dichlorodiphenylsilicane
Diphenylsilicon dichloride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula** $(C_6H_5)_2SiCl_2$

3.4 **IMCO/United Nations Numerical Designation** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp hydrochloric acid like pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** [illegible]

5.2 **Symptoms Following Exposure** [illegible]

5.3 **Treatment for Exposure** INHALATION [illegible] EYES [illegible] SKIN [illegible] INGESTION [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits** [illegible]

5.6 **Toxicity by Ingestion** [illegible]

5.7 **Late Toxicity** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics** [illegible]

5.9 **Liquid or Solid Irritant Characteristics** [illegible]

5.10 **Odor Threshold** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point** [illegible]

6.2 **Flammable Limits in Air** [illegible]

6.3 **Fire Extinguishing Agents** [illegible] carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water and [illegible]

6.5 **Special Hazards of Combustion Products** Hydrochloric acid [illegible]

6.6 **Behavior in Fire** [illegible]

6.7 **Ignition Temperature** [illegible]

6.8 **Electrical Hazard** [illegible]

6.9 **Burning Rate** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** Reacts with water to generate hydrogen chloride [illegible]

7.2 **Reactivity with Common Materials.** Reacts with surface moisture to generate hydrogen chloride which is corrosive to common metals

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** [illegible]

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** [illegible]

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Dow Corning Corporation
P O Box 592
Midland Mich [illegible]

2. PCR Inc
P O Box [illegible]
Gainesville Fla [illegible]

3. Stauffer Corp
Alfa Products
P O Box [illegible]
Beverly Mass [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

V O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Corrosive

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	[illegible]
Poison	[illegible]
Water Pollution	
Human Toxicity	[illegible]
Aquatic Toxicity	
Aesthetic Effect	[illegible]
Reactivity	
Other Chemicals	[illegible]
Water	[illegible]
Sea [illegible]	

12.3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm** [illegible]

13.4 **Freezing Point** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 25°C (liquid)

13.8 **Liquid Surface Tension on:** [illegible] dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** [illegible]

13.13 **Heat of Combustion** [illegible]

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Data [illegible]

13.16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

DPE	DIPHENYL ETHER

Common Synonyms
Phenyl ether
Diphenyl oxide
Phenoxybenzene

Liquid — Colorless — Mild pleasant odor

May float or sink in water. Freezing point is 81° F.

[illegible]

Fire

Combustible
[illegible]

Exposure

[illegible]

LIQUID OR SOLID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
EYES: [illegible] flush with plenty of water
IF SWALLOWED: [illegible] CONSCIOUS have immediately water [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(see Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Phenyl ether
Diphenyl oxide
Phenoxybenzene

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula:** $C_6H_5OC_6H_5$

3.4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Weak geranium

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation may cause nausea because of disagreeable odor. Contact of liquid with eyes causes mild irritation. Prolonged exposure of skin to liquid causes reddening and irritation. Ingestion produces nausea.

5.3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: induce vomiting and get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible] ppm

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion** Grade 2, oral LD_{50} = [illegible] mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics** Data not available

5.10 **Odor Threshold:** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point** [illegible] F C.C.

6.2 **Flammable Limits in Air** [illegible]

6.3 **Fire Extinguishing Agents** [illegible] carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** [illegible] F

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640

2. Givaudan Corp.
100 Delawanna Ave.
Clifton, N.J. 07014

3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure grade
Technical grade, Perfumery grade

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open or diaphragm vent

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A F L A N

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 170.2

13.3 **Boiling Point at 1 atm** 498° F = 259° C = 532° K

13.4 **Freezing Point** 81° F = 27° C = 300° K

13.5 **Critical Temperature** 721° F = 383° C = 656° K

13.6 **Critical Pressure.** 478 psia = 32.5 atm = 3.30 MN/m²

13.7 **Specific Gravity:** [illegible] Liquid

13.8 **Liquid Surface Tension.** 40.05 dynes/cm = 0.040 N/m at 50° C

13.9 **Liquid-Water Interfacial Tension.** [illegible] dynes/cm = 0.036 N/m at 50° C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** [illegible] Btu/lb = [illegible] cal/gm = [illegible] x 10⁴ J/kg

13.13 **Heat of Combustion** [illegible] Btu/lb = [illegible] cal/gm = [illegible] x 10⁴ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

DPM	DIPHENYLMETHANE DIISOCYANATE

Common Synonyms	
MDI Diphenylmethane-4,4'-diisocyanate	Solid — White to light yellow Sinks in water

Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Wear goggles and self-contained breathing apparatus
Extinguish with foam, dry chemical, carbon dioxide

Exposure

CALL FOR MEDICAL AID
SOLID
Irritating to skin and eyes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Evacuate immediate area of unprotected persons
Shut off ignition
Chemical and physical treatment

2. LABELS

No hazard label available
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** [illegible] MDI Diphenylmethane-4,4'-diisocyanate, Methylene bis (4-phenylisocyanate) (MSI) MDI, MDI [illegible] Methylene bis (4-phenylisocyanate) [illegible]

3.2 **Coast Guard Compatibility Classification** Isocyanate

3.3 **Chemical Formula** $(OCN-C_6H_4)_2CH_2$

3.4 **IMCO United Nations Numerical Designation.** Not assigned

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid

4.2 **Color.** Colorless to light yellow

4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Must use respirator [illegible] Wear rubber gloves, chemical goggles, [illegible] protective clothing [illegible]

5.2 **Symptoms Following Exposure:** Breathlessness [illegible]

5.3 **Treatment for Exposure:** INHALATION [illegible] SKIN CONTACT [illegible] Rubber [illegible] EYE CONTACT [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion** Data not available

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** [illegible]

5.9 **Liquid or Solid Irritant Characteristics** [illegible] Liquid [illegible] blistering of the skin

5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** [illegible] F C.C.

6.2 **Flammable Limits in Air** Not [illegible]

6.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used** Not [illegible]

6.5 **Special Hazards of Combustion Products.** [illegible] generated when heated

6.6 **Behavior in Fire** Solid melts and burns

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard** Not [illegible]

6.9 **Burning Rate** Not [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Slow [illegible] Exothermic reaction

7.2 **Reactivity with Common Materials:** Data not available

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not [illegible]

7.5 **Polymerization:** May occur slowly. Exothermic

7.6 **Inhibitor of Polymerization.** Not present

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Bayhem Corp.
Mobay Chemical Co., Pittsburgh, Pa.
Penn Lincoln Plaza, Wilmington, Pittsburgh, Pa. 15205
E. I. du Pont de Nemours & Co., Inc.
Elastomer Chemicals Dept.
Wilmington, Delaware
Upjohn Co.
Polymer Chemicals Division
La Porte, Tex. 77571

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Solid grade [illegible] Liquid grade may contain 5% o-dichlorobenzene

10.2 **Storage Temperature:** [illegible] 40 F

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
I	
Health	
Vapor Damage	[illegible]
Liquid Contact Damage	[illegible]
Poison	4
Water Pollution	
Human Toxicity	
Aquatic Toxicity	[illegible]
Reactivity	
Other Chemical	
Water	[illegible]
Not Required	

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid

13.2 **Molecular Weight** 250.1

13.3 **Boiling Point at 1 atm** [illegible] 192 [illegible] K

13.4 **Freezing Point** [illegible] K

13.5 **Critical Temperature** Not [illegible]

13.6 **Critical Pressure** Not [illegible]

13.7 **Specific Gravity** [illegible] 20 C (solid)

13.8 **Liquid Surface Tension** Not [illegible]

13.9 **Liquid-Water Interfacial Tension** Not [illegible]

13.10 **Vapor (Gas) Specific Gravity** Not [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not [illegible]

13.12 **Latent Heat of Vaporization** Not [illegible]

13.13 **Heat of Combustion.** Not [illegible]

13.14 **Heat of Decomposition** Not [illegible]

13.15 **Heat of Solution** Not [illegible]

13.16 **Heat of Polymerization** Not [illegible]

[illegible]

NOTES

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DNA	Di-n-PROPYLAMINE

Common Synonyms			
N-propyl-1-propanamine	Liquid	Colorless	Strong ammonia like odor
	Floats and mixes with water		

Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause headache, dizziness, coughing, or difficult breathing LIQUID Will burn eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook (CG 446-4)

Isolate marine water use, aquatic life, contaminate, high flammability
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** N-Propyl-1-propanamine

3.2 **Coast Guard Compatibility Classification** Not listed

3.3 **Chemical Formula** $(C_3H_7)_2NH$

3.4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color** Colorless

4.3 **Odor** Strong ammonia like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Self contained breathing apparatus, butyl rubber gloves, butyl rubber apron, face shield

5.2 **Symptoms Following Exposure** Inhalation causes severe cough and chest pain, pulmonary edema of the passages can cause lung edema, may also cause bronchitis, bronchitis, tracheitis and asthma. Ingestion causes irritation and burning in mouth and stomach. Contact with eyes causes severe irritation and edema of the cornea. Contact with skin causes severe irritation

5.3 **Treatment for Exposure** INHALATION remove victim to fresh air, if not breathing give artificial respiration, if breathing difficult give oxygen, call a physician. INGESTION give large amounts of water, get medical attention. EYES flush with water for 15 min, get medical attention. SKIN flush with water for 15 min

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion** Grade 3 oral rat LD_{50} [illegible] mg/kg, rat [illegible] mg/kg

5.7 **Late Toxicity** Causes degenerative changes in liver and kidneys of rats and rabbits

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 45°F CC

6.2 **Flammable Limits in Air** Data not available

6.3 **Fire Extinguishing Agents.** Foam, CO2, chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen, carbon monoxide

6.6 **Behavior in Fire**

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard.** Data not available

6.9 **Burning Rate** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction

7.2 **Reactivity with Common Materials.** May react with some forms of plastics

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** No data, 24 hr [illegible] not [illegible]

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

- Air Products and Chemicals, Inc., 1 N. Highway 90, Pace, Fla. 32502
- Pennwalt Corporation, 3 Penn Plaza, Philadelphia, Pa. 19102
- Eastman Organic Chemicals, Rochester, N.Y. 14650

10 SHIPPING INFORMATION

*10.1 **Grades or Purity** Technical, 98, Pure 99+%

*10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open, [illegible] requirement

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG 446-3)

A P Q T T

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

12 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Liquid

*13.2 **Molecular Weight:** 101.19

*13.3 **Boiling Point at 1 atm:** 227°F = 108°C = 381°K

13.4 **Freezing Point** −81°F = −63°C = 210°K

*13.5 **Critical Temperature** [illegible]

*13.6 **Critical Pressure:** 4.9 atm = 1.0 atm = 14.7 MN/m²

*13.7 **Specific Gravity:** 0.73 at 20°C (liquid)

*13.8 **Liquid Surface Tension:** 0.0[illegible] dyne/cm = 0.0[illegible] N/m at 20°C

*13.9 **Liquid-Water Interfacial Tension:** Not pertinent

*13.10 **Vapor (Gas) Specific Gravity:** 3.5

*13.11 **Ratio of Specific Heats of Vapor (Gas)**

*13.12 **Latent Heat of Vaporization** 143 Btu/lb = 79 cal/g = 3.3 × 10⁵ J/kg

13.13 **Heat of Combustion.** −15,750 Btu/lb = −10,420 cal/g = −43.6 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

*13.15 **Heat of Solution** Not pertinent

*13.16 **Heat of Polymerization.** Not pertinent

(Continued on next page)

NOTES

DPG	DIPROPYLENE GLYCOL

Common Synonyms	Thick liquid Colorless Odorless Sinks and mixes with water

Fire	Combustible
Exposure	LIQUID Irritating to eyes.
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification
3.3 Chemical Formula
3.4 IMCO United Nations Numerical Designation

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped).
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment
5.2 Symptoms Following Exposure
5.3 Treatment for Exposure: EYES SKIN INGESTION
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits
5.6 Toxicity by Ingestion
5.7 Late Toxicity
5.8 Vapor (Gas) Irritant Characteristics
5.9 Liquid or Solid Irritant Characteristics
5.10 Odor Threshold

6 FIRE HAZARDS

6.1 Flash Point
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents.
6.4 Fire Extinguishing Agents Not to be Used
6.5 Special Hazards of Combustion Products
6.6 Behavior in Fire
6.7 Ignition Temperature
6.8 Electrical Hazard
6.9 Burning Rate

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water
7.2 Reactivity with Common Materials
7.3 Stability During Transport.
7.4 Neutralizing Agents for Acids and Caustics
7.5 Polymerization
7.6 Inhibitor of Polymerization.

8 WATER POLLUTION

8.1 Aquatic Toxicity
8.2 Waterfowl Toxicity
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity
10.2 Storage Temperature
10.3 Inert Atmosphere
10.4 Venting

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation

Category	Rating

12.3 NFPA Hazard Classifications

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight.
13.3 Boiling Point at 1 atm.
13.4 Freezing Point.
13.5 Critical Temperature
13.6 Critical Pressure
13.7 Specific Gravity
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension.
13.10 Vapor (Gas) Specific Gravity
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization
13.13 Heat of Combustion. 11 650 Btu/lb = 6470 cal/g = 27.1×10^3 J/g
13.14 Heat of Decomposition
13.15 Heat of Solution
13.16 Heat of Polymerization

NOTES

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DFF — DISTILLATES: FLASHED FEED STOCKS

Common Synonyms

Liquid — Colorless — Gasoline-like odor

Floats on water. Flammable. Irritating vapor is produced

Fire

Flammable
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat

LIQUIDS
Irritating to eyes
Harmful if swallowed

DO NOT INDUCE VOMITING

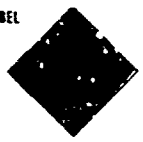
Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

2 LABEL



3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures
3.3 Chemical Formula
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped)
4.2 Color
4.3 Odor

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure: INHALATION — ASPIRATION — INGESTION
5.3 Treatment for Exposure: INHALATION — ASPIRATION — INGESTION — EYES — SKIN
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits
5.6 Toxicity by Ingestion
5.7 Late Toxicity
5.8 Vapor (Gas) Irritant Characteristics
5.9 Liquid or Solid Irritant Characteristics
5.10 Odor Threshold

6 FIRE HAZARDS

6.1 Flash Point
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents: Foam
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products
6.6 Behavior in Fire
6.7 Ignition Temperature
6.8 Electrical Hazard
6.9 Burning Rate

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics
7.5 Polymerization:
7.6 Inhibitor of Polymerization

8 WATER POLLUTION

8.1 Aquatic Toxicity
8.2 Waterfowl Toxicity
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature
10.3 Inert Atmosphere
10.4 Venting

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Flammable Liquid
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	
Health	
Vapor Toxicity	
Liquid Toxicity	
Irritation	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aquatic Life	
Reactivity	
Other Chemicals	
Water	
Self Reactivity	

12.3 NFPA Hazard Classifications

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm
13.2 Molecular Weight
13.3 Boiling Point at 1 atm
13.4 Freezing Point
13.5 Critical Temperature
13.6 Critical Pressure
13.7 Specific Gravity
13.8 Liquid Surface Tension
13.9 Liquid-Water Interfacial Tension
13.10 Vapor (Gas) Specific Gravity
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization
13.13 Heat of Combustion
13.14 Heat of Decomposition
13.15 Heat of Solution
13.16 Heat of Polymerization

NOTES

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DSR	DISTILLATES: STRAIGHT RUN

Common Synonyms
Straight run gasoline

Watery liquid — Colorless — Gasoline-like odor

Floats on water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.

LIQUIDS
Irritating to eyes.
Harmful if swallowed.

DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 Synonyms
3.2 Coast Guard Compatibility Classification. Miscellaneous hydrocarbon mixtures
3.3 Chemical Formula:
3.4 IMCO United Nations Numerical Designation

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped)
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure: INHALATION — ASPIRATION — INGESTION
5.3 Treatment for Exposure: INHALATION — ASPIRATION — INGESTION — SKIN
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits.
5.6 Toxicity by Ingestion
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics.
5.9 Liquid or Solid Irritant Characteristics.
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents
6.4 Fire Extinguishing Agents Not to be Used
6.5 Special Hazards of Combustion Products
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water.
7.2 Reactivity with Common Materials
7.3 Stability During Transport.
7.4 Neutralizing Agents for Acids and Caustics.
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity
8.2 Waterfowl Toxicity
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity.
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations.
12.2 NAS Hazard Rating for Bulk Water Transportation

Category	Rating

12.3 NFPA Hazard Classifications.

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight.
13.3 Boiling Point at 1 atm.
13.4 Freezing Point.
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization.
13.13 Heat of Combustion.
13.14 Heat of Decomposition:
13.15 Heat of Solution.
13.16 Heat of Polymerization.

NOTES

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DDN	DODECANOL

Common Synonyms
Lauryl alcohol
Dodecyl alcohol

Thick liquid — Colorless — Sweet odor

Floats on water. Freezing point is 75° F

Fire

Combustible

Exposure

LIQUID
Irritating to skin
Will burn eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula:
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation:
12.3 NFPA Hazard Classifications:

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm.
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

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DOD	DODECENE

Common Synonyms			
Propylene tetramer	Watery liquid	Colorless	Pleasant odor
	Floats on water		

[illegible]

Fire

Combustible.
[illegible] carbon dioxide

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
IF ON SKIN: [illegible] with plenty of water
IF IN EYES: [illegible] with plenty of water
IF SWALLOWED: [illegible] CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible] to health and wildlife officials
[illegible] water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** Dodecene (non linear)
Propylene tetramer
Tetrapropylene

3 2 **Coast Guard Compatibility Classification**
Olefin

3 3 **Chemical Formula:** $C_{12}H_{24}$

3 4 **IMCO United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective gloves; no respiratory protection needed if ventilation is adequate

5 2 **Symptoms Following Exposure:** No inhalation hazard expected. Aspiration hazard if ingested. Minor skin and eye irritation

5 3 **Treatment for Exposure** INHALATION: Remove victim to fresh air. INGESTION: do NOT induce vomiting! Do NOT lavage! Give vegetable oil and demulcents; call physician. EYE CONTACT: flush w/ water for 15 min. SKIN CONTACT: wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Grade 0 LD[illegible] above [illegible] g/kg

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Slight smarting of eyes and respiratory system at high concentrations. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 120°F (C.C.) 134°F (O.C.)

6 2 **Flammable Limits in Air**
Data not available

6 3 **Fire Extinguishing Agents** Water fog, foam, carbon dioxide, dry chemical

6 4 **Fire Extinguishing Agents Not to be Used**
Water may be ineffective

6 5 **Special Hazards of Combustion Products**
Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 400°F (est.)

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate.** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1 Atlantic Richfield Co
ARCO Chemical Division
260 S. Broad St
Philadelphia, Pa 19101

2 Continental Oil Co
Conoco Chemicals Division
Park 80 Plaza East
Saddle Brook, N J 07662

3 Sun Oil Co
St Davids, Pa 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98% - 99+% olefin

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A 1 1

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight** 168.31

13 3 **Boiling Point at 1 atm:**
365 - 385°F = 185 - 196°C = 458 - 469 K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.77 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
23.0 dynes/cm = 0.0230 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:**
Data not available

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion:** -19,100 Btu/lb
= -10,600 cal/g = -444 × 10³ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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DDC	1-DODECENE

Common Synonyms			
alpha-Dodecylene	Water: liquid	Colorless	Mild, pleasant odor
	Floats on water		

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with foam, dry chemical or carbon dioxide

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Adacene 12
alpha Dodecylene

3.2 **Coast Guard Compatibility Classification.** Olefin

3.3 **Chemical Formula.** $CH_3(CH_2)_8CH=CH_2$

3.4 **IMCO/United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild, pleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Protective gloves, goggles or face shield

5.2 **Symptoms Following Exposure.** No inhalation hazard expected. Aspiration hazard if ingested. Minor skin and eye irritation

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. INGESTION: do NOT induce vomiting! Do NOT lavage! Give vegetable oil and demulcent, call physician. EYE CONTACT: flush with water for 15 min. SKIN CONTACT: wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Slight smarting of eyes and respiratory system at high concentration. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point** 174°F (approx.)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents.** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 491°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 5.8 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Gulf Oil Chemicals Co.
Petrochemicals Division
Houston, Tex. 77001
2. Humphrey Chemical Co.
Desoto St.
North Haven, Conn. 06473
3. Phillips Petroleum Co.
Bartlesville, Okla. 74004

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 93–99% normal alpha olefins

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A I D

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight.** 168.32

13.3 **Boiling Point at 1 atm.** 415°F = 213°C = 486°K

13.4 **Freezing Point:** −31.1°F = −35°C = 238°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.788 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 25.6 dynes/cm = 0.0256 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.03

13.12 **Latent Heat of Vaporization** 110 Btu/lb = 61 cal/g = 2.55×10^5 J/kg

13.13 **Heat of Combustion** −18,911 Btu/lb = −10,506 cal/g = -439.87×10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

DDB — DODECYLBENZENE

Common Synonyms

1 Phenyldodecane
n-Dodecylbenzene
Laurylbenzene
Detergent alkylate #2
Dodecylbenzene (linear)

Liquid — Colorless — Weak oily odor

Floats on water

[illegible]

Fire

Combustible
Extinguish with dry chemical, foam or carbon dioxide
Water may be ineffective on fire

Exposure

Call for medical aid

LIQUID

Irritating to skin and eyes.
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES: Hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of affected water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Detergent Alkylate #2, n-Dodecylbenzene, Dodecylbenzene (linear), Laurylbenzene, 1-Phenyldodecane, UCANE Alkylate 12

3 2 **Coast Guard Compatibility Classification.** Aromatic hydrocarbon

3 3 **Chemical Formula:** $C_6H_5(CH_2)_{11}CH_3$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Weak oily

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Liquid causes mild irritation of eyes and may cause allergenic responses on repeated contact with skin. Ingestion causes nausea

5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min; get medical attention for persistent irritation. SKIN: wash with soap and water. INGESTION: do NOT induce vomiting; get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 1 LD50 5 to 15 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are nonirritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 275°F (135°C)

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents.** Dry chemical, foam

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate:** 3.5 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Witco Chemical Corporation
Witfield Division
2100 E. 223rd Street
Carson, Calif. 90745

2 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

3 Continental Oil Company
Conoco Chemicals
Park Lights Plaza West One
Saddle Brook, N.J. 07662

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Various mixtures containing 70–80% of undecyl plus dodecyl benzene along with 10% decylbenzene and other analogous hydrocarbons

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

X T 1

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 240

13 3 **Boiling Point at 1 atm:** 550°F = 288°C = 561°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.860 at 20°C (liquid)

13 8 **Liquid Surface Tension** 30.12 dynes/cm = 0.0301 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** (est.) 30 dynes/cm = 0.030 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** 35.3 Btu/lb = 82 cal/g = 3.4 × 10³ J/kg

13 13 **Heat of Combustion:** −18,100 Btu/lb = −10,000 cal/g = −4.18 × 10⁴ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

DCS	DODECYLBENZENESULFONIC ACID, CALCIUM SALT

Common Synonyms	
Calcium alkylaromatic sulfonate Calcium alkylbenzenesulfonate	Liquid Yellowish brown Solvent odor May float or sink in water

[illegible]

Fire	FLAMMABLE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes If swallowed will cause nausea [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning high flammability
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Calcium alkylaromatic sulfonate, Calcium alkylbenzenesulfonate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $(C_{12}H_{25}C_6H_4SO_3)_2Ca$ solvent

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Amber

4.3 **Odor:** Hydrocarbon solvent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. Has a drying effect on skin; prolonged contact may cause irritation

5.3 **Treatment for Exposure:** INGESTION give large amount of water, do NOT induce vomiting. EYES flush with water for at least 15 min. SKIN wipe off, flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** <100°F C.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6.5 **Special Hazards of Combustion Products.**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** ≥4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. The Richardson Company
   Organic Chemicals Division
   Melrose Park, Ill 60160
2. Witco Chemical Corp
   Organics Division
   277 Park Avenue
   New York, N.Y. 10017
3. ICI United States, Inc.
   Concord Pike and New Murphy Road
   Wilmington, Del 19899

10. SHIPPING INFORMATION

10.1 **Grades or Purity.** 59–67% remainder is a hydrocarbon solvent that is combustible or flammable

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-1-1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** Not pertinent (mixture)

13.3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.04 at 25°C (liquid solution) 0.9 at 25°C (solvent)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

DAI	DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT

Common Synonyms Isopropylamine dodecylbenzenesulfonate	Solid — Off white May float or sink and mix with water
[illegible]	
Fire	Combustible [illegible]
Exposure	[illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Isopropylamine dodecylbenzenesulfonate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_{12}H_{25}C_6H_4SO_3H \cdot NH_2CH(CH_3)_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid or viscous liquid

4 2 **Color:** Off white

4 3 **Odor:** Liquid form has sweet petroleum type odor

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves goggles mask (for liquid form)

5 2 **Symptoms Following Exposure:** Ingestion causes mild irritation of mouth and stomach Contact with liquid causes irritation of eyes and (on prolonged contact) mild irritation of skin

5 3 **Treatment for Exposure:** INGESTION give large amount of water consult a doctor if large amount was ingested EYES flush with water for at least 15 min consult a doctor if irritation persists SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, LD$_{50}$ 3.54 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** (liquid) > 300 F C C

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water foam carbon dioxide dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 The Richardson Company
100 New Street
Paterson N J 07501

2 ICI United States Inc
Concord Pike and New Murphy Rd
Wilmington Del 19899

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 96+% may also be shipped as a concentrated solution in a combustible petroleum solvent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-4)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 385.5

Boiling Point at 1 atm. Not pertinent (decompose)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity.** 1.03 at 20°C (solid) 1.03 at 25°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

DBS	DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT

Common Synonyms		
Triethanolamine dodecylbenzenesulfonate	Liquid	Yellowish brown
	Sinks and mixes with water	

Avoid contact with liquid. Keep people away.
[illegible]
Isolate and [illegible] as largest as feasible.
[illegible]

Fire	**Combustible** Extinguish with water [illegible]
Exposure	CALL FOR MEDICAL AID **LIQUID** **Irritating to skin and eyes** **If swallowed will cause nausea and vomiting.** Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Triethanolamine dodecylbenzenesulfonate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_{12}H_{25}C_6H_4SO_3H \cdot N(CH_2CH_2OH)_3 \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Amber

4 3 **Odor:** Data not available

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, face mask or goggles

5 2 **Symptoms Following Exposure:** Ingestion may cause irritation of mouth and stomach. Contact with eyes or prolonged contact with skin may cause irritation.

5 3 **Treatment for Exposure:** INGESTION give large amount of water, consult a doctor if large amount was ingested. EYES flush with water, consult a doctor if irritation persists. SKIN flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and irritating oxides of sulfur may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 The Richardson Company
Organic Chemicals Division
Melrose Park, Ill 60160

2 Ashland Chemical Co
P O Box 2219
Columbus, Ohio 43216

3 Stepan Chemical Co
Edens and Winnetka
Northfield, Ill 60093

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 60% solution in water

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 475 6 (solute)

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (est) 1 2 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

DSD	DODECYL SULFATE, DIETHANOLAMINE SALT

Common Synonyms			
Diethanolamine lauryl sulfate solution Lauryl sulfate, diethanolamine salt solution	Liquid	Clear to pale yellow	Mild odor
	May float or sink and mix with water		

Avoid contact with liquid. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID LIQUID *Irritating* to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS [illegible] keep in fire ward.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify appropriate [illegible] water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Diethanolamine lauryl sulfate solution
Lauryl sulfate, diethanolamine salt solution

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:**
$C_{12}H_{25}OSO_3H \cdot (HOCH_2CH_2)_2NH \cdot H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Clear, pale yellow

4.3 **Odor:** Mild fatty

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles or face shield, protective gloves

5.2 **Symptoms Following Exposure:** Ingestion causes mild irritation of stomach. Liquid irritates eyes and causes some corneal damage after prolonged contact. Prolonged contact with skin causes mild irritation.

5.3 **Treatment for Exposure:** INGESTION: consult a doctor if large amount was ingested. EYES: wash well with water, consult a doctor if irritation persists. SKIN: flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic vapors of diethanolamine and oxides of nitrogen may form in fires.

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Henkel Inc.
Chemical Specialties Div.
400 Alfred Avenue
Teaneck, N.J. 07666

2. E. I. duPont de Nemours & Co., Inc.
Dyes and Chemicals Division
1007 Market Street
Wilmington, Del. 19898

3. Ashland Chemical Co.
P.O. Box 2219
Columbus, Ohio 43216

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
35–40% solution in water

10.2 **Storage Temperature:** Below 38°C (100°F)

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent (solution)

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.01 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

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NOTES

DSM	DODECYL SULFATE, MAGNESIUM SALT

Common Synonyms			
Magnesium dodecyl sulfate Magnesium lauryl sulfate Lauryl sulfate, magnesium salt	Liquid	Light yellow	Mild odor
	May float or sink and mix with water		

Fire	Not flammable
Exposure	LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Lauryl magnesium sulfate
Lauryl sulfate, magnesium salt
Magnesium dodecyl sulfate
Magnesium lauryl sulfate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $(C_{12}H_{25}OSO_3)_2Mg \cdot 3H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Light yellow

4 3 **Odor:** Bland

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion causes mild irritation of stomach. Contact with liquid causes mild irritation of eyes. Skin is mildly irritated with prolonged contact

5 3 **Treatment for Exposure:** INGESTION consult a doctor if large amount was ingested. EYES flush with water, consult a doctor if irritation persists. SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Vistar
5699 Farmingdale Rd
Baltimore Md 21226

Surfact Co Inc
4800 South Seeley Avenue
Blue Island Ill 60406

Stepan Chemical Co
Edens and Winnetka
Northfield Ill 60093

10 SHIPPING INFORMATION

10 **Grades or Purity:** 25 30% solution in water

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.04 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 2

NOTES

DDS	DODECYL SULFATE, SODIUM SALT

Common Synonyms Sodium lauryl sulfate Lauryl sodium sulfate Sodium dodecyl sulfate	Solid paste or liquid — White to pale yellow — Mild odor Sinks and mixes with water
Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing SOLID OR LIQUID Will burn eyes Irritating to eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Lauryl sodium sulfate, Lauryl sulfate sodium salt, Sodium dodecyl sulfate, Sodium lauryl sulfate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_{12}H_{25}OSO_3Na$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White to pale yellow

4.3 **Odor:** Mild fatty

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, dust mask or face shield

5.2 **Symptoms Following Exposure:** Inhalation of dust causes sneezing and coughing. Ingestion of large amounts causes irritation of stomach. Dust irritates eyes and may cause burns on prolonged contact. Contact with skin causes some irritation; continued exposure to water solution causes drying out and cracking

5.3 **Treatment for Exposure:** INHALATION: remove from exposure. INGESTION: consult a doctor if large amounts have been ingested. EYES: flush well with water, consult doctor if irritation persists. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = [illegible] g/kg rats

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperatures:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] ppm 24 hr TLm

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** [illegible] of theoretical in 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Henkel Inc.
   Chemical Specialties Division
   680 Allwood Avenue
   Teaneck, N.J. 07666
2. E. I. du Pont de Nemours & Co., Inc.
   Dyes and Chemicals Division
   1007 Market Street
   Wilmington, Del. 19898
3. Ashland Chemical Co.
   P.O. Box 2219
   Columbus, Ohio 43216

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 88-[illegible], pharmaceutical grade, also shipped as 28-30% solutions in water

10.2 **Storage Temperature:** Below 38°C (100°F)

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 288

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** > 1 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heat of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

DST	DODECYL SULFATE, TRIETHANOLAMINE SALT

Common Synonyms			
Triethanolamine lauryl sulfate Lauryl sulfate, triethanolamine salt	Liquid	Colorless	Mild odor
	Sinks and mixes with water		

	[illegible]
Fire	Not flammable
Exposure	[illegible] LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. [illegible]
Water Pollution	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. [illegible]

1. RESPONSE TO DISCHARGE

See Emergency Methods Handbook CG 446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Lauryl sulfate triethanolamine salt
Triethanolamine lauryl sulfate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:**
$C_{12}H_{25}OSO_3H(OCH_2CH_2)_3N=HO$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Water white

4.3 **Odor:** Mild fatty

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Ingestion causes mild irritation of stomach. Contact with liquid irritates eyes and causes some corneal damage if prolonged. Skin is mildly irritated on prolonged contact.

5.3 **Treatment for Exposure:** INGESTION: consult a doctor if large amount was ingested. EYES: flush with water, consult a doctor if irritation persists. SKIN: flush with water.

5.4 **Toxicity by inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Data on products of triethanolamine and oxides of nitrogen may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

- Henkel Inc.
  Chemical Specialties Div
  460 Alfred Avenue
  Teaneck, N.J. 07666
- Ashland Chemical Co
  P.O. Box 2219
  Columbus, Ohio 43216
- Stepan Chemical Co
  Edens and Winnetka
  Northfield, Ill. 60093

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 43-45% solution in water

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

N P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 435 (nominal)

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

DTC	DODECYLTRICHLOROSILANE

Common Synonyms

Liquid — Colorless — Sharp irritating odor

Reacts with water. Irritating gas is produced on contact with water

[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE.
[illegible]
CONTAIN WATER OR FOAM FIRE

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
[illegible]

LIQUID
Will burn skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Issue warning [illegible] water contamination
Restrict access
Dispersal and flush with [illegible]

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** [illegible]
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $C_{12}H_{25}SiCl_3$
3.4 **IMCO/United Nations Numerical Designations:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sharp [illegible] hydrochloric acid vapor and irritating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor type respirator, protective rubber gloves, chemical worker's goggles, other protective equipment as necessary to prevent eyes and skin [illegible]
5.2 **Symptoms Following Exposure:** Inhalation irritates the mucous membrane. Contact with liquid causes severe burns to eyes and skin. Ingestion causes severe burns of mouth and stomach.
5.3 **Treatment for Exposure:** INHALATION: remove from exposure, support respiration and physician if needed. EYES: flush with water for [illegible] obtain medical attention immediately. SKIN: flush with water, obtain medical attention if skin is injured. INGESTION: [illegible] give large amounts of water, then milk or milk of magnesia.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1 LD[illegible] 500 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderate irritants such that prolonged and high concentrations important. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very dangerous to the eyes.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** > [illegible] °F (O.C.)
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam
6.5 **Special Hazards of Combustion Products:** Hydrochloric acid and phosgene when [illegible] burns
6.6 **Behavior in Fire:** Dodecyltrichlorosilane [illegible] contact with water applied to adjacent fires produces irritating hydrogen chloride fumes
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Generates hydrogen chloride and hydrochloric acid
7.2 **Reactivity with Common Materials:** Reacts with surface moisture to generate hydrogen chloride which is corrosive to metals [illegible]
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Dow Corning Corporation
P.O. Box [illegible]
Midland, Mich. 48640

PCR Inc.
P.O. Box [illegible]
Gainesville, Fla. 32602

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Not required
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-5

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	2
Liquid or Solid Irritant	4
Poisons	*
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	*
Reactivity	
Other Chemicals	*
Water	4
Self Reactive	

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** > 300°F = > 149°C = > 422 K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] liquid
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] × 10[illegible] J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

DTH	DOWTHERM

Common Synonyms	Liquid — Light to dark brown — Fragrant odor May float or sink in water. Freezing point is 54° F
Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes. Harmful if swallowed
Water Pollution	Effect of low concentration on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**

3.2 **Coast Guard Compatibility Classification:**

3.3 **Chemical Formula:**

3.4 **IMCO United Nations Numerical Designation:**

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:**

4.3 **Odor:**

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:**

5.2 **Symptoms Following Exposure:**

5.3 **Treatment for Exposure:** INHALATION — INGESTION — EYES OR SKIN

5.4 **Toxicity by Inhalation (Threshold Limit Value):**

5.5 **Short-Term Inhalation Limits:**

5.6 **Toxicity by Ingestion:**

5.7 **Late Toxicity:**

5.8 **Vapor (Gas) Irritant Characteristics:**

5.9 **Liquid or Solid Irritant Characteristics:**

5.10 **Odor Threshold:**

6 FIRE HAZARDS

6.1 **Flash Point:**

6.2 **Flammable Limits in Air:**

6.3 **Fire Extinguishing Agents:**

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:**

6.8 **Electrical Hazard:**

6.9 **Burning Rate:**

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:**

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:**

7.4 **Neutralizing Agents for Acids and Caustics:**

7.5 **Polymerization:**

7.6 **Inhibitor of Polymerization:**

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**

8.2 **Waterfowl Toxicity:**

8.3 **Biological Oxygen Demand (BOD):**

8.4 **Food Chain Concentration Potential:**

9 SELECTED MANUFACTURERS

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**

10.2 **Storage Temperature:**

10.3 **Inert Atmosphere:**

10.4 **Venting:**

11 HAZARD ASSESSMENT CODE

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Toxicity	
Liquid or Solid Toxicity	
Poison	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetics Effect	
Reactivity	
Other Chemicals	
Water	
Self Reaction	

12.3 **NFPA Hazard Classifications:**

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:**

13.3 **Boiling Point at 1 atm:**

13.4 **Freezing Point:**

13.5 **Critical Temperature:**

13.6 **Critical Pressure:**

13.7 **Specific Gravity:**

13.8 **Liquid Surface Tension:**

13.9 **Liquid-Water Interfacial Tension:**

13.10 **Vapor (Gas) Specific Gravity:**

13.11 **Ratio of Specific Heats of Vapor (Gas):**

13.12 **Latent Heat of Vaporization:**

13.13 **Heat of Combustion:**

13.14 **Heat of Decomposition:**

13.15 **Heat of Solution:**

13.16 **Heat of Polymerization:**

NOTES

EDR	ENDRIN

Common Synonyms

1, 2, 3, 4, 10-Hexachloro-6, 7-epoxy-1, 4, 4a, 5, 6, 7, 8 8a-octahydro-endo, endo-1, 4, 5, 8-dimethanonaphthalene
Hexadrin
Mendrin

Solid or solution — Colorless to tan — Odorless

Sinks in water

AVOID CONTACT WITH LIQUID SOLID AND DUST KEEP PEOPLE AWAY

Fire

Combustible solution or non flammable solid
POISONOUS GASES ARE PRODUCED IN FIRE
Extinguish with dry chemical, foam, carbon dioxide and water
Water may be ineffective on fire

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes, nose and throat
Move victim to fresh air
If not breathing, give artificial respiration, preferably mouth-to-mouth
Do not use oxygen administration

LIQUID OR SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
Remove all contaminated clothing and shoes
Flush affected area with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED induce VOMITING immediately by giving one quart of milk and two tablespoonfuls of salt in a glass of water
IF SWALLOWED without VOMITING or IF VOMITING CONVULSIONS do nothing except keep patient warm

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1, 2, 3, 4, 10-10 Hexachloro-6, 7-epoxy-1, 4, 4a, 5, 6, 7, 8, 8a-octahydro-endo, endo-1, 4, 5, 8-dimethanonaphthalene, Hexadrin, Mendrin

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C_{12}H_8Cl_6O$

3.4 **IMCO/United Nations Numerical Designation:** 6.1/1615

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid (Sometimes shipped as an emulsifiable concentrate in xylene solution)

4.2 **Color:** Colorless to tan

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator for spray, fog, or dust, rubber gloves and boots

5.2 **Symptoms Following Exposure:** Inhalation causes moderate irritation of nose and throat, prolonged breathing may cause same toxic symptoms as for ingestion. Contact with liquid causes moderate irritation of eyes and skin. Prolonged contact with skin may cause same toxic symptoms as for ingestion. Ingestion causes frothing of the mouth, facial congestion, convulsions, violent muscular contractions, dizziness, weakness, nausea

5.3 **Treatment for Exposure:** Get medical attention after all exposures to this compound. INHALATION: remove from exposure. EYES: flush with water for at least 15 min. SKIN: wash with plenty of soap and water, but do not scrub. INGESTION: remove from the gastrointestinal tract either by inducing vomiting (unless hydrocarbon solvents are involved and the amount of insecticide is well below the toxic amount) or by gastric lavage with saline solution. Saline cathartics may also be beneficial. Fats and oils should be avoided. Sedation with barbiturates is indicated if signs of CNS irritation are present, patient should have absolute quiet, expert nursing care, and a minimum of external stimuli to reduce danger of convulsions. epinephrine is contraindicated in view of the danger of precipitating ventricular fibrillation, if material ingested was dissolved in a hydrocarbon solvent, observe patient for possible development of hydrocarbon pneumonitis

5.4 **Toxicity by Inhalation (Threshold Limit Value).** 0.1 mg/m³

5.5 **Short-Term Inhalation Limits:** 0.5 mg/m³ for 30 min

5.6 **Toxicity by Ingestion:** Grade 4 oral LD_{50} = 3 mg/kg (rat)

5.7 **Late Toxicity:** None known

6 FIRE HAZARDS

6.1 **Flash Point:** Non flammable solid or combustible solution >80 F (O.C.) (xylene)

6.2 **Flammable Limits in Air:** 1.1 - 7.0% (xylene)

6.3 **Fire Extinguishing Agents** (Solution) Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective on solution fire

6.5 **Special Hazards of Combustion Products** Toxic hydrogen chloride and phosgene may be generated when solution burns

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate** 4 mm/min (xylene)

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 0.005 ppm 48 hr. carp, TLm, fresh water; 0.0025 ppm 48 hr. brown shrimp, TLm, salt water

8.2 **Waterfowl Toxicity:** LD_{50} = 5.64 mg/kg

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential** Probable

9 SELECTED MANUFACTURERS

1. Velsicol Chemical Corp
   341 East Ohio St
   Chicago, Ill. 60611
2. Shell Chemical Co
   1 Shell Plaza
   Houston, Texas 77002

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Technical 95-98; Dry formulations up to 75% endrin, liquid formulations up to 25% in flammable xylene

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification	
	Solution	Dry
Health Hazard (Blue)	3	2
Flammability (Red)	1	0
Reactivity (Yellow)	0	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** 380.92

13.3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13.4 **Freezing Point:** 392 F = 200°C = 473 K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 1.65 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

5 HEALTH HAZARDS (Cont'd.)

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold** Not pertinent (solid)

EPC

EPICHLOROHYDRIN

Common Synonyms			
1-Chloro-2,3-epoxypropane 3-Chloro-1,2-propylene oxide	Watery liquid	Colorless	Sweet garlic odor
	Sinks and mixes with water Poisonous, flammable vapor is produced		

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear goggles, self contained breathing apparatus, and rubber overclothing (including gloves).
Stop discharge if possible.
Call fire department.
Stay upwind and low; water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GASES ARE PRODUCED IN FIRE.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self contained breathing apparatus, and rubber overclothing (including gloves).
Combat fires from safe distance or protected location.
Extinguish with water, dry chemical, alcohol foam or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
POISONOUS IF INHALED.
Irritating to eyes.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED.
Will burn skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: water contaminant.
Restrict access.
Disperse and flush.

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
1-Chloro-2,3-epoxypropane
Chloromethloxirane
gamma-Chloropropylene oxide
3-Chloro-1,2-propylene oxide

3.2 **Coast Guard Compatibility Classification.**
Epichlorohydrin

3.3 **Chemical Formula**
OCH_2CHCH_2Cl

3.4 **IMCO/United Nations Numerical Designation:** 6.1, 2023

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color.** Colorless

4.3 **Odor:** Pungent garlic, sweet, pungent like chloroform

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Air pack or organic canister mask, protective gloves and goggles.

5.2 **Symptoms Following Exposure:** Vapor is irritating to eyes, nose, and throat; may cause headache, nausea, vomiting, and central nervous system depression. Rapidly fatal if swallowed: nausea, vomiting, and collapse. Skin contact is irritating.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, keep him warm and quiet, and get medical attention immediately if breathing stops, start artificial respiration. INGESTION: induce vomiting (but only if victim is conscious and without convulsions) and call a physician promptly; no specific antidote known. EYES OR SKIN: immediately flush with water for at least 15 min, and get medical attention; remove contaminated clothing and wash before reuse.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5.5 **Short-Term Inhalation Limits.** 10 ppm for 30 min

5.6 **Toxicity by Ingestion.** Grade 3; LD_{50} 90 to 500 mg/kg

5.7 **Late Toxicity:** Causes cancer in experimental animals

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will usually tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Earns severe skin irritant. May cause pain and second degree burns after a few minutes of contact.

5.10 **Odor Threshold:** 10 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 92°F O.C., 100°F C.C.

6.2 **Flammable Limits in Air:**
3% - 21.0%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide, water spray.

6.4 **Fire Extinguishing Agents Not to be Used:** Avoid use of dry chemical if fire occurs in container with confined vent.

6.5 **Special Hazards of Combustion Products:** Toxic irritating vapors are generated when heated.

6.6 **Behavior in Fire:** Containers may explode in fire because of polymerization.

6.7 **Ignition Temperature:** 804°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 2.6 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Mild reaction, not likely to be hazardous.

7.2 **Reactivity with Common Materials:** No reaction.

7.3 **Stability During Transport.** Stable.

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.

7.5 **Polymerization:** Can polymerize in presence of strong acids and bases, particularly when hot.

7.6 **Inhibitor of Polymerization.** None used.

8. WATER POLLUTION

8.1 **Aquatic Toxicity.**
36 ppm/48 hrs/Rainbow (fish)/TL_m/freshwater

8.2 **Waterfowl Toxicity.** Data not available.

8.3 **Biological Oxygen Demand (BOD):** Data not available.

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640
2. Shell Chemical Co.
Industrial Chemicals Division
Houston, Texas 77001
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.0%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Poison, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	4
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	1
Self Reaction	2

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 92.53

13.3 **Boiling Point at 1 atm**
239.4°F = 115.2°C = 388.4 K

13.4 **Freezing Point**
−72.6°F = −58.1°C = 215.1 K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.18 at 20°C (liquid)

13.8 **Liquid Surface Tension**
37.0 dynes/cm = 0.037 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity.**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.155

13.12 **Latent Heat of Vaporization**
176 Btu/lb = 97.9 cal/g = 4.10×10^5 J/kg

13.13 **Heat of Combustion** −8143 Btu/lb
= −4525 cal/g = -189.4×10^5 J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

EVO — EPOXIDIZED VEGETABLE OILS

Common Synonyms
Epoxidized drying oils
Epoxidized oils

Oily liquid — Pale yellow — Odorless

Floats on water

Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible.
Extinguish with foam, dry chemical or carbon dioxide

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Drying oil epoxides
Epoxidized drying oils
Epoxidized oils

3 2 **Coast Guard Compatibility Classification.**
Glycol ethers

3 3 **Chemical Formula.**
$(OCRHCHRCOO)_2H$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless to yellow
4 3 **Odor:** Very weak

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Data not available
5 2 **Symptoms Following Exposure:** Data not available
5 3 **Treatment for Exposure:** Data not available
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion** Grade 0 LD50 above 15 g/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** None expected
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** 550°F O C
6 2 **Flammable Limits in Air:**
Not pertinent
6 3 **Fire Extinguishing Agents:** Foam
dry chemical carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent
6 5 **Special Hazards of Combustion Products**
Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature**
Data not available
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials.**
No reaction
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 240 ppm/24 hr/brine shrimp/TL_m
8 2 **Waterfowl Toxicity:**
8 3 **Biological Oxygen Demand (BOD):**
4% of theoretical in 5 days, fresh water, acclimated seed
8 4 **Food Chain Concentration Potential:**

9 SELECTED MANUFACTURERS

1 Ashland Oil Inc
Chemical Products Division
Columbus Ohio 43216
2 Swift & Co
Swift Agricultural Chemicals Corp
Wilmington N C 28401
3 Witco Chemical Corp
Argus Chemical Corp Division
633 Court St
Brooklyn N Y 11231

10. SHIPPING INFORMATION

10 1 **Grades or Purity.**
Epoxidized vegetable oil
Epoxidized soybean oil
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight.** Not pertinent
13 3 **Boiling Point at 1 atm.** Very high
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.0 at 20°C (liquid)
13 8 **Liquid Surface Tension:**
36 2 dynes/cm = 0 0362 N/m at 24°C
13 9 **Liquid-Water Interfacial Tension:**
50 dynes/cm = 0 05 N/m at 22.7°C
13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent
13 12 **Latent Heat of Vaporization:**
Not pertinent
13 13 **Heat of Combustion** (est.) −13,000 Btu/lb
= −7,000 cal/g = −30.0 × 10³ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

ETH	ETHANE

Common Synonyms	Liquefied compressed gas Colorless Mild gasoline-like odor Floats and boils on water Flammable visible vapor cloud is produced

[illegible]

Fire	**FLAMMABLE** **Flashback along vapor trail may occur** **Vapor may explode if ignited in an enclosed area** Stop flow of gas if possible Cool exposed containers with water. Use water spray to disperse vapor. Let fire burn
Exposure	CALL FOR MEDICAL AID **VAPOR** **If inhaled will cause difficult breathing** **Not irritating to eyes, nose or throat** Move victim to fresh air If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen **LIQUID** **Will cause frostbite.** Flush affected areas with plenty of water DO NOT RUB AFFECTED AREAS
Water Pollution	**Not harmful**

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
Evacuate area

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Methylmethane

3 2 **Coast Guard Compatibility Classification**
Paraffin

3 3 **Chemical Formula:** C_2H_6

3 4 **IMCO United Nations Numerical Designation** 2 0 1035

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):**
Liquid or compressed gas

4 2 **Color** Colorless

4 3 **Odor:** Weak sweetish

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Self contained breathing apparatus for high vapor concentrations

5 2 **Symptoms Following Exposure** In high vapor concentrations can act as simple asphyxiant
Liquid causes severe frostbite

5 3 **Treatment for Exposure.** Remove from exposure, support respiration

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion** Not pertinent

5 7 **Late Toxicity** None

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are non-irritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly

5 10 **Odor Threshold:** 300 ppm

6 FIRE HAZARDS

6 1 **Flash Point** −211°F

6 2 **Flammable Limits in Air**
2.9% - 13.0%

6 3 **Fire Extinguishing Agents:**
Stop flow of gas

6 4 **Fire Extinguishing Agents Not to be Used**
Data not available

6 5 **Special Hazards of Combustion Products**
Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature:** 940°F

6 8 **Electrical Hazard** Class I group D

6 9 **Burning Rate:** 7.3 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
None

8 2 **Waterfowl Toxicity** None

8 3 **Biological Oxygen Demand (BOD).**
None

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Atlantic Richfield Co
ARCO Chemical Co Division
260 South Broad St
Philadelphia Pa 19101

2 Cities Service Co Inc
Petrochemicals Division
60 Wall St
New York N Y 10005

3 Phillips Petroleum Co
Bartlesville Okla 74004

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Research pure

10 2 **Storage Temperature:** −128°F

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3)

A B C D E F G

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Gas

13 2 **Molecular Weight:** 30.07

13 3 **Boiling Point at 1 atm**
−127.5°F = −88.6°C = 264.6°K

13 4 **Freezing Point**
−297.9°F = −183.3°C = 89.9°K

13 5 **Critical Temperature**
90.1°F = 32.3°C = 305.5°K

13 6 **Critical Pressure:**
708.0 psia = 48.1 atm = 4.879 MN/m²

13 7 **Specific Gravity** 0.546 at −88.6°C (liquid)

13 8 **Liquid Surface Tension.**
16 dynes/cm = 0.016 N/m at −88.6°C

13 9 **Liquid-Water Interfacial Tension:**
(est.) 45 dynes/cm = 0.045 N/m at −88.6°C

13 10 **Vapor (Gas) Specific Gravity:** 1.1

13 11 **Ratio of Specific Heats of Vapor (Gas).**
1.191

13 12 **Latent Heat of Vaporization**
211 Btu/lb = 117 cal/g = 4.90 × 10⁵ J/kg

13 13 **Heat of Combustion:** −20,293 Btu/lb
= −11,274 cal/g = −472.02 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

EHP	ETHOXYDIHYDROPYRAN

Common Synonyms

2-Ethoxy-3,4-dihydro-2H-pyran

Liquid — Colorless

Floats on water

Fire

Combustible

Exposure

Exposure data not available

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Coast Guard Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2-Ethoxy-3,4-dihydro-2H-pyran

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula:** $CH_2=CHCH_2CH_2CH(OC_2H_5)O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure.** Contact with liquid irritates eyes. Also irritates skin on prolonged contact

5 3 **Treatment for Exposure** EYES: flush with water for at least 15 min. SKIN: wipe off, wash well with soap and water. INGESTION: induce vomiting, get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits.** Not pertinent

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 98 F O C

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents.** Foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 4 5 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N Y 10017

2 Guardian Chemical Corporation
Eastern Chemical Division
P O Box 2900-B
Hauppauge, N Y 11788

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

N F U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight** 128 17

13 3 **Boiling Point at 1 atm** 289 F = 143 C = 416 K

13 4 **Freezing Point.** −148 F = −100 C = 173 K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 875 at 20 C (liquid)

13 8 **Liquid Surface Tension** (est.) 25 dynes/cm = 0 025 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension** (est.) 30 dynes/cm = 0 030 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization.** (est.) 120 Btu/lb = 69 cal/g = 2 9 × 10 J/kg

13 13 **Heat of Combustion.** (est.) −14 000 Btu/lb = −7 900 cal/g = −330 × 10 J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

EOD — ETHOXYLATED DODECANOL

Common Synonyms
Ethoxylated dodecyl alcohol
Ethoxylated lauryl alcohol
Tergitol nonionic TMN

Oily liquid — Colorless to yellow — Pleasant odor

Mixes slowly with water. Freezing point is 61° F

Avoid contact with liquid
Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with water, foam, dry chemical, carbon dioxide

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin
Will burn eyes
Harmful if swallowed
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
Ethoxylated dodecyl alcohol
Ethoxylated lauryl alcohol
Polyoxyethyl dodecyl ether
Polyoxyethyl lauryl ether
Tergitol Nonionic TMN

3.2 **Coast Guard Compatibility Classification**
Alcohol

Continued on page 4

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mild and pleasant

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Plastic gloves, goggles
5.2 **Symptoms Following Exposure:** Liquid causes eye injury and defats the skin, causing irritation
5.3 **Treatment for Exposure:** Flush eyes with water for at least 15 min. Wash skin well with water. Get medical attention
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Grade 1 (> 15 g/kg rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** None
5.9 **Liquid or Solid Irritant Characteristics:** Liquid causes eye injury. Contact with skin may cause irritation
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point.** 470°F (C.C.)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or alcohol foam
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products.** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate.** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. BASF Wyandotte Corp.
Industrial Chemicals Group
Wyandotte, Mich. 48192
2. Jefferson Chemical Co.
3336 Richmond Ave.
Houston, Tex. 77098
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Usually 100%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

VPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid
13.2 **Molecular Weight:** 430 – 626
13.3 **Boiling Point at 1 atm.** Very high
13.4 **Freezing Point:** 61°F = 16°C = 289 K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.0 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible] = [illegible] Btu/lb = [illegible] cal/g = [illegible] x 10^[illegible] J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

3 CHEMICAL DESIGNATIONS (Cont'd.)

3.3 **Chemical Formula:**
$C_{12}H_{25}O(CH_2CH_2O)_nCH_2CH_2OH$
n = 6–10 (average)

3.4 **IMCO United Nations Numerical Designation:** Not listed

ENP — ETHOXYLATED NONYLPHENOL

Common Synonyms

Liquid or solid — White — Mild odor

May float or sink in water

Avoid contact with liquid and solid. Keep people away.
Stop discharge if possible.
Call fire department.
Isolate and remove discharge material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with dry chemicals, foam, carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

LIQUID OR SOLID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED by victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting; keep airway clear.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify water treatment and wastewater officials.
Notify operators of nearby water intake.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification.** Glycol ether
3.3 **Chemical Formula:** $C_9H_{19}C_6H_4(OC_2H_4)_nH$ where n = 4 – 100
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid or solid
4.2 **Color:** White
4.3 **Odor:** Mild aromatic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Gloves and safety glasses
5.2 **Symptoms Following Exposure:** Contact with eyes causes irritation. Prolonged contact with skin causes irritation.
5.3 **Treatment for Exposure:** No treatment required for inhalation or ingestion. EYES: flush with copious quantities of tap water for 15 min. and seek appropriate medical attention. SKIN: wash affected areas with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion.** Grade 2, oral LD_{50} = 1,310 mg/kg (rats)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** (Burns with difficulty) Cleveland OC > 300°F OC
6.2 **Flammable Limits in Air** Not pertinent
6.3 **Fire Extinguishing Agents.** Water, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used.**
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction
7.2 **Reactivity with Common Materials**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
1.5 to > 1,000 ppm for bluegills LC_{50} (increased ethylene oxide chain length gives decreased toxicity)
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0.5–2.0% of theoretical in 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Diamond Shamrock Chemical Co.
1100 Superior Avenue
Cleveland, Ohio 44114
2. GAF Corp.
140 West 51 St.
New York, N.Y. 10020
3. Monsanto Company
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

(liquid) VP
(solid) SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid or liquid
13.2 **Molecular Weight:** > 500
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.99–1.07 at 25°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization.** Not pertinent
13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

ECP	ETHOXYLATED PENTADECANOL

Common Synonyms			
Ethoxylated pentadecylalcohol Tergitol nonionic 45-S-10	Liquid	Colorless to yellow	Pleasant odor
	Mixes slowly with water. Freezing point is 59° F		

Water will liquid
No pole charge is possible
[illegible]
[illegible]
[illegible]

Fire	Combustible [illegible]
Exposure	[illegible] **LIQUID** **Irritating to skin** **Will burn eyes** [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Ethoxylated pentadecyl alcohol; Polyoxyethyl pentadecyl ether; Tergitol Nonionic 45-S-10

3.2 **Coast Guard Compatibility Classification** Alcohol

3.3 **Chemical Formula:** $C_{15}H_{31}O(CH_2CH_2O)_9CH_2CH_2OH$ (average)

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild, pleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Plastic gloves, goggles

5.2 **Symptoms Following Exposure:** Liquid causes eye injury and defatting skin causes irritation

5.3 **Treatment for Exposure:** Flush eyes with water for at least 15 min. Wash skin with soap and water. Get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** None

5.9 **Liquid or Solid Irritant Characteristics** Liquid causes eye injury. Contact with skin causes irritation

5.10 **Odor Threshold** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point.** 470° F C.C.

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Carbon dioxide or dry chemical for small fires, alcohol foam and water for large fires

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. BASF Wyandotte Corp
   Industrial Chemicals Group
   Wyandotte, Mich. 48192
2. Jefferson Chemical Co
   [illegible] Rockwood Ave
   Houston, Texas 77062
3. Union Carbide Corp
   Chemicals and Plastics Division
   270 Park Ave
   New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Usually 100%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

XPQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension** [illegible]

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** [illegible]

13.15 **Heat of Solution** [illegible]

13.16 **Heat of Polymerization:** [illegible]

[illegible]

NOTES

EOT	ETHOXYLATED TETRADECANOL

Common Synonyms Ethoxylated tetradecyl alcohol Ethoxylated myristyl alcohol Tergitol nonionic 45-S-10	Liquid — Colorless to yellow — Pleasant odor Mixes slowly with water. Freezing point is 59° F
[illegible]	
Fire	Combustible [illegible]
Exposure	[illegible] *LIQUID* Irritating to skin Will burn eyes [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethoxylated myristyl alcohol
Ethoxylated tetradecyl alcohol
Polyoxyethyl myristyl ether
Polyoxyethyl tetradecyl ether
Tergitol Nonionic 45-S-10

3.2 **Coast Guard Compatibility Classification.** Alcohol

3.3 **Chemical Formula**
$C_{14}H_{29}O(CH_2CH_2O)_6CH_2CH_2OH$
(n = 0 average)

Continued on page 4

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild, pleasant

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Plastic gloves, goggles

5.2 **Symptoms Following Exposure:** Liquid causes eye injury and defats the skin, causing irritation

5.3 **Treatment for Exposure:** Flush eyes with water for at least 15 min. Wash skin well with water. Get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** Liquid causes eye injury. Contact with skin may irritate

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** 470°F O.C.

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Carbon dioxide or dry chemical for small fires, alcohol foam and water for large fires

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. BASF Wyandotte Corp.
Industrial Chemicals Group
Wyandotte, Mich. 48192

2. Jefferson Chemical Co.
3336 Richmond Ave.
Houston, Texas 77052

3. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Usually 100%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 660

13.3 **Boiling Point at 1 atm:** Very high

13.4 **Freezing Point:** 59° F = 15° C = 288° K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 ***Specific Gravity:*** [illegible] (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** (est.) −11,000 Btu/lb = −6,200 cal/g = −260 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) −9 Btu/lb = −5 cal/g = −0.2 × 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

3. CHEMICAL DESIGNATIONS (Cont'd)

3.4 **IMCO United Nations Numerical Designation:** Not listed

ETD	ETHOXYLATED TRIDECANOL

Common Synonyms			
Ethoxylated tridecyl alcohol Tergitol nonionic 3-A-6	Liquid	Colorless to yellow	Pleasant odor

Avoid contact with liquid
[illegible]

Fire	Combustible Extinguish with [illegible] carbon dioxide [illegible]
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin Will burn eyes Harmful if swallowed [illegible] [illegible] water [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ethoxylated tridecyl alcohol
Polyoxyethyl tridecyl ether
Tergitol 3-A-6 Nonionic

3 2 **Coast Guard Compatibility Classification:** Alcohol

3 3 **Chemical Formula:**
$C_{13}H_{27}O(CH_2CH_2O)_6CH_2CH_2OH$
n = 5 (average)

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild pleasant

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Plastic gloves goggles

5 2 **Symptoms Following Exposure:** Liquid causes eye injury and defats the skin causing irritation

5 3 **Treatment for Exposure:** In case of contact with eyes immediately flush with plenty of water for at least 15 min get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 [illegible] g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** None

5 9 **Liquid or Solid Irritant Characteristics:** Liquid causes eye injury Contact with skin may cause irritation

5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** [illegible] °F O C

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Carbon dioxide or dry chemical for small fires alcohol foam and water for large ones

6 4 **Fire Extinguishing Agents Not to be Used:** Data not available

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Not [illegible]

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 BASF Wyandotte Corp
Industrial Chemicals Group
Wyandotte Mich 48192

2 Jefferson Chemical Co
3336 Richmond Ave
Houston Texas 77052

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Usually 100%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A P Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 464

13 3 **Boiling Point at 1 atm:** Very high

13 4 **Freezing Point:** Data not available

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** [illegible] at 15 C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** [illegible]

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** [illegible]

13 16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

ETG — ETHOXY TRIGLYCOL

Common Synonyms			
Ethoxytriethylene glycol Triethylene glycol monoethyl ether	Liquid	Colorless	Odorless
	Sinks and mixes with water		

Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, alcohol foam, or carbon dioxide
Water and foam may be ineffective on fire
Cool exposed containers with water

Exposure

Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearest water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Dilute and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Diethylene glycol monoethyl ether
Triethylene glycol monoethyl ether
Tetraethylene glycol monoethyl ether

3.2 **Coast Guard Compatibility Classification.** Group 5

3.3 **Chemical Formula:** $C_2H_5OCH_2CH_2OCH_2CH_2OH$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Practically odorless characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles and adequate protective clothing

5.2 **Symptoms Following Exposure:** No appreciable hazard in ordinary handling use

5.3 **Treatment for Exposure:** Wash affected parts with water

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 1 Dangerous

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are mildly irritating to the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** 275°F OC

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Dry chemical, carbon dioxide, or alcohol foam

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may be ineffective

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co
Midland, Mich 48640

2. Olin Corp
Chemicals Division
275 Lake Ridge Rd
Stamford, Conn 06904

3. Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Not necessary

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-5

APQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	[illegible]
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

*13.3 **Boiling Point at 1 atm:** [illegible] °C [illegible] °K

13.4 **Freezing Point:** [illegible] °C [illegible] °K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

*13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** Not pertinent

*13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** [illegible]

*13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion.** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

ETA	ETHYL ACETATE

Common Synonyms
Acetic acid ethyl ester
Acetic ester
Vinegar naphtha

Water liquid — Colorless — Pleasant fruity odor

Floats on water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause headache, dizziness, nausea, or loss of consciousness.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook

Isolate area. Keep flammables away.
Evacuate area.
Disperse and flush.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetic acid ethyl ester; Acetic ester; Acetic ether; Ethyl ethanoate
3.2 **Coast Guard Compatibility Classification:** Ester
3.3 **Chemical Formula:** $CH_3COOC_2H_5$
3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pleasant fruity

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister, chemical goggles or face shield
5.2 **Symptoms Following Exposure:** Headache, irritation of eyes, nose and throat, dizziness and nausea, weakness, unconsciousness
5.3 **Treatment for Exposure:** INHALATION: Give oxygen, mouth-to-mouth, or other artificial respiration if needed. Call a physician immediately. If swallowed, induce vomiting immediately by giving 1 tablespoon of salt in a glass of water. Call a physician immediately.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 400 ppm
5.5 **Short-Term Inhalation Limits:** [illegible]
5.6 **Toxicity by Ingestion:** Grade 1 Ethyl [illegible]
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor [illegible] at high concentrations. Irritating to eyes, nose and throat.
5.9 **Liquid or Solid Irritant Characteristics:** May cause [illegible] and possibly blistering of the skin.
5.10 **Odor Threshold:** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 24 [illegible]
6.2 **Flammable Limits in Air:** 2.2 [illegible]
6.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide, dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Not applicable
6.5 **Special Hazards of Combustion Products:** Not applicable
6.6 **Behavior in Fire:** Not applicable
6.7 **Ignition Temperature:** 800 F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive
7.2 **Reactivity with Common Materials:** Not reactive
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not applicable
7.5 **Polymerization:** Not applicable
7.6 **Inhibitor of Polymerization:** Not applicable

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** [illegible] 5 days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Eastman Kodak Co.
Tennessee Eastman Co., Div.
Kingsport, Tenn. 37662
2. Monsanto Co.
Monsanto Industrial Chemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166
Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Toxicity	
Liquid or Solid Toxicity	
Poisons	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetics	2
Reactivity	
Other Chemicals	
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Liquid
*13.2 **Molecular Weight:** 88
*13.3 **Boiling Point at 1 atm:** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** [illegible]
13.6 **Critical Pressure:** [illegible]
13.7 **Specific Gravity:** [illegible] Liquid
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** 6.70 dynes/cm = 0.00670 N/m at 30°C
13.10 **Vapor (Gas) Specific Gravity:** 3.0
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not applicable
13.15 **Heat of Solution:** Not applicable
13.16 **Heat of Polymerization:** Not applicable

*Chemical Water Tables

NOTES

REVISED 1978

EAA	# ETHYL ACETOACETATE

Common Synonyms			
Acetoacetic acid ethyl ester Acetoacetic ester Diacetic ether Ethyl acetoacetate EAA	Liquid	Colorless	Pleasant fruity odor
	Mixes with water		

Stop discharge if possible. Keep people away.
Call fire department.
Isolate and remove contaminated soil.
Notify local health and pollution control agencies.

Fire	**Combustible** Extinguish with foam, carbon dioxide, dry chemical, or water fog.
Exposure	Contact medical aid. **LIQUID** **Irritating to eyes.** **Harmful if swallowed** Remove contaminated clothing. Flush affected areas with plenty of water. IF IN EYES: Lift upper and lower lids and flush eyes with water. IF SWALLOWED: Induce vomiting. Give two glasses of water.
Water Pollution	**Effect of low concentration on aquatic life is unknown** **May be dangerous if it enters water intakes** Notify appropriate water purveyors. Notify appropriate water pollution control agencies.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Isolate contaminated water contaminated.
Dike spill area.

2. LABELS

No special labels required by Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetoacetic acid ethyl ester, Acetoacetic ester, Diacetic ether, Ethyl acetoacetate, EAA

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CH_3COCH_2COOC_2H_5$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Aromatic fruity

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles, rubber gloves, rubber aprons

5.2 **Symptoms Following Exposure:** Liquid may cause mild irritation of eyes

5.3 **Treatment for Exposure:** EYES: Flush with water for 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 3.98 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 175°F (C.C.) 79°F (C.C.)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, water fog

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 800°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:** Not reactive

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Eastman Chemical Products, Inc.
Kingsport, Tennessee 37662

Lonza, Inc.
22-10 Route 208
Fair Lawn, N.J. 07410

Aldrich Chemical
940 West St. Paul Ave.
Milwaukee, Wis. 53233

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Not required

10.4 **Venting:** Open dike or vented

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NPQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 130

13.3 **Boiling Point at 1 atm:** 181°F = 83°C = 356°K

13.4 **Freezing Point:** < -112°F = < -80°C = < 193°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.021 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 33 dynes/cm = 0.033 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 6 dynes/cm = 0.006 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 4.5

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 90 Btu/lb = 50 cal/g = 210 kJ/kg

13.13 **Heat of Combustion:** -14,549 Btu/lb = -8,083 cal/g = -33,900 kJ/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

EAC

ETHYL ACRYLATE

Common Synonyms
Acrylic acid, ethyl ester
Ethyl 2-propenoate

Liquid | Colorless | Fruity odor

Floats on water. Flammable, irritating vapor is produced

Fire

FLAMMABLE.
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache or nausea

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floats on shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Isolate area. Keep flammables out
Restrict access
Evacuate area
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acrylic acid, ethyl ester; Ethyl 2-propenoate
3.2 **Coast Guard Compatibility Classification:** Acrylate
3.3 **Chemical Formula:** $CH_2=CHCOOCH_2CH_3$
3.4 **IMCO United Nations Numerical Designation:** 1917

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Characteristic acrid, fruity, sharp fragrant, acrid, slightly nauseating, sharp, ester type

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor mask, impervious clothing, rubber gloves
5.2 **Symptoms Following Exposure:** May cause irritation of eyes and skin. Exposure to high concentrations may cause headache, nausea, vertigo, depression, etc.
5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air and administer oxygen if breathing difficult. SKIN AND EYES: Wash with copious quantities of water. Get medical aid.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5.5 **Short-Term Inhalation Limits:** 25 ppm for 15 min
5.6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible]
5.7 **Late Toxicity:** Repeated exposure may develop sensitization
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor concentrations of [illegible] ppm are not usually tolerable for extended periods of time
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the eyes and skin. Prolonged or repeated exposure may cause severe burns or serious injury
5.10 **Odor Threshold:** [illegible] ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 44°F (C.C.)
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors generated when heated
6.6 **Behavior in Fire:** Vapor [illegible]
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** May occur; exclude moisture, heat, and exposure to light; temperatures above 100°F promote it
7.6 **Inhibitor of Polymerization:** [illegible] monomethyl ether of hydroquinone

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 12 ppm/24 hrs/brine shrimp/TL_m
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 66% of theoretical in 5 days, freshwater, acclimated seed
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Cosmene Corp
   Celanese Chemical Co. Division
   245 Park Ave
   New York, N.Y. 10017
2. Dow Badische Co
   Williamsburg, Va. 23185
3. Rohm and Haas Co
   Independence Mall West
   Philadelphia, Pa. 19105

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-5

APOTUZ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	[illegible]
Health	
Vapor Toxicity	[illegible]
Liquid or Solid Toxicity	2
Poison	[illegible]
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	[illegible]
Reactivity	
Other Chemicals	2
Water	[illegible]
Self Reactivity	[illegible]

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	[illegible]
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible] °K
13.4 **Freezing Point:** [illegible] °K
13.5 **Critical Temperature:** [illegible] °K
13.6 **Critical Pressure:** [illegible] atm
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** [illegible] N/m
13.9 **Liquid-Water Interfacial Tension:** [illegible] N/m
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb
13.13 **Heat of Combustion:** [illegible] Btu/lb
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** [illegible] Btu/lb

Continued on next page

NOTES

REVISED 1978

EAL — ETHYL ALCOHOL

Common Synonyms
Ethanol
Alcohol
Grain alcohol
Denatured alcohol

Watery liquid — Colorless — Alcohol odor

Floats and mixes with water. Flammable. Irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control officials.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective in this.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
Move to fresh air.

LIQUID
Not harmful.

Water Pollution

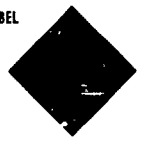
Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health or wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — high flammability.
Disperse and flush.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**

Alcohol	Fermentation alcohol
Cologne spirit	Grain alcohol
Denatured alcohol	Spirit
Ethanol	Spirits of wine

3.2 **Coast Guard Compatibility Classification.** Alcohol

3.3 **Chemical Formula:** C_2H_5OH

3.4 **IMCO/United Nations Numerical Designation** 3.2/1170

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild, rather pleasant, like wine or whiskey. (Denatured alcohol may be unpleasant.)

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** All purpose canister, safety goggles. Avoid contact with liquid and inhalation of vapors.

5.2 **Symptoms Following Exposure:** Irritation of eyes, nose and throat. Headache and drowsiness may occur. Liquid causes intoxication.

5.3 **Treatment for Exposure:** INHALATION: if breathing is affected, remove victim to fresh air, call physician, administer oxygen. Speed is of primary importance. EYES OR SKIN: flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 1000 ppm

5.5 **Short-Term Inhalation Limits:** 5000 ppm for 15 min

5.6 **Toxicity by Ingestion** Grade 1. LD_{50} 5 to 15 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.

5.10 **Odor Threshold:** 10 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 55°F (C.C.), 64°F (O.C.)

6.2 **Flammable Limits in Air:** 3.3% – 19%

6.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, water spray, alcohol foam

6.4 **Fire Extinguishing Agents Not to be Used.** None

6.5 **Special Hazards of Combustion Products:** None

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature** 689°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 3.9 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** 250 ppm/6 hr goldfish lethal, fresh water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD):** 12% 5 days, 44.2% (theor.) 5 days, 71.2% (theor.) 20 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Commercial Solvents Corp.
   245 Park Ave.
   New York, N.Y. 10017
2. National Distillers and Chemical Corp.
   U.S. Industrial Chemicals Co. Division
   Tuscola, Ill. 61953
3. Publicker Industries, Inc.
   1429 Walnut St.
   Philadelphia, Pa. 19102

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous (200 proof), 190 proof, specially denatured, completely denatured

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P Q R S

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** 46.07

13.3 **Boiling Point at 1 atm:** 172.9°F = 78.3°C = 351.5°K

13.4 **Freezing Point.** −173°F = −114°C = 159°K

13.5 **Critical Temperature.** 469.6°F = 243.1°C = 516.3°K

13.6 **Critical Pressure** 926 psia = 63.0 atm = 6.38 MN/m²

13.7 **Specific Gravity** 0.790 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 1.6

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.12

13.12 **Latent Heat of Vaporization** 369 Btu/lb = 200 cal/g = 8.37 × 10⁵ J/kg

13.13 **Heat of Combustion.** −11,570 Btu/lb = −6425 cal/g = −268.8 × 10⁶ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** −99 Btu/lb = −55 cal/g = −2.3 × 10⁵ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

EAD — ETHYLALUMINUM DICHLORIDE

Common Synonyms

EADC
Aluminum ethyl dichloride

Liquid heated — Colorless to light yellow

IGNITES WHEN EXPOSED TO AIR. Reacts violently with water. Poisonous gas is produced on contact with water. Freezing point is 90° F.

Call fire department
Wear goggles and self contained breathing apparatus
Stop discharge if possible. Keep people away
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

IGNITES WHEN EXPOSED TO AIR
Irritating gases are produced when heated
Extinguish with dry graphite, soda ash or other inert powder
DO NOT USE WATER, FOAM, CARBON DIOXIDE, DRY CHEMICAL OR VAPORIZING LIQUID ON FIRE
DO NOT USE WATER ON ADJACENT FIRES

Exposure

CALL FOR MEDICAL AID

GAS PRODUCED IN REACTION WITH WATER
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move to fresh air
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

LIQUID (HEATED)
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability, corrosive
Restrict access
Evacuate area

2. LABELS

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Aluminum ethyl dichloride, EADC
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula.** $C_2H_5AlCl_2$
3.4 **IMCO/United Nations Numerical Designation:** 4.2, 1924

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color:** Colorless to light amber, yellow
4.3 **Odor:** Not pertinent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full protective clothing, preferably of aluminized glass cloth, goggles, face shield, gloves, in case of fire, all purpose canister or self contained breathing apparatus
5.2 **Symptoms Following Exposure:** Inhalation of smoke from fire causes metal fume fever (flu like symptoms); acid fumes irritate nose and throat. Contact with liquid (which is spontaneously flammable) causes severe burns of eyes and skin
5.3 **Treatment for Exposure:** INHALATION: only fumes from fire need be considered; metal fume fever is not critical and lasts less than 36 hrs; irritation of nose and throat by acid vapors may require treatment by a physician. EYES: flush gently with water for 15 min; treat burns if fire occurred; get medical attention. SKIN: wash with water; treat burns caused by fire; get medical attention
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Metal fume fever may develop after breathing smoke from fire
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point.** Not pertinent (ignites spontaneously)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents.** Dry chemical, inert dry powders such as sand, limestone
6.4 **Fire Extinguishing Agents Not to be Used** Water, foam, halogenated agents, or carbon dioxide
6.5 **Special Hazards of Combustion Products** Intense smoke may cause metal fume fever. Irritating hydrogen chloride also formed
6.6 **Behavior in Fire:** Contact with water applied to adjacent fires will cause formation of irritating smoke containing aluminum oxide and hydrogen chloride
6.7 **Ignition Temperature:** Ignites spontaneously in air at ambient temperature
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride fumes and flammable ethane gas
7.2 **Reactivity with Common Materials** Reacts with surface moisture to generate hydrogen chloride which is corrosive to common metals
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Rinse with sodium bicarbonate or lime solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD).** None
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Ethyl Corporation
   Industrial Chemicals Division
   Ethyl Tower
   451 Florida
   Baton Rouge, La. 70801
2. Texas Alkyls, Incorporated
   P. O. Box 600
   Deer Park, Texas 77536
3. Ventron Corp.
   Alfa Products
   P. O. Box 159
   Beverly, Mass. 01915

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure (neat) 25% or less by weight in benzene, hexane or heptane. Solutions are not pyrophoric
10.2 **Storage Temperature:** 35–40°C
10.3 **Inert Atmosphere:** Inerted dry nitrogen at 5 psig
10.4 **Venting** Safety relief with rupture disc

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

VOZ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	3
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid
13.2 **Molecular Weight:** 130.0
13.3 **Boiling Point at 1 atm** 381°F = 194°C = 467°K
13.4 **Freezing Point.** 90°F = 32°C = 305°K
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity:** 1.227 at 35°C (liquid)
13.8 **Liquid Surface Tension.** (est.) 30 dynes/cm = 0.030 N/m at 35°C
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization.** Not pertinent
13.13 **Heat of Combustion** (est.) = 5,600 Btu/lb = −3,100 cal/g = −13.0 × 10³ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

EAS — ETHYLALUMINUM SESQUICHLORIDE

Common Synonyms
EASC

Liquid — Colorless to yellow

IGNITES WHEN EXPOSED TO AIR. Reacts violently with water. Poisonous and flammable gases are produced on contact with water

Call fire department
Wear goggles, self contained breathing apparatus and rubber overclothing (including gloves)
Stop discharge if possible. Keep people away
Isolate or remove discharged material
Notify local health and pollution control agencies

Fire

IGNITES WHEN EXPOSED TO AIR
If in water, let fire burn
If not in water extinguish with dry graphite, soda ash, or other inert powder
DO NOT USE WATER, FOAM, CARBON DIOXIDE, DRY CHEMICALS OR VAPORIZING LIQUIDS ON FIRE
DO NOT USE WATER ON ADJACENT FIRES

Exposure

Call for medical aid

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled
Move victim to fresh air
If breathing is difficult, give oxygen

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

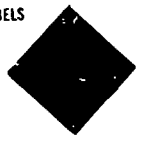
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, corrosive
Restrict access
Evacuate area

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** EASC
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $(C_2H_5)_3Al_2Cl_3$
3.4 **IMCO/United Nations Numerical Designation:** 4.2, 1928

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Yellow, colorless
4.3 **Odor:** Not pertinent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Full protective clothing, preferably of aluminized glass cloth, goggles, face shield, gloves, in case of fire, all purpose canister or self contained breathing apparatus

5.2 **Symptoms Following Exposure:** Inhalation of smoke from fire causes metal fume fever (flu like symptoms), acid fumes irritate nose and throat. Contact with liquid, which is spontaneously flammable, causes severe burns of eyes and skin

5.3 **Treatment for Exposure.** INHALATION: only fumes from fire need be considered, metal fume fever is not critical and lasts less than 36 hrs, irritation of nose and throat by acid vapors may require treatment by a physician. EYES: flush gently with water for 15 min. Treat burns of fire as usual, see medical attention. SKIN: wash with water, treat burns caused by fire, get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits.** Not pertinent

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Metal fume fever may develop after breathing smoke from fire

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes

5.10 **Odor Threshold.** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (ignites spontaneously)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Dry chemical, inert dry powders such as sand or limestone

6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam, halogenated agents, or carbon dioxide

6.5 **Special Hazards of Combustion Products:** Intense smoke may cause metal fume fever. Irritating hydrogen chloride also formed

6.6 **Behavior in Fire:** Contact with water from adjacent fires will cause formation of irritating smoke containing aluminum oxide and hydrogen chloride

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride fumes and flammable ethane gas

7.2 **Reactivity with Common Materials:** Reacts with surface moisture to generate hydrogen chloride, which is corrosive to common metals

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Ethyl Corporation
   Industrial Chemicals Division
   Ethyl Tower
   451 Florida
   Baton Rouge, La. 70801
2. Texas Alkyls, Incorporated
   P.O. Box 600
   Deer Park, Texas 77536
3. Ventron Corp.
   Alfa Products
   P.O. Box 159
   Beverly, Mass. 01915

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure (neat) 25% by weight in benzene, hexane or heptane. Solutions are not pyrophoric

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Inerted dry nitrogen at 5 psig

10.4 **Venting:** Safety relief with rupture disc

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

VOZ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	3
Reactivity (Yellow)	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 247.5

13.3 **Boiling Point at 1 atm:** 399°F = 204°C = 477°K

13.4 **Freezing Point:** −4°F = −20°C = 253°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.092 at 25°C (liquid)

13.8 **Liquid Surface Tension** (est.): 32 dynes/cm = 0.032 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion** (est.): −8,600 Btu/lb = −4,800 cal/g = −200 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

EAM

ETHYLAMINE

Common Synonyms

Aminoethane
Monoethylamine

Liquid — Colorless — Strong ammonia like odor

Mixes with water. Boiling point is 62° F. Flammable, irritating vapor is produced

Shut off ignition sources. Call fire department
Stop discharge if possible
Evacuate area in case of large leakage
Stay upwind. Use water spray to knock down vapor
Isolate and secure discharged material
Notify other affected personnel and control agencies

Fire

FLAMMABLE
Irritating gases are produced when heated
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemicals, alcohol, foam, carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

Call for medical aid

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled
Move victim to fresh air
If breathing is difficult, give oxygen

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk

Water Pollution

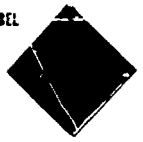
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability, air contaminant, water contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Aminoethane, Monoethylamine
3.2 **Coast Guard Compatibility Classification.** Amines (4)
3.3 **Chemical Formula:** $C_2H_5NH_2$
3.4 **IMCO/United Nations Numerical Designation:** 2.1036

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pungent, strong ammoniacal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Amine type or ammonia type mask, plastic gloves, face shield and goggles
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory tract and lungs, pulmonary edema may result. Liquid causes severe irritation and burns of eyes and skin, and can permanently injure eyes after 1-5 seconds contact. Ingestion causes severe burns of mouth and stomach, can be fatal
5.3 **Treatment for Exposure.** Get prompt medical attention for anyone overcome or injured by exposure to this compound. INHALATION: remove victim to fresh air, keep him warm and administer oxygen until medical help arrives. EYES: wash for 15 min with water, avoid pressure on eyelids. SKIN: wash with soap and water, do not use ointments for at least 24 hrs, do not cover burned area with dry clothing, keep moist with physiological saline solution. INGESTION: if victim is conscious, give large amount of water, then induce vomiting
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm
5.5 **Short-Term Inhalation Limits:** 25 ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 400 mg/kg (rat)
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** 0°F (0°C)
6.2 **Flammable Limits in Air:** 3.5% - 14%
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective
6.5 **Special Hazards of Combustion Products.** Irritating and toxic oxides of nitrogen may be formed
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Containers may explode when heated
6.7 **Ignition Temperature:** 724°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 5.0 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Will strip and dissolve paint, dissolves most plastic materials, can cause swelling of rubber by absorption. The reactions are not hazardous
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** 40 ppm/24 hr chub, 11 ppm fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Virginia Chemicals Inc.
3340 West Norfolk Road
Portsmouth, Va. 23703
2. Pennwalt Corporation
Three Parkway
Philadelphia, Pa. 19102
3. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous (98.5-99.7%), 70 - 72% in water
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B C K I-M N

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	3
Self Reaction	0

12.3 **NFPA hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid
13.2 **Molecular Weight:** 45.1
13.3 **Boiling Point at 1 atm:** 61.7°F = 16.5°C = 289.7°K
13.4 **Freezing Point:** −114°F = −81°C = 192°K
13.5 **Critical Temperature.** 361°F = 183°C = 456°K
13.6 **Critical Pressure:** 827 psia = 56.2 atm = 5.70 MN/m²
13.7 **Specific Gravity:** 0.687 at 15°C (liquid)
13.8 **Liquid Surface Tension** 20.5 dynes/cm = 0.0205 N/m at 15°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 1.5
13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.1181
13.12 **Latent Heat of Vaporization** 253 Btu/lb = 146 cal/g = 6.11 × 10⁵ J/kg
13.13 **Heat of Combustion:** −16,180 Btu/lb = −8,990 cal/g = −3.76 × 10⁷ J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

ETB	ETHYLBENZENE

Common Synonyms
Phenylethane
EB

Liquid — Colorless — Sweet, gasoline-like odor

Floats on water. Flammable, irritating vapor is produced.

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber over clothing (including gloves).
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles, self-contained breathing apparatus and rubber over clothing (including gloves).
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause dizziness or difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

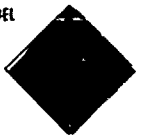
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** EB
Phenylethane

3.2 **Coast Guard Compatibility Classification:**
Aromatic hydrocarbon

3.3 **Chemical Formula:** $C_6H_5C_2H_5$

3.4 **IMCO/United Nations Numerical Designation** 3/1175

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, safety goggles

5.2 **Symptoms Following Exposure:** Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters.

5.3 **Treatment for Exposure:** INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration. INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis. SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm

5.5 **Short-Term Inhalation Limits:** 200 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure.

5.10 **Odor Threshold:** 140 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 80°F (O.C.), 59°F (C.C.)

6.2 **Flammable Limits in Air:**
1.0% - 6.7%

6.3 **Fire Extinguishing Agents:** Foam (most effective), water fog, carbon dioxide or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6.5 **Special Hazards of Combustion Products:**
Irritating vapors are generated when heated.

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back.

6.7 **Ignition Temperature:** 810°F

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate:** 5.8 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.**
No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
29 ppm/96 hr/bluegill/11 m/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
2.8% (theor.) 5 days

8.4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

1 Amoco Chemicals Corp
130 East Randolph Drive
Chicago, Ill. 60601

2 Dow Chemical Co
Midland, Mich. 48640

3 Monsanto Co
800 North Lindbergh Blvd
St. Louis, Mo. 63166

10. SHIPPING INFORMATION

10.1 **Grades or Purity**
Research grade 99.98%, pure grade 99.5%, technical grade 99.0%

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight.** 106.17

13.3 **Boiling Point at 1 atm.**
277.2°F = 136.2°C = 409.4°K

13.4 **Freezing Point**
−139°F = −95°C = 178°K

13.5 **Critical Temperature:**
651.0°F = 343.9°C = 617.1°K

13.6 **Critical Pressure**
523 psia = 35.6 atm = 3.61 MN/m²

13.7 **Specific Gravity:** 0.867 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
29.2 dynes/cm = 0.0292 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
35.48 dynes/cm = 0.03548 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.071

13.12 **Latent Heat of Vaporization**
144 Btu/lb = 80 Cal/g = 3.35 × 10⁵ J/kg

13.13 **Heat of Combustion:** −17,780 Btu/lb = −9,877 cal/g = −413.5 × 10³ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

REVISED 1978

EBT	ETHYL BUTANOL

Common Synonyms			
Pseudohexyl alcohol sec-Pentylcarbinol	Liquid Floats on water	Colorless	Mild alcohol odor

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, foam, or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn eyes
Harmful if swallowed
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Ethyl-1-butanol
2-Ethylbutyl alcohol
sec-Hexyl alcohol
sec-Pentylcarbinol
Pseudohexyl alcohol

3.2 **Coast Guard Compatibility Classification.** Alcohol

3.3 **Chemical Formula:** $(C_2H_5)_2CHCH_2OH$

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color** Colorless

4.3 **Odor** Mild and nonresidual

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Fresh air mask, plastic gloves, coverall, goggles, safety shower and eye bath

5.2 **Symptoms Following Exposure:** Liquid causes eye burns. Vapors may be mildly irritating to nose and throat

5.3 **Treatment for Exposure** Remove to fresh air. Remove contaminated clothing. Wash affected skin areas with water. Flush eyes with water for at least 15 min and get medical care

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 [illegible] g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics.** Irritates eyes, moderate irritation of skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 128°F (O.C.)

6.2 **Flammable Limits in Air:** 1.2% - 8.0%

6.3 **Fire Extinguishing Agents.** Carbon dioxide or dry chemical for small fires; alcohol foam for large fires

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 580°F (calc.)

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-1-U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 102.17

13.3 **Boiling Point at 1 atm** 293°F = 146°C = 419°K

13.4 **Freezing Point.** −173°F = −114°C = 159°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.834 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 24.3 dynes/cm = 0.0243 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** 136.0 Btu/lb = 108.9 cal/g = 4.550 × 10³ J/kg

13.13 **Heat of Combustion** (est.) −16,400 Btu/lb = −9,250 cal/g = −38.7 × 10³ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

EBR — ETHYL BUTYRATE

Common Synonyms			
Ethyl butanoate Butyric acid ethyl ester Butyric ether	Liquid	Colorless	Fruity odor
	Floats on water		

Shut off ignition sources. Call fire department.
Avoid contact with liquid and vapor. Keep people away.
Stop discharge if possible.
Stay upwind. Use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Extinguish with dry chemicals, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache or dizziness

If exposure level is unknown, flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting, dizziness or headache

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES: hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

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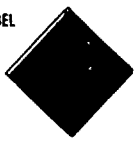
1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Restrict access.
Mechanical containment.
Should be removed.
Chemical and physical treatment.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Butyric acid ethyl ester; Butyr ether; Ethyl butanoate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $CH_3CH_2CH_2COOC_2H_5$
3.4 **IMCO/United Nations Numerical Designation:** 3.3, 1180

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like apple or pineapple

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** All purpose canister mask or chemical cartridge respirator, glasses or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, dizziness, nausea, vomiting, and narcosis. Contact with liquid irritates eyes.
5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air and call a physician, give artificial respiration if necessary. INGESTION: induce vomiting and call a physician. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1 oral LD_{50} = 13 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** 0.015 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 85°F (C.C.), 75°F (C.C.)
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back. Containers may explode in fire.
6.7 **Ignition Temperature:** 865°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 4.72 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** May attack some forms of plastics
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Fritzsche Dodge and Olcott Inc.
76 Ninth Avenue
New York, N.Y. 10011
2. Northwestern Chemical Co.
120 N. Aurora St.
West Chicago, Ill. 60185
3. Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 98+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 116.16
13.3 **Boiling Point at 1 atm:** 250°F = 121°C = 394°K
13.4 **Freezing Point:** −135°F = −93°C = 180°K
13.5 **Critical Temperature:** 559°F = 293°C = 566°K
13.6 **Critical Pressure:** 460 psia = 31 atm = 3.2 MN/m²
13.7 **Specific Gravity:** 0.879 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 24.5 dynes/cm = 0.0245 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** 4.0
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 128 Btu/lb = 71 cal/g = 3.6 × 10⁵ J/kg
13.13 **Heat of Combustion:** −13 200 Btu/lb = −7330 cal/g = −30.6 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

ECL	ETHYL CHLORIDE

Common Synonyms			
Chloroethane Ether hydrochloric	Liquid	Colorless	Pleasant odor
	Floats and may boil on water. Flammable. Irritating vapor is produced. Boiling point is 54° F		

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Stop flow of gas or liquid if possible.
Cool exposed containers and men effecting shutoff with water.
Let fire burn.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Will cause frostbite.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
DO NOT RUB AFFECTED AREAS.

Water Pollution

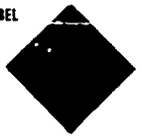
Not harmful to aquatic life.
May be dangerous if it enters water intakes.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Restrict access.
Evacuate area.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chloroethane, Monochlorethane
3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon
3.3 **Chemical Formula:** C_2H_5Cl
3.4 **IMCO/United Nations Numerical Designation:** 2.0, 1037

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Ethereal, pungent, ethereal, ether like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Neoprene rubber clothing where liquid contact is likely; chemical worker's goggles. RESPIRATORY PROTECTION: for 1000 ppm to 2% (v/v) 1-2 hr or less: full face mask and organic vapor canister; for greater levels: self-contained breathing apparatus or equivalent.
5.2 **Symptoms Following Exposure:** Vapor causes drunkenness, anesthesia, possible lung injury. Liquid may cause frostbite on eyes and skin.
5.3 **Treatment for Exposure:** INHALATION: get person to fresh air, keep warm and quiet. Get medical attention. SKIN: treat frostbite.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1000 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Not pertinent
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** −58°F C.C.
45°F O.C.
6.2 **Flammable Limits in Air:**
3.6% - 12%
6.3 **Fire Extinguishing Agents:** Water fog, carbon dioxide, dry chemical. For large fires it is best to allow material to burn while cooling surrounding equipment. Stop flow of ethyl chloride.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated in fires.
6.6 **Behavior in Fire:** Containers may explode.
6.7 **Ignition Temperature:** 966°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 3.8 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Ethyl Corp.
Industrial Chemicals Division
451 Florida
Baton Rouge, La. 70801
2. PPG Industries Inc.
Industrial Chemical Division
Lake Charles, La. 70601

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
Technical 98-100%
USP 100%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A B C D E F G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemical	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Gas
13.2 **Molecular Weight:** 64.52
13.3 **Boiling Point at 1 atm:**
54.0°F = 12.2°C = 285.4°K
13.4 **Freezing Point:**
−217°F = −136°C = 137°K
13.5 **Critical Temperature:**
369°F = 187.2°C = 460.4°K
13.6 **Critical Pressure:**
750 psia = 51.0 atm = 5.23 MN/m²
13.7 **Specific Gravity:** 0.900 at 12.2°C (liquid)
13.8 **Liquid Surface Tension:**
19.5 dynes/cm = 0.0195 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:**
(est.) 40 dynes/cm = 0.04 N/m at 0°C
13.10 **Vapor (Gas) Specific Gravity:** 2.2
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.15
13.12 **Latent Heat of Vaporization:**
163 Btu/lb = 90.6 cal/g = 3.79 × 10⁵ J/kg
13.13 **Heat of Combustion:** −5100 Btu/lb
= −2500 cal/g = −10.4 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

ECA

ETHYL CHLOROACETATE

Common Synonyms

Chloroacetic acid ethyl ester
Ethyl chloroacetate
Ethyl chlorethanoate
Monochloroacetic acid ethyl ester
Monochlorethanoic acid ethyl ester

Liquid — Colorless to light brown — Irritating or fruity odor

Sinks in water. Irritating vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, or nausea
LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
Flush affected areas with plenty of water
IF SWALLOWED NO VOMITING OR GIVING ANYTHING TO DRINK

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chloroacetic acid, ethyl ester, Ethyl chloroacetate, Ethyl chlorethanoate, Monochloroacetic acid ethyl ester, Monochlorethanoic acid ethyl ester

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CICH_2COOC_2H_5$

3.4 **IMCO/United Nations Numerical Designation:** 3.3 1181

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless, light straw to tan

4.3 **Odor:** Extremely irritating, fruity, pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister mask, rubber gloves, chemical goggles

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membrane, headache and nausea. Contact with liquid causes extreme eye irritation and conjunctivitis, irritates skin if not removed at once. Ingestion causes irritation of mouth and stomach

5.3 **Treatment for Exposure:** INHALATION: remove patient to fresh air, get medical attention. EYES: flush with copious quantities of water for at least 15 min, get medical attention if irritation persists. SKIN: wash with soap and water. INGESTION: give large amounts of water and induce vomiting, get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4 LD_{50} <50 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 129°F (OC) 100°F (CC)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Water fog, foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating toxic hydrogen chloride and phosgene may be generated in fires

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 2.3 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Very slow, not hazardous

7.2 **Reactivity with Common Materials:** Slow hydrolysis to acidic products will cause slow corrosion of common metals. No hazard involved

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Ozygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Kay Fries Chemicals Inc
   300 Lexington Avenue
   New York, N.Y. 10017
2. Monsanto Company
   Monsanto Industrial Chemicals
   800 North Lindbergh Boulevard
   St. Louis, Mo. 63166
3. Dow Chemical Co
   Midland, Mich. 48640

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X X X

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 122.6

13.3 **Boiling Point at 1 atm.** 289°F = 143°C = 416°K

13.4 **Freezing Point:** −15°F = −26°C = 247°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.15 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 24 dynes/cm = 0.024 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 4.3

13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available

13.12 **Latent Heat of Vaporization:** 155 Btu/lb = 86 cal/g = 3.6 × 10⁵ J/kg

13.13 **Heat of Combustion:** −7250 Btu/lb = −4028 cal/g = −168 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4

NOTES

ECF — ETHYL CHLOROFORMATE

Common Synonyms

Chloroformic acid ethyl ester
Ethyl chlorocarbonate

Liquid — Colorless to light yellow — Irritating odor

Reacts slowly with water. Irritating vapor is produced.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles, self-contained breathing apparatus and rubber [illegible]
Shut off ignition sources. Call fire department.
Stop discharge if possible.
Flush water area to reduce vapor discharge.
Stay upwind. Use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus and rubber overclothing (media by Grace).
Extinguish with dry chemicals or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes, nose and throat.
Move victim to fresh air.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

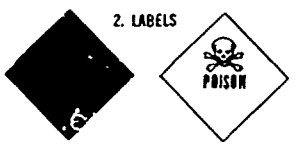
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: corrosive, high flammability, poison.
Restrict access.
Disperse and flush.

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chloroformic acid, ethyl ester; Ethylchlorocarbonate
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $ClCOOC_2H_5$
3.4 **IMCO/United Nations Numerical Designation.** 3.2, 1182

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Irritating, sharp, like hydrochloric acid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air line mask, self-contained breathing apparatus or organic and acid canister mask, full protective clothing.
5.2 **Symptoms Following Exposure:** Inhalation causes mucous membrane irritation, coughing and sneezing. Vapor causes severe lachrymation. Liquid causes acid type burns of eyes and skin like those of hydrochloric acid. Ingestion causes severe burns of mouth and stomach.
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, use artificial respiration if breathing has stopped, call a doctor. Keep victim quiet and administer oxygen if needed. EYES: flush with water for at least 15 min, see a doctor. SKIN: wash liberally with water for at least 15 min, then apply dilute solution of sodium bicarbonate or commercially prepared neutralizer. INGESTION: do NOT induce vomiting, give large amounts of water, get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} < 50 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
5.9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure.
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 82 F (O.C.), 61 F (C.C.)
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents.** Water, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products.** Toxic chlorine and phosgene gases may be formed in fires
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 932 F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 2.6 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Slow reaction with water, evolving hydrogen chloride (hydrochloric acid)
7.2 **Reactivity with Common Materials.** Slow evolution of hydrogen chloride from surface moisture; reaction can cause some corrosion
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1. Stauffer Chemical Corporation
   Oil Division
   500 Ayard Road
   Muskegon, Mich. 49445
2. Chemetron Corporation
   Chemicals Group
   633 Seventh Avenue
   New York, N.Y. 10019
3. FMC Corporation
   Industrial Chemical Division
   633 Third Avenue
   New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 98+
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

V O N Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	[illegible]
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	[illegible]
Poisons	3
Water Pollution	
Human Toxicity	[illegible]
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	2
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	[illegible]
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight.** 108.5
13.3 **Boiling Point at 1 atm.** 201 F = 94 C = 367 K
13.4 **Freezing Point:** −[illegible] F = −[illegible] C = 192 K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.135 at 20°C (liquid)
13.8 **Liquid Surface Tension.** 27.5 dynes/cm = 0.0275 N/m at 15°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity.** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.1044
13.12 **Latent Heat of Vaporization** (est.) 140 Btu/lb = 79 cal/g = [illegible] × 10³ J/kg
13.13 **Heat of Combustion.** (est.) −6,900 Btu/lb = −3,800 cal/g = −160 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
3.16 **Heat of Polymerization:** Not pertinent

(Continued on page [illegible])

NOTES

ECS — ETHYLDICHLOROSILANE

Common Synonyms

Liquid — Colorless — Sharp, irritating odor

Reacts violently with water. Irritating gas is produced on contact with water.

Shut off ignition sources. Call fire department.
Avoid contact with liquid. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Water spray may be ineffective. Water may react violently with the material.
DO NOT USE WATER OR FOAM ON FIRE.

Exposure

Call for medical aid.

VAPOR
Irritating to eyes, nose and throat.
Move victim to fresh air.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

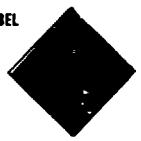
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4)

Issue warning — high flammability, corrosive.
Restrict access.
Evacuate area.
Disperse and flush with water.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms.
3.2 **Coast Guard Compatibility Classification:** Not applicable.
3.3 **Chemical Formula:** $C_2H_5SiHCl_2$
3.4 **IMCO/United Nations Numerical Designation:** 3.2, 1183

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sharp, hydrochloric acid-like odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor type respirator, protective rubber gloves, chemical worker's goggles, other equipment as necessary to protect skin and eyes.
5.2 **Symptoms Following Exposure:** Inhalation irritates mucous membranes. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach.
5.3 **Treatment for Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove to fresh air, give artificial respiration if required. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting, give large amounts of water, followed by milk or milk of magnesia.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 LD50 (Rat) 500 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and the nose and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 5/-15°C
6.2 **Flammable Limits in Air:** 2.9% (LEL)
6.3 **Fire Extinguishing Agents:** Dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam
6.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene gases may be formed.
6.6 **Behavior in Fire:** Difficult to extinguish; reignition may occur. Contact with water applied to adjacent fires produces irritating hydrogen chloride fumes and flammable hydrogen gas.
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** <2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously evolving hydrogen chloride (hydrochloric acid).
7.2 **Reactivity with Common Materials.** Reaction with surface moisture will generate hydrogen chloride, which corrodes common metals.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

Dow Corning Corporation
P. O. Box 592
Midland, Mich. 48640

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	4
Self Reaction	1

12.3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 129.1
13.3 **Boiling Point at 1 atm:** 165°F = 74°C = 347°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.092 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 21.7 dynes/cm = 0.0217 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 4.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13.12 **Latent Heat of Vaporization:** (est.) 104 Btu/lb = 57.2 cal/g = 2.42 × 10⁵ J/kg
13.13 **Heat of Combustion:** (est.) −6,500 Btu/lb = −3,600 cal/g = −150 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization.** Not pertinent

Continued on page 3 and 4

NOTES

ETL	ETHYLENE

Common Synonyms		
Ethene Olefiant gas	Liquefied compressed gas Colorless Sweet odor Floats and boils on water Flammable visible vapor cloud is produced	

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
May explode if ignited in an enclosed area
[illegible]

Exposure

[illegible]

VAPOR
Not irritating to eyes, nose or throat
If inhaled, will cause headache, dizziness or loss of consciousness
[illegible]

LIQUID
Will cause frostbite
[illegible]
DO NOT RUB AFFECTED AREAS

Water Pollution

Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Isolate area. High flammability
Restrict access
Evacuate area

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethene
Olefiant gas

3.2 **Coast Guard Compatibility Classification:**
Oxidizer

3.3 **Chemical Formula:** C_2H_4

3.4 **IMCO United Nations Numerical Designation:**
2.1 (compressed)
2.1 (liquefied)

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** [illegible]

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:**
[illegible]

6.3 **Fire Extinguishing Agents:** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6.5 **Special Hazards of Combustion Products:**
Vapors are anesthetic

6.6 **Behavior in Fire:** [illegible]

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** [illegible]

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
22 ppm 1 hr sunfish and fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):**
Data not available

8.4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co
Houston Tex 77001
2. Phillips Petroleum Co
Bartlesville Okla 74004
3. Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99 [illegible]%

10.2 **Storage Temperature:** Ambient (gas)
-155°F (liquid)

10.3 **Inert Atmosphere:** No requirements

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG-446-2)

A B C D e F G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Toxicity	0
Liquid or Solid Toxicity	0
Poison	
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	
Aesthetic Effect	0
Reactivity	
Other Chemicals	
Water	0
Self Reaction	2

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 28.05

13.3 **Boiling Point at 1 atm:**
-154.7°F = -103.9°C = 169.3°K

13.4 **Freezing Point:**
-272.4°F = -169.1°C = 104.1°K

13.5 **Critical Temperature:**
49.8°F = 9.9°C = 283.1°K

13.6 **Critical Pressure:**
742 psia = 50.5 atm = 5.1 MN/m²

13.7 **Specific Gravity:** 0.569 at -103.9°C (liquid)

13.8 **Liquid Surface Tension:**
Indices [illegible]

13.9 **Liquid-Water Interfacial Tension:**
[illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.240

13.12 **Latent Heat of Vaporization:**
207.7 Btu/lb = 115.4 cal/g
= 4.832 × 10⁵ J/kg

13.13 **Heat of Combustion:** 20,295 Btu/lb
= 11,272 cal/g = 47.184 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 4

NOTES

REVISED 1978

ECH	ETHYLENE CHLOROHYDRIN

Common Synonyms
2-Chloroethanol
2-Chloroethanol
2-Chloroethyl alcohol
Ethylene chlorohydrin
Glycol chlorohydrin

Liquid — Colorless — Faint sweet pleasant odor

Mixes with water. Irritating vapor is produced.

Not flammable. Combustible liquid.
Not applicable.
Use water spray, fog, or foam.
Water spray may be ineffective.
Not applicable.
Not applicable.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Extinguish with water spray, fog, or foam. Cool exposed containers with water.

Exposure

Not applicable.

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
May cause pulmonary edema.
Symptoms may be delayed.

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Rapidly absorbed through skin.
Contact with liquid causes severe burns.
IF IN EYES hold open and immediately flush with water.
IF SWALLOWED give water to drink and induce vomiting.
Immediately call a physician.
DO NOT INJECT ETHYLENE CHLOROHYDRIN

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Not applicable.
Not applicable.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Isolate material. Stop water contamination.
Restrict access.
Dike for recovery.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Chloroethanol
2-Chloroethanol
2-Chloroethyl alcohol
Ethylene chlorohydrin, Glycol chlorohydrin
3.2 **Coast Guard Compatibility Classification:** To be developed
3.3 **Chemical Formula:** $CICH_2CH_2OH$
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Faint sweet

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Oxygen canister mask or self-contained breathing apparatus, goggles or face shield, rubber gloves.
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of upper respiratory system, nausea, headache, delirium, coma, collapse. Liquid causes irritation of eyes and skin, prolonged contact with skin may allow penetration into body and cause same symptoms as following inhalation or ingestion. Ingestion causes nausea, headache, delirium, coma, and collapse.
5.3 **Treatment for Exposure:** INHALATION: remove from exposure, give artificial respiration if breathing has stopped, call physician. EYES: flush with water for at least 15 min, get medical attention if irritation persists. SKIN: wash off with copious amounts of water, call physician if irritation has been prolonged. INGESTION: give large amounts of water, get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 toxicity, LD_{50} [illegible] mg/kg (rat)
5.7 **Late Toxicity:** Damage to central nervous system and liver in humans
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible] F (C)
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Water, alcohol foam, dry chemical or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene when may be formed
6.6 **Behavior in Fire:** Vapors are heavier than air and may flash back to a source of ignition
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive
7.2 **Reactivity with Common Materials:** Not reactive
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** [illegible] days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. [illegible]
2. Platz and Baer, Inc.
[illegible] Northern Boulevard
Flushing, N.Y. [illegible]
3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Not required
10.4 **Venting:** Open flame arrester

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poison, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not rated
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible] °C, [illegible] °F, [illegible] K
13.4 **Freezing Point:** [illegible] °C, [illegible] °F, [illegible] K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 20°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10^3 J/kg
13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10^3 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

ETC	# ETHYLENE CYANOHYDRIN

Common Synonyms
Hydracrylonitrile
2-Cyanoethanol
Glycol cyanohydrin
3-Hydroxypropanenitrile

Liquid — Colorless to yellow brown — Weak odor to odorless

Sinks and mixes with water

Stop discharge if possible
Call fire department
Avoid contact and contamination
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Wear self-contained breathing apparatus
Extinguish by flooding with alcohol foam, carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes.
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water
Induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not induce vomiting or give water

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Dissolve and Dilute

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Cyanoethanol
Glycol cyanohydrin
Hydracrylonitrile
2-Hydroxyethanenitrile
3-Hydroxypropanenitrile

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** HOCH$_2$CH$_2$CN

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to yellow-brown

4.3 **Odor:** Practically odorless characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wear supplied mask, plastic gloves, rubber clothing, vapor-proof goggles

5.2 **Symptoms Following Exposure:** Liquid irritating to eyes and skin. Inhalation may cause dizziness, headache, etc.

5.3 **Treatment for Exposure:** INGESTION: induce vomiting, give water and gastric lavage. EYES: wash with water. SKIN: flush exposed area with plenty of water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 3 Data lacking

5.7 **Late Toxicity:** Ingestion of liquid may cause severe kidney damage

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** Not appreciable hazard. Prolonged contact may cause irritation

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** 265°F (130°C)

6.2 **Flammable Limits in Air:** 2.7 vol % (121°F) to 36 vol % (200°F)

6.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, foam, alcohol foam, water fog, water spray, or large fire

6.4 **Fire Extinguishing Agents Not to be Used:** Water in a solid stream may cause further spread of fire

6.5 **Special Hazards of Combustion Products:** Toxic gases are generated when heated

6.6 **Behavior in Fire:** Decomposes, generating toxic gas

6.7 **Ignition Temperature:** 932°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not pertinent

7.2 **Reactivity with Common Materials:** Not pertinent

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

American Amine & Extract Co., Inc.
Venango and I Street
Philadelphia, Pa. 19134

Union Carbide Corp.
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Toxicity	3
Contact Solid Toxicity	3
Poisons	3
Acute Pollution	
Human Toxicity	
Aquatic Toxicity	2
Acute Effect	3
Reactivity	
Other Chemicals	3
Water	3
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	
Reactivity (Yellow)	

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 71.08

13.3 **Boiling Point at 1 atm:** 445°F = 229°C = 502°K

13.4 **Freezing Point:** -31.2°F = -35.2°C = 237.8°K

13.5 **Critical Temperature:** 804°F = 429°C = N/A °K

13.6 **Critical Pressure:** 770 psia = 49 atm = 4.9 MN/m²

13.7 **Specific Gravity:** 0.97 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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EDA	ETHYLENEDIAMINE

Common Synonyms
1,2-Diaminoethane
1,2-Ethanediamine

Liquid — Colorless — Mild ammonia odor

Floats and mixes with water. Irritating vapor is produced. Freezing point is 52°F.

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with water, dry chemical, alcohol foam, or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Disperse and flush.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2-Diaminoethane; 1,2-Ethanediamine
3.2 **Coast Guard Compatibility Classification:** Aliphatic amine
3.3 **Chemical Formula:** $NH_2CH_2CH_2NH_2$
3.4 **IMCO/United Nations Numerical Designation:** NO 1604

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Strong ammoniacal odor, ammonia-like, mild and ammoniacal odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Full rubber protective clothing and gloves and boots, chemical worker's goggles, face shield where contact with face is likely. If necessary to enter closed area for 1-2 hr or less with mist, wear full faced gas mask with canister approved by Bureau of Standards for use with ammonia.
5.2 **Symptoms Following Exposure.** High concentration of vapor burns eyes and irritates nose and throat. Liquid burns eyes and skin.
5.3 **Treatment for Exposure.** Get medical help immediately. INGESTION: drink large amounts of water or milk quickly, induce vomiting only if instructed by physician. EYES: flush immediately and thoroughly with flowing water for at least 15 min. SKIN: remove clothing and flush affected area with copious amounts of flowing water. Then wash with soap and water. Severe exposure may require showering.
5.4 **Toxicity by Inhalation (Threshold Limit Value).** 10 ppm
5.5 **Short-Term Inhalation Limits.** 20 ppm for 5 min
5.6 **Toxicity by Ingestion.** Grade 2. LD_{50} 0.5 to 5 g/kg (male rat)
5.7 **Late Toxicity.** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
5.9 **Liquid or Solid Irritant Characteristics.** Highly severe skin irritant; may cause pain and second degree burns after a few minutes contact.
5.10 **Odor Threshold:** 10 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 99°F (O.C.), 110°F (T.C.)
6.2 **Flammable Limits in Air:** 2.8 – 14.3%
6.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemicals, foam or water
6.4 **Fire Extinguishing Agents Not to be Used.** Do not use water in case of drum or tank fires.
6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 715°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate.** 2.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Gives off heat but reaction is not hazardous.
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7.5 **Polymerization:** Not pertinent.
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 60 ppm/24 hr (shub/killed, fresh water)
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 78% (theor.) 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Michigan 48640
2. Jefferson Chemical Co., Inc.
3336 Richmond Ave.
Houston, Texas 77002
3. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 60.10
13.3 **Boiling Point at 1 atm:** 244°F = 117°C = 390 K
13.4 **Freezing Point:** 51.8°F = 11.0°C = 284.2 K
13.5 **Critical Temperature:** 608°F = 320°C = 593 K
13.6 **Critical Pressure:** 941 psia = 64 atm = 6.4 MN/m²
13.7 **Specific Gravity:** 0.899 at 20°C (liquid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.082
13.12 **Latent Heat of Vaporization:** 288 Btu/lb = 160 cal/g = 6.70 × 10⁵ J/kg
13.13 **Heat of Combustion:** −12,290 Btu/lb = −6830 cal/g = −286.0 × 10⁵ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** (est.) −9 Btu/lb = −5 cal/g = −0.2 × 10⁵ J/kg
13.16 **Heat of Polymerization.** Not pertinent

(Continued on back page)

NOTES

REVISED 1978

EDT	ETHYLENEDIAMINE TETRACETIC ACID

Common Synonyms
Versene acid
Tetrine acid
Ethylene bis (iminodiacetic acid)
EDTA

Solid powder — White — Odorless

Floats on water

Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

SOLID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contaminant
Should be removed

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** EDTA Endrate
Ethylenebis(iminodiacetic acid)
(Ethylenedinitrilo)tetraacetic acid
Tetrine acid Versene acid

3.2 **Coast Guard Compatibility Classification**
Not applicable

3.3 **Chemical Formula**
$(HOOCCH_2)_2NCH_2CH_2N(CH_2COOH)_2$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid
4.2 **Color.** White
4.3 **Odor** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Data not available
5.2 **Symptoms Following Exposure** Data not available
5.3 **Treatment for Exposure** Data not available
5.4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Grade 1 LD50 to 0.5 g/kg (as sodium or calcium salt)
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin
5.10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air**
Not pertinent
6.3 **Fire Extinguishing Agents**
Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used**
Not pertinent
6.5 **Special Hazards of Combustion Products**
Not pertinent
6.6 **Behavior in Fire** Not pertinent
6.7 **Ignition Temperature** Not pertinent
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials**
No reaction
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
129 ppm/96 hr/catfish/tapwater
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)**
1.7 5 days
8.4 **Food Chain Concentration Potential.**
None

9. SELECTED MANUFACTURERS

1 Ciba Geigy Corp
Geigy Industrial Chemicals Division
McIntosh, Ala 36553
2 Dow Chemical Co
Midland, Mich 48640
3 W R Grace & Co
Dewey & Almy Chemical Division
Cambridge, Mass 02140

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Data not available
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classification**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm**
Powder
13.2 **Molecular Weight** 164
13.3 **Boiling Point at 1 atm** Not pertinent
13.4 **Freezing Point** Data not available
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity** 0.86 at 20°C (solid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension**
Not pertinent
13.10 **Vapor (Gas_a) Specific Gravity**
Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent
13.12 **Latent Heat of Vaporization**
Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

EDB — ETHYLENE DIBROMIDE

Common Synonyms
1,2 Dibromoethane
Ethylene bromide

Liquid | Colorless | Sweet odor

Sinks in water. Poisonous vapor is produced.
Freezing point is 50° F.

Stop discharge if possible. Keep people away.
Avoid contact with liquid and vapor.
Contain and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
POISONOUS GASES ARE PRODUCED WHEN HEATED.
Wear goggles, self-contained breathing apparatus and rubber over-clothing including gloves.
Avoid contact of liquids with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
POISONOUS IF INHALED.
Irritating to eyes, nose and throat.
May cause pulmonary edema.
If breathing has stopped, perform artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Irritating to skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, do not induce VOMITING. Have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of affected water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4.)

Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Bromofume; 1,2-Dibromoethane; Dibromoethane; Dowfume-40; W-10; W-15; W-40; Ethylene bromide; Glycol dibromide.

3.2 **Coast Guard Compatibility Classification.** Halogenated hydrocarbon.

3.3 **Chemical Formula:** $BrCH_2CH_2Br$

3.4 **IMCO United Nations Numerical Designation:** 6.1 1605

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mildly sweet, like chloroform

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Canister type mask or self-contained air mask, neoprene gloves, chemical safety goggles.

5.2 **Symptoms Following Exposure:** Local inflammation, blisters and ulcers on skin, irritation in lungs and digestive injury to liver and kidneys; may be absorbed through skin.

5.3 **Treatment for Exposure:** Remove from exposure. Remove contaminated clothing. Wash skin with soap and water. Flush eyes with plenty of water. Consult physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** 1 mg/m³

5.5 **Short-Term Inhalation Limits:** 50 ppm for 5 min

5.6 **Toxicity by Ingestion:** Grade 4. LD₅₀ 50 to 500 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Decomposition gases are toxic and irritating.

6.6 **Behavior in Fire:** Decomposes into toxic irritating gases. Reacts with hot metals such as aluminum and magnesium.

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 18 mg/L/48 hr, bluegill, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co.
   Midland, Mich. 48640
2. Great Lakes Chemical Corp.
   West Lafayette, Ind. 47906
3. PPG Industries, Inc.
   Houston Chemical Co. Division
   1 Gateway Center
   Pittsburgh, Pa. 15222

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3.)

AX

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** ORM-A

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 187.86

13.3 **Boiling Point at 1 atm.** 268°F = 131°C = 404 K

13.4 **Freezing Point.** 49.6°F = 9.8°C = 283.0 K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 2.180 at 20°C (liquid)

13.8 **Liquid Surface Tension** 38.78 dynes/cm = 0.03878 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 36.54 dynes/cm = 0.03654 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.09

13.12 **Latent Heat of Vaporization:** 92.1 Btu/lb = 45.6 cal/g = 1.91 × 10⁵ J/kg

13.13 **Heat of Combustion.** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

EDC — ETHYLENE DICHLORIDE

Common Synonyms
1,2 Dichloroethane
Ethylene chloride
EDC

Liquid | Colorless | Sweet odor

Sinks in water. Flammable, irritating vapor is produced

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self contained breathing apparatus and rubber overclothing (including gloves).
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area
Wear goggles, self contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea, dizziness or difficult breathing
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

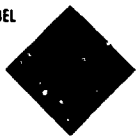
Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Bromide | EDC
1,2 Dichloroethane | Ethylene chloride
Dutch liquid | Glycol dichloride

3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3.3 **Chemical Formula:** $ClCH_2CH_2Cl$

3.4 **IMCO United Nations Numerical Designation:** 1184

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Ethereal, chloroform like, ether like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Clean, body covering clothing and safety glasses with side shields. Respiratory protection: up to 50 ppm, none; 50 ppm to 2%, 1/2 hr or less, full face mask and canister; greater than 2%, self contained breathing apparatus.

5.2 **Symptoms Following Exposure:** Inhalation of vapors causes nausea, drunkenness, depression. Contact of liquid with eyes may produce corneal injury. Prolonged contact with skin may cause a burn.

5.3 **Treatment for Exposure:** INHALATION: if victim is overcome, remove him to fresh air, keep him quiet and warm, and get medical attention immediately; if breathing stops, give artificial respiration. INGESTION: induce vomiting, call a physician, treat the symptoms. EYES: flush immediately with copious amounts of flowing water for at least 15 min. SKIN: remove clothing and wash skin thoroughly with soap and water; wash contaminated clothing before reuse.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 50 ppm

5.5 **Short-Term Inhalation Limits:** 200 ppm for 5 min during any 3 hour period

5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure.

5.10 **Odor Threshold:** 100 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 60°F O.C., 55°F C.C.

6.2 **Flammable Limits in Air:** 6.2% - 15.6%

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases (hydrogen chloride, phosgene) are generated.

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.

6.7 **Ignition Temperature:** 775°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 1.6 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 150 ppm/* fathead minnow, 11 ppm/* saltwater
*Time period not specified

8.2 **Water Fowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 0.002 lb/lb/5 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Continental Oil Co.
   Conoco Chemicals Division
   Park 80 Plaza East
   Saddle Brook, N.J. 07662
2. Dow Chemical Co.
   Midland, Mich. 48640
3. Shell Chemical Co.
   Industrial Chemicals Division
   Houston, Texas 77001

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure/vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

X X

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effects	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 98.96

13.3 **Boiling Point at 1 atm:** 182.3°F = 83.5°C = 356.7°K

13.4 **Freezing Point:** = 32.4°F = -35.9°C = 237.3°K

13.5 **Critical Temperature:** 560°F = 288°C = 561°K

13.6 **Critical Pressure:** 738 psia = 50 atm = 5.1 MN/m²

13.7 **Specific Gravity:** 1.253 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 32.2 dynes/cm = 0.0322 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.03 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** 3.4

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.115

13.12 **Latent Heat of Vaporization:** 138 Btu/lb = 76.4 cal/g = 3.20 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) 3400 Btu/lb = 1900 cal/g = 80 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

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NOTES

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EGL	ETHYLENE GLYCOL

Common Synonyms
Glycol
Monoethylene glycol
1,2-Ethanediol

Thick liquid — Colorless — Odorless

Sinks and mixes with water

Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, alcohol foam, or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
If swallowed, will cause loss of consciousness
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** 1,2-Dihydroxyethane; 1,2-Ethanediol; Ethylene dihydrate; Glycol; Monoethylene glycol
3.2 **Coast Guard Compatibility Classification:** Glycol
3.3 **Chemical Formula:** HOCH$_2$CH$_2$OH
3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Slight odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles, shower and eye bath
5.2 **Symptoms Following Exposure:** Inhalation of vapor is not hazardous. Ingestion causes stupor or coma, sometimes leading to fatal kidney injury
5.3 **Treatment for Exposure:** INGESTION induce vomiting and call a physician. SKIN AND EYES flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$ 5 to 15 g/kg (rat, guinea pig, mouse)
5.7 **Late Toxicity:** Late kidney injury may result if ingested
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are nonirritating to the eyes and throat
5.9 **Liquid or Solid Irritant Characteristics.** No appreciable hazard, practically harmless to the skin
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** 240°F O.C. 232°F C.C.
6.2 **Flammable Limits in Air** LEL = 3.2v, UEL not listed
6.3 **Fire Extinguishing Agents** Water fog, alcohol foam, carbon dioxide, or dry chemical
6.4 **Fire Extinguishing Agents Not to be Used.** Water or foam may cause frothing
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire.** Not pertinent
6.7 **Ignition Temperature:** 775°F
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate** 1.0 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** > 100 ppm/48 hr, shrimp/1% salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** 12% (theor.) 5 days, 78% (theor.) 20 days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Dow Chemical Co., Midland, Mich. 48640
2. PPG Industries, Inc., Chemical Division, Guayanilla, Puerto Rico 00656
3. Union Carbide Corp., Chemicals and Plastics Division, 270 Park Ave., New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Industrial grade, low conductivity grade
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemical	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight.** 62.07
13.3 **Boiling Point at 1 atm:** 387.22°F = 197.6°C = 470.8°K
13.4 **Freezing Point** 8.6°F = −13°C = 260°K
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity:** 1.115 at 20°C (liquid)
13.8 **Liquid Surface Tension** Not pertinent
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.095
13.12 **Latent Heat of Vaporization:** 344 Btu/lb = 191 cal/g = 8.00 × 10^5 J/kg
13.13 **Heat of Combustion** −7259 Btu/lb = −4032 cal/g = −168.9 × 10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** (est.) −20 Btu/lb = −12 cal/g = −0.8 × 10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

EGY	ETHYLENE GLYCOL DIACETATE

Common Synonyms

Ethylene acetate
Glycol diacetate
Ethylene diacetate

Liquid — Colorless — Weak fruity odor

Sinks and mixes with water

[illegible]

Fire

Combustible
[illegible]

Exposure

[illegible]
LIQUID
Irritating to skin and eyes
[illegible]
IF INHALED [illegible]
IF SWALLOWED [illegible] CONSCIOUS [illegible] drink water [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning — water contaminant
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ethylene acetate, Ethylene diacetate, Glycol diacetate
3 2 **Coast Guard Compatibility Classification.** Esters (13)
3 3 **Chemical Formula:** $CH_3COOCH_2CH_2OCOCH_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Weak fruity

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation is not hazardous. Liquid causes mild irritation of eyes. Ingestion causes stupor or coma
5 3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES and SKIN: flush well with water. INGESTION: induce vomiting, call a physician
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion** Grade 1 oral LD_{50} = 6,860 mg/kg (rat)
5 7 **Late Toxicity:** Ingestion may cause severe injury to kidney
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat
5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 205°F (C.C.) 191°F (C.C.)
6 2 **Flammable Limits in Air** 1.6 v/o – 8.4
6 3 **Fire Extinguishing Agents** Water, alcohol foam, dry chemical, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature** 900°F
6 8 **Electrical Hazard** Data not available
6 9 **Burning Rate.** [illegible] mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2 Eastman Chemical Products, Inc.
Kingsport, Tenn. 37662

3 Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 98+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

X P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	-
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 146.1
13 3 **Boiling Point at 1 atm:** 375.6°F = 190.9°C = 464.1 K
13 4 **Freezing Point.** −42.7°F = −41.5°C = 231.7 K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.104 at 20°C (liquid)
13 8 **Liquid Surface Tension** (est.) 20 dynes/cm = 0.020 N/m (20°C)
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** 133 Btu/lb = 74 cal/g = 3.1 × 10 J/kg
13 13 **Heat of Combustion** (est.) −11,000 Btu/lb = −6,000 cal/g = −250 × 10 J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

EEE — ETHYLENE GLYCOL DIETHYL ETHER

Common Synonyms

Diethyl Cellosolve
1,2 Diethoxyethane

Liquid — Colorless — Mild pleasant odor

Floats and mixes slowly with water. Irritating vapor is produced.

Stop if this is possible. Keep people away.
Call fire department.
Isolate and dispose of spilled material.
[illegible]

Fire

Combustible
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.

Exposure

CAUTION: medical aid

VAPOR
Irritating to eyes, nose and throat.
May cause coughing.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with one to 1 water.
IF IN EYES: hold eyelids open and flush with plenty of water.
IF SWALLOWED: induce vomiting if CONSCIOUS; have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Footline to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant.
Disperse and flush.

2. LABELS

No label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diethyl Cellosolve; 1,2 Diethoxyethane
3.2 **Coast Guard Compatibility Classification:** Alcohols (6)
3.3 **Chemical Formula:** $C_2H_5OCH_2CH_2OC_2H_5$
3.4 **IMCO/United Nations Numerical Designation:** 33 1153

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Faint ethereal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with liquid irritates eyes but has little or no effect on skin. Ingestion causes irritation of mouth and stomach.
5.3 **Treatment for Exposure:** INHALATION: remove from exposure. EYES: flush with water for at least 15 min. SKIN: wash with copious amounts of water. INGESTION: drink water and get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 4,390 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 90°F (O.C.)
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 406°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 4.1 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0.19 lb/lb, 10 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastern Chemical Division
230 Marcus Boulevard
Hauppauge, N.Y. 11788

2. Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V P Q T T

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 118.2
13.3 **Boiling Point at 1 atm:** 252°F = 122°C = 395°K
13.4 **Freezing Point:** −[illegible]°F = −74°C = 199°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.8484 at 20°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 4.1
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0504
13.12 **Latent Heat of Vaporization:** 192 Btu/lb = [illegible] cal/g = 4.48 × [illegible] J/kg
13.13 **Heat of Combustion:** (est.) −15,100 Btu/lb = −8,100 cal/g = −340 × [illegible] J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

EGD — ETHYLENE GLYCOL DIMETHYL ETHER

Common Synonyms
Monoglyme
1,2-Dimethoxyethane
Dimethyl Cellosolve
Ansul Ether 12

Liquid — Colorless — Fragrant odor

Floats and mixes with water. Irritating vapor is produced

Stop discharge if possible
Caution department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, alcohol foam, or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
If inhaled, will cause dizziness or difficult breathing
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Not irritating to skin
If swallowed, will cause nausea, vomiting or loss of consciousness
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, Code 4

Fire warning: highly flammable
Dike and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ansul Ether 12, 1,2-Dimethoxyethane, Dimethyl Cellosolve, Monoglyme
3.2 **Coast Guard Compatibility Classification:** Glycol ether
3.3 **Chemical Formula:** $CH_3OCH_2CH_2OCH_3$
3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mild ethereal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wear chemical splash goggles, rubber gloves, and rubber boots
5.2 **Symptoms Following Exposure:** Dizziness, difficult breathing, nausea
5.3 **Treatment for Exposure:** INHALATION: Move to fresh air; if breathing has stopped, give artificial respiration; if breathing is difficult, give oxygen. INGESTION: Induce vomiting with syrup of ipecac
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Guide LD50 [illegible]
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** None
5.9 **Liquid or Solid Irritant Characteristics:** None
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 104°F C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Containers may explode in fires
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Dow Chemical Company
Chemical Division
Dow Center, MI
Mallinckrodt, Inc., St. Louis

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, Code 5

VPQRS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
*13.3 **Boiling Point at 1 atm.:** [illegible] °C = [illegible] K
*13.4 **Freezing Point:** [illegible] °C = [illegible] K
*13.5 **Critical Temperature:** [illegible] °C = [illegible] K
*13.6 **Critical Pressure:** [illegible] = [illegible] MN/m²
13.7 **Specific Gravity:** [illegible] at [illegible] °C/[illegible] °C
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg
*13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg
13.14 **Heat of Decomposition:** Not pertinent
*13.15 **Heat of Solution:** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg
13.16 **Heat of Polymerization:** Not pertinent

*Compared to water (=1)

NOTES

REVISED 1978

EGM — ETHYLENE GLYCOL MONOBUTYL ETHER

Common Synonyms
2-Butoxyethanol
Butyl Cellosolve
Dowanol EB
Poly-Solv EB

Oily liquid — Colorless — Mild rancid odor

Floats and mixes with water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible.
Extinguish with dry chemical, alcohol foam, or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Dispersed and flush

2 LABELS

Not applicable (see text)
Code: [illegible]

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
[illegible]

3.2 **Coast Guard Compatibility Classification**
[illegible]

3.3 **Chemical Formula**
$C_6H_{14}O_2$ or $C_4H_9OCH_2CH_2OH$

3.4 **IMCO United Nations Numerical Designation.** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild characteristic, slightly rancid, mild ethereal

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air pack or organic canister respirator, rubber gloves, goggles, clothing to prevent body contact with liquid

5.2 **Symptoms Following Exposure:** Vapors irritate eyes and nose. Ingestion or skin contact causes [illegible]

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air and call a physician. SKIN OR EYES: immediately flush with large amounts of water, get medical care for eyes

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 50 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD50 [illegible] g/kg rat

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Repeated or prolonged contact may cause irritation and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 165°F OC, 155°F CC

6.2 **Flammable Limits in Air:**
1.1 – 10.6%

6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol type foam for large fires

6.4 **Fire Extinguishing Agents Not to be Used**
Data not available

6.5 **Special Hazards of Combustion Products**
Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 472°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate.** 6.7 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
1000 ppm/24 hr/brine shrimp/TLm

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):**
26% of theoretical in 5 days, fresh water

8.4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1. Jefferson Chemical Co
[illegible] Richmond Ave
Houston, Texas 77002
2. Olin Corp
Chemicals Division
Brandenburg, Ky 40108
3. Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open (atmospheric pressure)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

APQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poison	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effects	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** 118.17

13.3 **Boiling Point at 1 atm.**
230.2°F = 110°C = 383.2°K

13.4 **Freezing Point:** −103°F = −75°C = [illegible]°K

13.5 **Critical Temperature.**
[illegible]°F = [illegible]°C = [illegible]°K

13.6 **Critical Pressure:**
[illegible] = [illegible] MN/m²

13.7 **Specific Gravity:** 0.902 at 20°C/water

13.8 **Liquid Surface Tension.** Not pertinent

13.9 **Liquid-Water Interfacial Tension.**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
[illegible]

13.12 **Latent Heat of Vaporization.**
[illegible] Btu/lb = [illegible] cal/g = [illegible] kJ/kg

13.13 **Heat of Combustion:** 13,890 Btu/lb
= 7720 cal/g = 32.3 × 10³ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** [illegible] Btu/lb
= [illegible] cal/g = [illegible] kJ/kg

13.16 **Heat of Polymerization** Not pertinent

(Continued on page [illegible])

NOTES

REVISED 1978

EMA	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE

Common Synonyms	Liquid	Colorless	Weak fruity odor
2 Butoxyethanol acetate 2 Butoxyethyl acetate Glycol monobutyl ether acetate Butyl "Cellosolve" acetate	Floats and mixes slowly with water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning; water contaminant
Disperse and flush

2 LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** 2 Butoxyethanol acetate, 2 Butoxyethyl acetate, Butyl Cellosolve acetate, Glycol monobutyl ether acetate

3.2 **Coast Guard Compatibility Classification:** Esters (3)

3.3 **Chemical Formula:** $n\text{-}C_4H_9OCH_2CH_2OCOCH_3$

3.4 **IMCO/United Nations Numerical Designation.** Not assigned

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Weak fruity

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation of concentrated vapor may cause headache, nausea, dizziness. Liquid causes irritation to eyes and mucous membranes. Skin. Ingestion produces same symptoms as inhalation

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. EYES: flush for 15 minutes with water for at least 15 min. SKIN: flush with water. INGESTION: induce vomiting, get medical assistance

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion.** Grade 1 oral LD_{50} = 3,200 mg/kg (mouse)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 190°F (C.C.) 169°F (C.C.)

6.2 **Flammable Limits in Air:** 0.9% - 8.8%

6.3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 645°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.1 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corporation
   Chemicals and Plastics Division
   270 Park Avenue
   New York, N.Y. 10017
2. Eastman Chemical Products, Inc.
   Kingsport, Tenn. 37662

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 98+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

A P Q T U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 160.21

13.3 **Boiling Point at 1 atm:** 470°F = 192.2°C = 465.4°K

13.4 **Freezing Point:** −82°F = −63.5°C = 209.7°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.942 at 20°C (liquid)

13.8 **Liquid Surface Tension.** (est.) 26 dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization:** 59 Btu/lb = 65 cal/g = 2.7 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) −14,000 Btu/lb = −7,700 cal/g = −320 × 10³ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

EGE	ETHYLENE GLYCOL MONOETHYL ETHER

Common Synonyms
Poly-Solv EE
Dowanol EE
Cellosolve
Glycol monoethyl ether
2-Ethoxyethanol

Oily liquid — Colorless — Sweet odor

Floats and mixes with water

[illegible]

Fire

Combustible
[illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook (CG 446-4)

[illegible]

2. LABELS

[illegible]

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** [illegible]
3.2 **Coast Guard Compatibility Classification** [illegible]
3.3 **Chemical Formula** [illegible]
3.4 **IMCO United Nations Numerical Designation:**

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color:** [illegible]
4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]
5.2 **Symptoms Following Exposure:** [illegible]
5.3 **Treatment for Exposure:** [illegible]
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]
5.5 **Short-Term Inhalation Limits.** [illegible]
5.6 **Toxicity by Ingestion** [illegible]
5.7 **Late Toxicity:** [illegible]
5.8 **Vapor (Gas) Irritant Characteristics** [illegible]
5.9 **Liquid or Solid Irritant Characteristics.** [illegible]
5.10 **Odor Threshold.** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents.** [illegible]
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products.** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate** 2.4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]
7.2 **Reactivity with Common Materials:** [illegible]
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics** [illegible]
7.5 **Polymerization** [illegible]
7.6 **Inhibitor of Polymerization** [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** [illegible]
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** [illegible]
10.3 **Inert Atmosphere:** [illegible]
10.4 **Venting:** [illegible]

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG 446-3)

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
[illegible]	[illegible]
Health	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	

12.3 **NFPA Hazard Classifications.** [illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** [illegible]
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm.** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature** [illegible]
13.6 **Critical Pressure:** [illegible]
13.7 **Specific Gravity** [illegible]
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension.** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** [illegible]
13.15 **Heat of Solution:** [illegible]
13.16 **Heat of Polymerization:** [illegible]

[illegible]

NOTES

REVISED 1978

EGA	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE

Common Synonyms
Poly Solv EE acetate
Cellosolve acetate
2-Ethoxyethyl acetate

Liquid — Colorless — Pleasant odor

Floats and mixes slowly with water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible.
Extinguish with dry chemical, carbon dioxide, or water fog
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harmful if swallowed.
Remove contaminated clothing and shoes
Quickly affected area with plenty of water
IF IN EYES Flush eyes with plenty of water
IF SWALLOWED and victim CONSCIOUS have victim drink water

Water Pollution

Effect of low concentration on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Dispersal and dilute

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cellosolve acetate
2-Ethoxyethanol acetate
2-Ethoxyethyl acetate
Ethylene monoethyl ether acetate
Poly Solv EE acetate

3.2 **Coast Guard Compatibility Classification:** Inert

3.3 **Chemical Formula:** $CH_3COOCH_2CH_2OCH_2CH_3$

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild pleasant ether like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles

5.2 **Symptoms Following Exposure:** Vapor irritates mucous membranes and eyes. Liquid irritates and may damage exposed tissue

5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air. Restore and support physical functions. EYES: Flush with large amounts of water. SKIN: Wash exposed area

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD[illegible] [illegible]

5.7 **Late Toxicity:** Causes kidney damage in laboratory animals. Effects unknown in humans

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor causes slight nasal irritation and respiratory irritation which [illegible] in healthy [illegible]

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. Repeated wetting and drying may cause scaling and reddening of the skin

5.10 **Odor Threshold:** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] F C.C.

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents.** Alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 4000 ppm/24 hr/brine shrimp/TLm

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 36% of theoretical in 5 days, freshwater

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Eastman Kodak
Texas Eastman Division
Eastman Texas Div.
2 Union Carbide
Chemicals Division
Bloomingburg, New York
Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open/Vent as required

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-5

VPQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	[illegible]
Health	
Acute Toxicity	
Toxicity Short Term	
Irritant	
Water Pollution	
Human Tainted	[illegible]
Aquatic Toxicity	[illegible]
Aquatic Effects	[illegible]
Reactivity	
Other Chemicals	
Water	[illegible]
Self Reactivity	[illegible]

12.3 **NFPA Hazard Classifications.** [illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

*13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible] °C [illegible] °F [illegible] °K

13.4 **Freezing Point:** [illegible] °C [illegible] °F [illegible] °K

13.5 **Critical Temperature:** [illegible] °C [illegible] °F [illegible] °K

13.6 **Critical Pressure:** [illegible] atm [illegible] psia [illegible] MPa

*13.7 **Specific Gravity:** [illegible]

*13.8 **Liquid Surface Tension:** [illegible]

*13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

*13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

*13.13 **Heat of Combustion:** [illegible]

*13.14 **Heat of Decomposition.** [illegible]

13.15 **Heat of Solution:** [illegible]

*13.16 **Heat of Polymerization:** [illegible]

Continued on page [illegible]

NOTES

EME	ETHYLENE GLYCOL MONOMETHYL ETHER

Common Synonyms		
Poly-Solv EM Dowanol EM Methyl Cellosolve Glycol monomethyl ether 2-Methoxyethanol	Liquid	Colorless	Odorless
	Floats and mixes with water	

Not to be discharged if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	Combustible Extinguish with dry chemical, carbon dioxide, or alcohol foam Cool exposed containers with water
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES Hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes. Notify municipal health or wildlife officials Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook

Dike and [illegible]

2. LABELS

[illegible]

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dowanol EM
Ethylene glycol monomethyl ether
Methyl cellosolve
Methyl Cellosolve
Poly-Solv EM

3.2 **Coast Guard Compatibility Classification.** [illegible]

3.3 **Chemical Formula.** CH3OCH2CH2OH

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** [illegible]

4.3 **Odor:** Mild ether [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles, rubber gloves, rubber boots, rubber apron, and [illegible]

5.2 **Symptoms Following Exposure:** Irritation of eyes, nose, and throat. Headache, dizziness, nausea, vomiting, [illegible]

5.3 **Treatment for Exposure:** SKIN OR EYES [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm

5.5 **Short-Term Inhalation Limits.** None [illegible]

5.6 **Toxicity by Ingestion:** Grade 2 Dangerous [illegible]

5.7 **Late Toxicity:** Causes blood disorders and damage to central nervous system in humans

5.8 **Vapor (Gas) Irritant Characteristics:** None [illegible]

5.9 **Liquid or Solid Irritant Characteristics.** Moderately irritating to eyes and mucous membrane [illegible]

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air** [illegible]

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or alcohol foam

6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]

6.5 **Special Hazards of Combustion Products:** [illegible]

6.6 **Behavior in Fire:** [illegible]

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** [illegible]

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials.** [illegible]

7.3 **Stability During Transport:** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]

7.5 **Polymerization:** [illegible]

7.6 **Inhibitor of Polymerization.** [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data [illegible]

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD):** [illegible]

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Jefferson Chemical Co. Inc.
[illegible] Richmond Ave.
Houston, Texas [illegible]

Olin Corp.
Chemical Div.
Brandenburg, Ky. [illegible]

Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
[illegible]	
Health	
Water Pollution	
Reactivity	

12.3 **NFPA Hazard Classifications:** [illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas).** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** 9460 Btu/lb
= 4250 cal/g = 220 × 10³ J/kg

13.14 **Heat of Decomposition.** [illegible]

13.15 **Heat of Solution:**
Data not available

13.16 **Heat of Polymerization.** [illegible]

[illegible]

NOTES

REVISED 1976

ETI	ETHYLENEIMINE

Common Synonyms
Azridine

Oily liquid — Colorless — Ammonia odor

Floats and mixes with water. Poisonous flammable vapor is produced

AVOID CONTACT WITH LIQUID and VAPOR. Keep people away.

Fire

FLAMMABLE.
Containers may explode when heated.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes.

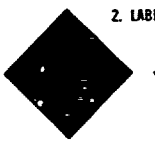
Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula: C_2H_5N
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity: Causes cancer in mice. Effects on man unknown.
5.8 Vapor (Gas) Irritant Characteristics:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

Dow Chemical
Midland, Michigan

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

Hazardous Substances Handbook, 1985

VFQRS/

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
Flammable liquid

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	
Health	
Liquid Solid Damage	
Poison	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	
Taste Effect	
Reactivity	
Other Chemicals	
Water	
Self Reaction	

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

5 HEALTH HAZARDS (Cont'd)

5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

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EOX — ETHYLENE OXIDE

Common Synonyms
Oxirane
1,2-Epoxyethane

Liquefied gas — Colorless — Sweet odor

Floats and mixes with water. Flammable, irritating vapor is produced. Boiling point is 51°F.

Avoid contact with liquid. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber protective clothing (including gloves).
Shut off ignition sources; extinguish if in department.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Containers may explode when heated
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles, self-contained breathing apparatus and rubber protective clothing (including gloves).
Stop flow of gas if possible.
Combat fires from behind barrier; cool containers with water from maximum distance.
Flood discharge area with water.
Cool exposed containers and protect personnel effectively with water.
Extinguish with alcohol foam, dry chemical, carbon dioxide, or halon.

Exposure

CAUTION: MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea, vomiting and difficult breathing
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with water.
IF IN EYES: hold eyelids apart and flush with plenty of water.
IF SWALLOWED: do not induce vomiting. Give one or two glasses of water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify operators of downstream water intakes.

1. RESPONSE TO DISCHARGE

(See Response Section Handbook, CG-446-4)
Isolate for high flammability.
Evacuate.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** 1,2-Epoxyethane; Oxirane
3.2 **Coast Guard Compatibility Classification** Alkylene oxide
3.3 **Chemical Formula** CH_2CH_2O
3.4 **IMCO United Nations Numerical Designation** 2.0 1040

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Colorless
4.3 **Odor:** Sweet characteristic ether like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Air supplied mask, goggles or face shield, rubber shoes and gloves.
5.2 **Symptoms Following Exposure** Exposure to low vapor concentrations often result in delayed nausea and vomiting. Higher concentrations produce irritation of eyes, nose and throat; high concentrations have caused pulmonary edema. Contact with skin causes blistering and burns.
5.3 **Treatment for Exposure** INHALATION: move contaminated victim immediately to fresh air and continue artificial respiration. SKIN OR EYES: flush immediately with plenty of water for 15 minutes and seek medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 50 ppm
5.5 **Short-Term Inhalation Limits** 500 ppm for 30 min
5.6 **Toxicity by Ingestion** Grade 3, oral rat LD_{50} = 33 g/kg
5.7 **Late Toxicity:** Causes cancer in mice. Effects on humans unknown.
5.8 **Vapor (Gas) Irritant Characteristics** Vapor is moderately irritating such that personnel will not usually tolerate moderate exposure to high vapor concentrations.
5.9 **Liquid or Solid Irritant Characteristics** Liquid is severe eye irritant; may cause painful second degree burns after a few minutes contact.
5.10 **Odor Threshold** 50 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** < 0 F (O.C.)
6.2 **Flammable Limits in Air** 3.6 – 100%
6.3 **Fire Extinguishing Agents** Stop flow of gas. Use water, carbon dioxide, dry chemical or alcohol foam.
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products** Irritating vapors generated when heated.
6.6 **Behavior in Fire** Vapor is heavier than air and may travel considerable distance to a source of ignition and flashback. Containers may explode when heated.
6.7 **Ignition Temperature** 804°F
6.8 **Electrical Hazard** Class I, Group B
6.9 **Burning Rate** 3.5 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Slow reaction, not hazardous
7.2 **Reactivity with Common Materials** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization** May polymerize violently if contaminated with alkaline or acidic materials and metal oxides or chlorides.
7.6 **Inhibitor of Polymerization** None used

8. WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co., Midland, Mich. 48640
2. Jefferson Chemical Co., Inc., 3336 Richmond Ave., Houston, Texas 77002
3. Union Carbide Corp., Chemicals and Plastics Div., 270 Park Ave., New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity.** Commercial 100. Most contain no acetylene
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere** Inerted
10.4 **Venting.** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)
A B C K-L M N

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	1
Self Reaction	4

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	3

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Gas
13.2 **Molecular Weight.** 44.05
13.3 **Boiling Point at 1 atm** 51.1°F = 10.6°C = 283.8°K
13.4 **Freezing Point** −170.7°F = −112.6°C = 160.6°K
13.5 **Critical Temperature** 385°F = 196°C = 469°K
13.6 **Critical Pressure** 1040 psia = 71.0 atm = 7.2 MN/m²
13.7 **Specific Gravity.** 0.8869 at 20°C (liquid)
13.8 **Liquid Surface Tension** 24.3 dynes/cm = 0.0243 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** 1.5
13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.212
13.12 **Latent Heat of Vaporization.** 249.3 Btu/lb = 138.5 cal/g = 5.799 × 10⁵ J/kg
13.13 **Heat of Combustion.** −11,430 Btu/lb = −6380 cal/g = −26.7 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution** −61 Btu/lb = −34 cal/g = −1.4 × 10⁵ J/kg
13.16 **Heat of Polymerization** Not pertinent

Continued in next Sheet

NOTES

REVISED 1978

EFT — ETHYL ETHER

Common Synonyms
Anesthetic ether
Sulfuric ether
Ether
Diethyl ether
Diethyl oxide

Watery liquid — Colorless — Sweet odor

Floats on water. Flammable, irritating vapor is produced. Boiling point is 94° F.

Avoid contact with liquid and vapor. Keep people away.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — high flammability.
Restrict access.
Evacuate area.

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
Anesthesia ether — Ether
Diethyl ether — Ethoxyethane
Diethyl oxide — Sulfuric ether

3.2 **Coast Guard Compatibility Classification**
Ether

3.3 **Chemical Formula** $C_4H_{10}O$

3.4 **IMCO United Nations Numerical Designation** 3.1, 1155

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sweet, pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved organic vapor canister mask, chemical goggles, synthetic rubber or plastic gloves.

5.2 **Symptoms Following Exposure.** Vapor inhalation may cause headache, nausea, vomiting, and loss of consciousness. Contact with eyes will be irritating. Skin contact from clothing wet with the chemical may cause burns.

5.3 **Treatment for Exposure.** INHALATION: remove victim to fresh air; if breathing has stopped, apply artificial respiration; if breathing is difficult, give oxygen; call a physician. EYES: flush immediately with water for 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 400 ppm

5.5 **Short Term Inhalation Limits** 1000 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} 0.5 to 5 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause reddening, smarting of the eyes, or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics.** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly.

5.10 **Odor Threshold** 0.83 ppm

6 FIRE HAZARDS

6.1 **Flash Point** −40°F (−40°C; −49°F; −45°C)

6.2 **Flammable Limits in Air**
1.85 — 36.5

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or foam

6.4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6.5 **Special Hazards of Combustion Products**
Not pertinent

6.6 **Behavior in Fire** Vapors heavier than air and may travel considerable distance to a source of ignition and flashback. Decomposes violently when heated.

6.7 **Ignition Temperature:** 356°F

6.8 **Electrical Hazard:** Class I, group C

6.9 **Burning Rate:** 0.7 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials**
No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD):** 1.5 — 5 days

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. Exxon Chemical Co.
Houston, Texas 77001
2. Publicker Industries Inc.
1429 Walnut Street
Philadelphia, Pa. 19102
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, absolute, purified, anesthesia, USP, concentrated

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere** Inerted

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q-T-U-V-W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	4
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	2
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** 74.12

13.3 **Boiling Point at 1 atm**
94.3°F = 34.6°C = 307.8°K

13.4 **Freezing Point**
−177.3°F = −116.3°C = 156.9°K

13.5 **Critical Temperature**
380.3°F = 193.5°C = 466.7°K

13.6 **Critical Pressure.**
527 psia = 35.9 atm = 3.64 MN/m²

13.7 **Specific Gravity** 0.714 @ 20°C (liquid)

13.8 **Liquid Surface Tension**
17.0 dynes/cm = 0.0170 N/m @ 20°C

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity.** 2.6

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.081

13.12 **Latent Heat of Vaporization** 155 Btu/lb = 84.9 cal/g = 3.56 × 10⁵ J/kg

13.13 **Heat of Combustion.** −14,550 Btu/lb = −8062 cal/g = −33.8 × 10⁶ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

(See reverse side, Sandia)

NOTES

REVISED 1978

EFM	ETHYL FORMATE

Common Synonyms

Formic acid ethyl ester
Ethyl formic ester
Ethyl methanoate
Formic ether

Liquid — Colorless — Pleasant odor

Floats and mixes with water. Flammable. Irritating vapor is produced.

Shut off ignition sources. Call fire department.
Stop discharge if possible. Keep people away.
Stay upwind. Use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Extinguish with dry chemicals, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

Call for medical aid.

VAPOR

Irritating to eyes, nose and throat.
If inhaled will cause difficult breathing.

Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID

Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
EYES: Hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, water contaminant.
Restrict access.
Evacuate area.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethyl formic ester, Ethyl methanoate, Formic acid ethyl ester, Formic ether

3.2 **Coast Guard Compatibility Classification:** Esters (13)

3.3 **Chemical Formula:** $HCOOC_2H_5$

3.4 **IMCO/United Nations Numerical Designation:** 3.1, 1190

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic pleasant aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic cartridge respirator, goggles, face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation of vapor causes slight irritation of the eyes and rapidly increasing irritation of the nose. High concentrations cause deep narcosis within a few minutes followed by death within a few hours. Contact with liquid causes moderate irritation of eyes and mild irritation of skin. Ingestion causes irritation of mouth and stomach; may cause deep narcosis and death if not treated.

5.3 **Treatment for Exposure:** INHALATION: remove from exposure, begin artificial respiration if breathing has stopped, call physician. EYES: wash with water for 15 min., call physician if needed. SKIN: wash with water for 15 min., call physician if irritation persists. INGESTION: do NOT induce vomiting, get medical attention at once.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 1,850 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effects are temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant. May cause pain and second degree burns after a few minutes' contact.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 10°F (O.C.) = −4°F (C.C.)

6.2 **Flammable Limits in Air:** 2.6% – 16.0%

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel long distance to a source of ignition and flash back

6.7 **Ignition Temperature:** 850°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.6 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 30% / 10 days, 0.8 lb/lb / 10 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Fritzsche, Dodge & Olcott, Inc.
   76 Ninth Avenue
   New York, N.Y. 10001
2. Eastman Kodak Co.
   Eastman Organic Chemicals
   Rochester, N.Y. 14650
3. Aldrich Chemical Co.
   940 West St. Paul Avenue
   Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 95+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure/vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

V P Q R-S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	1
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 74.1

13.3 **Boiling Point at 1 atm.:** 129.6°F = 54.2°C = 327.4°K

13.4 **Freezing Point:** −110°F = −79°C = 194°K

13.5 **Critical Temperature:** 455°F = 235°C = 508°K

13.6 **Critical Pressure:** 686 psia = 46.6 atm = 4.73 MN/m²

13.7 **Specific Gravity:** 0.922 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension** (est.): 28 dynes/cm = 0.028 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 2.6

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.014

13.12 **Latent Heat of Vaporization:** 176 Btu/lb = 98 cal/g = 4.1 × 10⁵ J/kg

13.13 **Heat of Combustion:** −9,500 Btu/lb = −5,300 cal/g = −22.0 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** −50 Btu/lb = −28 cal/g = −1.2 × 10⁵ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 4 and 5

NOTES

EHA — ETHYLHEXALDEHYDE

Common Synonyms			
2 Ethylhexanal Butylethylacetaldehyde alpha Ethylkapronaldehyde Octylaldehyde 2 Ethylhexaldehyde	Liquid Floats on water	White	Mild odor

[illegible]

Fire

Combustible
[illegible]
Water may be ineffective
[illegible]

Exposure

SAFE FORM PROCEED
VAPOR
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]
LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
[illegible]
IF IN EYES [illegible] and [illegible] quantities of water
IF SWALLOWED [illegible] CONSCIOUS [illegible]
IF SWALLOWED [illegible] NOT GIVE [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** Butylethylacetaldehyde 2 Ethylkapronaldehyde 2 Ethylhexaldehyde 2 Ethylhexanal Octylaldehyde

3 2 **Coast Guard Compatibility Classification:** Aldehyde

3 3 **Chemical Formula.** $C_4H_9CHC_2H_5CHO$

3 4 **IMCO/United Nations Numerical Designation:** 3 3 1191

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Rubber gloves safety goggles or face shield

5 2 **Symptoms Following Exposure:** Inhalation may be irritating to mucous membrane overexposure may cause dizziness and collapse Ingestion causes irritation of mouth and stomach Contact with eyes or skin causes irritation

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air give oxygen if breathing is difficult call a doctor EYES irrigate immediately for 15 min then get medical attention SKIN flush with water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Grade 2 oral rat LD_{50} = 3 730 mg kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure may cause second degree burns on long exposure

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 122°F O C 112°F C C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents** Dry chemical alcohol foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products**

6 6 **Behavior in Fire**

6 7 **Ignition Temperature.** 387°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials.** May ignite spontaneously when spilled on clothing paper or other absorbent materials

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Eastman Chemical Products Inc
Kingsport Tenn 37662

2 Union Carbide Corp
Chemicals and Plastics
270 Park Avenue
New York N Y 10017

3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06900

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 95 0+ %

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 128 25

13 3 **Boiling Point at 1 atm** 322°F = 164 C = 437°K

13 4 **Freezing Point.** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 820 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** 164 Btu lb = 91 2 cal g = 3 82 × 10⁵ J kg

13 13 **Heat of Combustion** 15 860 Btu lb = 8 810 cal g = 3 69 × 10⁷ J kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 4 and 5

NOTES

EHX	2-ETHYL HEXANOL

Common Synonyms
2 Ethyl Hexanol
2 Ethylhexyl Alcohol

Oily liquid | Colorless | Faint odor

Floats on water

[illegible]

Fire

Combustible
[illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4

Mechanical containment
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** 2 Ethyl Hexanol
2 Ethylhexyl Alcohol

3 2 **Coast Guard Compatibility Classification**
Alcohol

3 3 **Chemical Formula:**
$CH_3CH_2CH_2CH_2CH(C_2H_5)CH_2OH$

3 4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Strong

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** [illegible]

5 2 **Symptoms Following Exposure** Anesthetic nausea headache dizziness [illegible] irritating to skin and eyes

5 3 **Treatment for Exposure:** INHALATION [illegible] fresh air SKIN wash affected [illegible] and water EYES flush with water for [illegible] medical care

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits.** Not pertinent

5 6 **Toxicity by Ingestion** Grade 2 LD_{50} [illegible] kg rabbit/animals

5 7 **Late Toxicity:** Increased excitability of central nervous system in rats and rabbits

5 8 **Vapor (Gas) Irritant Characteristics** Vapor causes slight [illegible] respiratory system [illegible] concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard Repeated [illegible] and allowed remain may cause smarting and reddening of the skin

5 10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** [illegible] F O C [illegible] F C C

6 2 **Flammable Limits in Air:**
Data not available

6 3 **Fire Extinguishing Agents:** Foam carbon dioxide dry chemical

6 4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6 5 **Special Hazards of Combustion Products.**
Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature** [illegible] F

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** [illegible] mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
19 ppm/24 hr/brine shrimp/TLM

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD)**
68% of theoretical in 5 days

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Eastman Chemical Products Inc
Kingsport Tenn 37662

2 Occidental Enterprises
Penuelas Puerto Rico 00624

3 Shell Chemical Co
Industrial Chemicals Division
Houston Tex 77001

4 Union Carbide Corp
Chemicals and Plastics Division
270 Park Avenue
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99 9+

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open flame vented

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

A T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight.** 130 23

13 3 **Boiling Point at 1 atm:**
[illegible] F = 184 [illegible] C = 457 9 K

13 4 **Freezing Point**
<[illegible] F = <70 C = <343 K

13 5 **Critical Temperature**
[illegible] F = [illegible] C = [illegible] K

13 6 **Critical Pressure**
[illegible] psia = [illegible] = [illegible] MN

13 7 **Specific Gravity:** [illegible] at 20 C (liquid)

13 8 **Liquid Surface Tension**
[illegible] dynes/cm = 0 027 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension:**
22 dynes/cm = 0 022 N/m at 22 7°C

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization**
[illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg

13 13 **Heat of Combustion** [illegible] Btu/lb
= [illegible] cal/g = [illegible] J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

(See reverse side)

NOTES

REVISED 1978

EAI	2-ETHYLHEXYL ACRYLATE, INHIBITED

Common Synonyms			
Acrylic acid 2-ethylhexylester 2-Ethylhexyl 2-propenoate	Liquid Floats on water	Colorless	Sharp odor

Stop discharge if possible. Keep people away.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire	**Combustible** **Containers may explode in fire** Combat fires from safe distance. Protect exposed personnel. Extinguish with dry chemicals, carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	Call for medical aid. **LIQUID** **Irritating to skin and eyes** **Harmful if swallowed** Remove contaminated clothing and shoes. Flood affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning - water contaminant
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acrylic acid 2-ethylhexyl ester; 2-Ethylhexyl 2-propenoate

3.2 **Coast Guard Compatibility Classification:** Acrylate

3.3 **Chemical Formula:** $CH_2=CHCOOCH_2CH(C_2H_5)(CH_2)_3CH_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp, mild ester type, pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus, rubber gloves, vapor proof chemical safety goggles, impervious apron and boots.

5.2 **Symptoms Following Exposure:** Inhalation of concentrated vapor causes drowsiness and convulsions. Liquid causes irritation of eyes and may irritate skin on prolonged exposure. Ingestion produces same symptoms as inhalation.

5.3 **Treatment for Exposure:** INHALATION: give artificial respiration and oxygen if necessary, call a physician. EYES: immediately flush with plenty of water for at least 15 min., get medical attention. SKIN: immediately flush with plenty of water for at least 15 min. INGESTION: induce vomiting and consult a physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 1,540 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are not irritating to eyes and throat.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 198°F (O.C.)

6.2 **Flammable Limits in Air:** 0.8% - 6.4%

6.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Heat can result in a severe polymerization with rapid release of energy. Sealed containers may rupture explosively if hot.

6.7 **Ignition Temperature:** 496°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.6 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Will polymerize in the absence of inhibitor and when heated

7.6 **Inhibitor of Polymerization:** Monomethyl ether of hydroquinone (MEHQ) 120 ppm; Hydroquinone (HQ) 120 ppm

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 22 ppm/24 hr, Tank shrimp, H_{50}

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 97% of theoretical in 5 days, fresh water acclimated seed

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Celanese Chemical Company, 245 Park Avenue, New York, N.Y. 10017
2. Rohm and Haas Co., Inc., Independence Mall West, Philadelphia, Pa. 19105
3. Union Carbide Corporation, Chemicals and Plastics Division, 270 Park Avenue, New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+

10.2 **Storage Temperature:** <100°F (38°C)

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

X U U /

*12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 184.2

13.3 **Boiling Point at 1 atm:** (polymerizes) 417°F = 214°C = 487°K

13.4 **Freezing Point:** −130°F = −90°C = 183°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.888 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 110 Btu/lb = 61 cal/g = 2.6 × 10⁵ J/kg

13.13 **Heat of Combustion:** −15,500 Btu/lb = −8,600 cal/g = −360 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** −142 Btu/lb = −79 cal/g = −3.3 × 10³ J/kg

Continued on page 5 and 6

NOTES

EHT	ETHYL HEXYL TALLATE

Common Synonyms	Liquid	Light yellow	Mild odor
	Floats on water		

Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	Combustible Extinguish with dry chemical, foam, or carbon dioxide
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook (CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Cryptas EH
3 2 **Coast Guard Compatibility Classification** Essential
3 3 **Chemical Formula** (Mixture)
3 4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Pale yellow
4 3 **Odor:** Mild characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Data not available
5 2 **Symptoms Following Exposure:** Data not available
5 3 **Treatment for Exposure:** Data not available
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits** Not pertinent
5 6 **Toxicity by Ingestion** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics.** None
5 10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 395°F O C
6 2 **Flammable Limits in Air** Data not available
6 3 **Fire Extinguishing Agents** Data not available
6 4 **Fire Extinguishing Agents Not to be Used:** Data not available
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Arizona Chemical Co
[illegible] W. 50th St.
New York, N.Y. 10020
2 Cabot Chemicals Inc
Picayune, Miss. 39466
3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG 446-3)

X T U X Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight.** Not pertinent
13 3 **Boiling Point at 1 atm** Very high
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** (est.) 0.95 at 20°C (liquid)
13 8 **Liquid Surface Tension.** 30.4 dynes/cm = 0.0304 N/m at 24°C
13 9 **Liquid-Water Interfacial Tension:** 28 dynes/cm = 0.028 N/m at 21.3°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion.** [illegible]
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

ENB — ETHYLIDENENORBORNENE

Common Synonyms			
5-Ethylidenebicyclo (2,2,1) hept-2-ene Ethylidenenorcamphene Ethylidenenorbornylene	Liquid	White	Turpentine like odor
	Floats on water		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY

Fire

Combustible

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, coughing or difficult breathing

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 5-Ethylidenebicyclo(2,2,1)hept-2-ene; Ethylidenenorbornene; Ethylidenenorcamphene

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula:** C_9H_{12}

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Like turpentine

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Organic canister, air supplied mask, goggles, face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation: Vapor causes headache, confusion and respiratory distress. Ingestion causes [illegible] gastrointestinal [illegible]. Contact: Liquid causes severe pain in eyes and skin

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, administer artificial respiration and oxygen if required, call [illegible]. INGESTION: give large amounts of water and induce vomiting, get medical attention immediately. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion.** Grade 2 [illegible] LD_{50} = [illegible] g/kg (rats)

5.7 **Late Toxicity:** Causes kidney [illegible] in guinea pigs and [illegible] rats

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. Hospitalized clothing and allowed to remain, may cause smarting and reddening of skin

5.10 **Odor Threshold:** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 96°F (O.C.)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products.**

6.6 **Behavior in Fire**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard.** Data not available

6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Data not available

7.6 **Inhibitor of Polymerization:** Data not available

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corp
   Chemicals and Plastics Div
   270 Park Avenue
   New York, N.Y. 10017
2. Aldrich Chemical Co
   940 W. Saint Paul Ave
   Milwaukee, Wis. 53233
3. Pfaltz and Bauer, Inc.
   375 Fairfield Ave
   Stamford, Conn. 06902

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X F U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	1
Self Reaction	1

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 120.2

13.3 **Boiling Point at 1 atm.** 297°F = 147.6°C = 420.8°K

13.4 **Freezing Point:** −112°F = −80°C = 193°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.896 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** 4

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Data not available

13.13 **Heat of Combustion** [illegible] = −10,450 cal/g = −43.7 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Data not available

Continued on next page

NOTES

ELT	ETHYL LACTATE

Common Synonyms	Liquid	Colorless	Mild odor
Lactic acid ethyl ester Ethyl 2 hydroxypropionate Ethyl 2 hydroxypropanoate	Mixes with water		

[illegible]

Fire	Combustible [illegible]
Exposure	[illegible] LIQUID Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4

Issue warning water contaminant
Disperse and flush

2 LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Ethyl alpha hydroxypropionate Ethyl 2 hydroxypropanoate Ethyl DL Lactate Lactic acid ethyl ester

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula:** $CH_3CHOHCOOC_2H_5$

3 4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles, face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation of concentrated vapor may cause drowsiness. Contact with liquid causes mild irritation of eyes and is on prolonged contact skin. Ingestion may cause narcosis

5 3 **Treatment for Exposure:** INHALATION remove [illegible] fresh air EYES and SKIN flush well with water INGESTION induce vomiting get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** [illegible]

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** [illegible]

6 2 **Flammable Limits in Air:** [illegible]

6 3 **Fire Extinguishing Agents.** Water, dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature:** [illegible]

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Kay Fries Chemicals Inc
360 Lexington Avenue
New York N Y 10017

2 Aceto Chemical Co
126-02 Northern Boulevard
Flushing N Y [illegible]

3 Eastman Kodak Co
Eastman Organic Chemicals
Rochester N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

A P Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** [illegible]

13 3 **Boiling Point at 1 atm:** [illegible]

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** [illegible] at 20°C (liquid)

13 8 **Liquid Surface Tension.** 29 20 dynes/cm × 0.0292 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** [illegible]

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution.** Data not available

13 16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

EMC	ETHYL MERCAPTAN

Common Synonyms			
Ethanethiol Mercaptoethane Ethyl sulfhydrate Thioethyl alcohol	Liquid	Colorless to yellow	Strong skunk like odor

Floats and mixes slowly with water. Poisonous, flammable vapor is produced. Boiling point is 95° F.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources; fire-fighting particularly.
Stop discharge if possible.
May quench with water spray. Keep dilute vapor.
Isolate water discharge if possible.
Notify local health and wildlife officials.

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with foam, carbon dioxide, or dry chemical.
Water may be ineffective.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED
May cause central nervous system depression.
Prolonged exposure may cause irritation of eyes, nose, and throat.
Breathing difficulty, coma, death.
LIQUID
POISONOUS IF SWALLOWED
IF SWALLOWED and conscious, induce vomiting.
IF SWALLOWED and unconscious or convulsions, do not induce vomiting.

Water Pollution

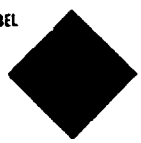
Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify water plant operators.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Isolate and deny ignition.
Avoid contact and inhalation.
Prevent access.
Evacuate area.
Dispose of properly.

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Ethanethiol, Ethyl hydrosulfide, Mercaptoethane, Thioethyl alcohol
3.2 **Coast Guard Compatibility Classification.** Not applicable
3.3 **Chemical Formula.** C_2H_5SH
3.4 **IMCO/United Nations Numerical Designation.** 1228

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Colorless
4.3 **Odor** Strong skunk like odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Protective clothing, goggles, respirator
5.2 **Symptoms Following Exposure** Inhalation: Headache, nausea, vomiting, coma, death. Ingestion: Nausea and vomiting.
5.3 **Treatment for Exposure** INHALATION: Remove victim to fresh air. Administer oxygen and artificial respiration. EYES: Flush with water. SKIN: Remove contaminated clothing. Wash with soap and water. INGESTION: Induce vomiting.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 10 ppm
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion** Grade 3: LD50 [illegible] mg/kg
5.7 **Late Toxicity** May cause central nervous system depression.
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point** <0°F C.C.
6.2 **Flammable Limits in Air** [illegible]
6.3 **Fire Extinguishing Agents** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products** Irritating fumes, sulfur dioxide are generated
6.6 **Behavior in Fire** Vapor is heavier than air and may travel long distance. Flashback along vapor trail may occur. Ignition and flashback: containers may explode. Toxic fumes are released when burned.
6.7 **Ignition Temperature.** [illegible]°F
6.8 **Electrical Hazard.** Data not available
6.9 **Burning Rate** [illegible] mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive
7.2 **Reactivity with Common Materials.** Not reactive
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Pennwalt Corporation
Chemicals Div.
Three Parkway
Philadelphia, PA 19102

Phillips Petroleum Co.
Chemical Department
Special Products Div.
Bartlesville, Okla. 74004

Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]
10.2 **Storage Temperature** Below 40°F
10.3 **Inert Atmosphere** Not required
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A P O E U V W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State (at 15°C and 1 atm):** Liquid
13.2 **Molecular Weight** 62
13.3 **Boring Point at 1 atm.** 95°F (35°C) (308°K)
13.4 **Freezing Point.** [illegible]°F (-147°C) (126°K)
13.5 **Critical Temperature** [illegible]°F (225°C) (498°K)
13.6 **Critical Pressure** [illegible] MN/m²
13.7 **Specific Gravity:** 0.839 at 20°C (water at 4°C)
13.8 **Liquid Surface Tension:** [illegible] dynes/cm = 0.02[illegible] N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** [illegible] dynes/cm = 0.02[illegible] N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 2.1
13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.08 at 15°C
13.12 **Latent Heat of Vaporization** [illegible] cal/g = [illegible] kJ/kg
13.13 **Heat of Combustion** [illegible] cal/g = [illegible] kJ/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

ETM — ETHYL METHACRYLATE

Common Synonyms
Ethyl methacrylate stabilized
Methacrylic acid ethyl ester
Ethyl 2-methacrylate
Ethyl alpha-methacrylate
Ethyl 2-methyl 2-propenoate

Liquid — Colorless — Sharp unpleasant odor

Floats on water

[illegible]

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning, high flammability
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Ethyl 2-methacrylate, Ethyl methacrylate, inhibited, Ethyl alpha-methacrylate, Ethyl 2-methyl 2-propenoate, Methacrylic acid ethyl ester
3.2 **Coast Guard Compatibility Classification:** Acrylate
3.3 **Chemical Formula** $CH_2=C(CH_3)COOC_2H_5$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Acrid, sharp

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Impervious gloves, chemical goggles, face shield, protective clothing, breathing apparatus if exposed to vapors or aerosols
5.2 **Symptoms Following Exposure:** Inhalation may cause irritation to the respiratory membrane. Ingestion causes irritation to the mouth and stomach. Contact irritates eyes and skin
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, apply artificial respiration and oxygen if indicated. INGESTION: induce vomiting, call a physician. EYES: wash with [illegible] SKIN: flush with water, wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade [illegible] LD_{50} [illegible] g/kg (rabbits)
5.7 **Late Toxicity:** Causes birth defects in experimental animals
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] F (C.C.)
6.2 **Flammable Limits in Air:** [illegible] (LEL)
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire.** Sealed containers may rupture/explode if heated. Fire can cause a violent polymerization reaction with rapid release of energy. Vapors are heavier than air and can travel to source of ignition and flash back
6.7 **Ignition Temperature** [illegible] F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** [illegible] mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** If proper concentration of inhibitor is not present or when material is hot, a violent polymerization reaction can occur
7.6 **Inhibitor of Polymerization** Oxygen is the [illegible] inhibits polymerization

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Polysciences, Inc.
Paul Valley Industrial Park
Warrington, Pa. [illegible]
Rohm and Haas
Independence Mall West
Philadelphia, Pa. 19105
2. E. I. duPont de Nemours & Co., Inc.
Plastics Dept.
Polymer Products Division
Wilmington, Del. 19898

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical
10.2 **Storage Temperature:** Below 85°F (100°F)
10.3 **Inert Atmosphere:** Ventilated inert gas
10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X F L /

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 114
13.3 **Boiling Point at 1 atm.** [illegible] °F = [illegible] °C = [illegible] K
13.4 **Freezing Point:** < -55°F = < -48°C = < 225°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.91-.91 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension.** Data not available
13.10 **Vapor (Gas) Specific Gravity:** 3.9
13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.06-1
13.12 **Latent Heat of Vaporization.** 170 Btu/lb = [illegible] cal/g = 4.0 × 10⁵ J/kg
13.13 **Heat of Combustion** 12,670 Btu/lb = [illegible] cal/g = [illegible] × 10⁷ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** -218 Btu/lb = -121 cal/g = -5.06 × 10⁵ J/kg

Continued on pages 3 and 4

NOTES

ETN	ETHYL NITRITE

Common Synonyms

Nitrous ether
Sweet spirit of nitre
Spirit of ether nitrite

Liquid — Colorless to light yellow — Pleasant odor

Floats on water. May boil on water. Boiling point [illegible]

Shut off ignition sources; call fire department. Stop discharge if possible. Keep people away. Isolate and remove leaking material. [illegible]

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-[illegible] breathing apparatus. [illegible] from safe distance or protected location. Extinguish with water. [illegible]

Exposure

[illegible] medical [illegible]

VAPOR

If inhaled will cause headache, dizziness, or loss of consciousness.
Move victim to fresh air.
If [illegible] give [illegible]

LIQUID

If swallowed will cause headache or loss of consciousness.
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Isolate area. Stop flammables. Remove sources. Evacuate area. Disperse and flush.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Nitrous ether. Spirit of ether nitrite. Sweet spirit of nitre.

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** C_2H_5ONO

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale yellow

4.3 **Odor:** Aromatic, ethereal characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, goggles, [illegible] and rubber gloves.

5.2 **Symptoms Following Exposure:** Inhalation vapor may cause headache, increased pulse rate, decreased blood [illegible], and unconsciousness. Contact with liquid irritates eyes and skin.

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure to fresh air; if breathing has been stopped give artificial respiration; call physician. EYES: flush with water. Contact lenses should be removed after initial irrigation. SKIN: flush with water; wash with soap and water. INGESTION: DO NOT induce vomiting; call physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] °C

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen are generated.

6.6 **Behavior in Fire:** Vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back. Use decomposition products above 194 F. Containers may explode in fire.

6.7 **Ignition Temperature:** 194 F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable if stored in a cool place and not exposed to strong light.

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Mallinckrodt Chemical Works
22 West Side Avenue
P.O. Box 84
Jersey City, N.J. [illegible]

Platz and Baum, Inc.
126-04 Northern Boulevard
Flushing, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Offered as pure [illegible] [illegible] Percent [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Nitrogen or [illegible]

10.4 **Venting:** Safety vent

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A B C D E F G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	[illegible]
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	
Reactivity	
Other Reactivity	
Water	0
Self Reaction	4

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	4
Reactivity (Yellow)	4

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible] °C = [illegible] K

13.4 **Freezing Point:** [illegible] °C = [illegible] K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] Liquid

13.8 **Liquid Surface Tension:** [illegible] Dynes/cm = [illegible] N/m at [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible] Dynes/cm = [illegible] N/m at [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available

13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/gm = [illegible] J/kg

13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/gm = [illegible] J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

EPS	ETHYLPHENYLDICHLOROSILANE

Common Symptoms	Liquid — Colorless — Sharp irritating odor Reacts with water. Poisonous gas is produced on contact with water
	[illegible]
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible]
Exposure	[illegible] GAS PRODUCED IN REACTION WITH WATER POISONOUS IF INHALED Irritating to eyes, nose and throat [illegible] LIQUID Will burn skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning [illegible] water contaminate

Restrict access

Disperse and [illegible]

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** [illegible]

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C_8H_{10}Cl_2SiO$

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp irritating odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor type respirators or protective rubber gloves, chemical worker's goggles, other equipment as necessary to protect skin and eyes

5.2 **Symptoms Following Exposure:** Inhalation irritates nose and throat. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth, throat, stomach

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give artificial respiration if needed, call physician. EYES: flush with water for 15 min, take to medical attention immediately. SKIN: flush with water, obtain medical attention if burning has occurred. INGESTION: if victim is conscious give large amounts of water, induce vomiting, get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1: [illegible] 50 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that persons will find high concentrations unpleasant. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** > 300 F (C.C.)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water [illegible]

6.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene fumes may be formed

6.6 **Behavior in Fire:** Difficult to extinguish (requires [illegible]). Contact with water applied to adjacent [illegible] may generate [illegible] hydrogen chloride gas

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts with water to generate hydrogen chloride (hydrochloric acid)

7.2 **Reactivity with Common Materials:** Will react with surface moisture to form hydrogen chloride which will corrode common metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Dow Corning Corporation
P.O. Box 592
Midland, Mich. 48640

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

A O

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Toxicity	1
Liquid or Solid Toxicity	3
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	3
Self Reaction	

12.3 **NFPA Hazard Classifications:** Not [illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 209.1

13.3 **Boiling Point at 1 atm:** > 400 F = > 429 C = > 422°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 15°C (liquid)

13.8 **Liquid Surface Tension:** [illegible] Dynes/cm = [illegible] N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] x 10^3 J/kg

13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] x 10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

EPD	ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS

Common Synonyms	Liquid	Colorless	Choking odor
Ethylthiophosphonyl dichloride	Reacts with water. Poisonous gas is produced on contact with water.		

May decompose if possible. Keep [illegible]
Cool [illegible] temperature
[illegible]

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE
Wear oxygen and [illegible] breathing apparatus
Extinguish with dry [illegible] powder or carbon dioxide
DO NOT USE WATER OR FOAM ON FIRE

Exposure

CALL FOR MEDICAL AID
GAS PRODUCED IN REACTION WITH WATER
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move [illegible]
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim [illegible] CONVULSIONS [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Dike [illegible] water [illegible] contaminant
Neutralize
Disperse and flush [illegible]

2 LABEL

3 CHEMICAL DESIGNATION*

3.1 **Synonyms:** Ethylphosphonothioic dichloride; Ethylthiophosphonyl dichloride
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $C_2H_5PSCl_2$
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Acid and choking

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]
5.2 **Symptoms Following Exposure:** Inhalation [illegible] may be delayed [illegible] Contact with liquid causes painful irritation, [illegible] and severe burns and possible damage [illegible]
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air [illegible] EYES: flush thoroughly with water and seek medical attention. SKIN: wash thoroughly with soap and water. INGESTION: give large amounts of water, induce vomiting, get medical attention [illegible]
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible]
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] F OC
6.2 **Flammable Limits in Air:** Not applicable
6.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or air
6.5 **Special Hazards of Combustion Products:** Oxides of sulfur, phosphorus, hydrogen chloride and phosgene
6.6 **Behavior in Fire:** Contact with water or exposure to adjacent fires will produce irritating fumes of hydrogen chloride
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts with water to produce hydrogen chloride (hydrochloric acid)
7.2 **Reactivity with Common Materials:** Will react with surface moisture to produce hydrogen chloride which will react with common metals
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water. Treat with sodium bicarbonate or lime solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Ethyl Corporation
Industrial Chemicals Division
Ethyl Tower
[illegible] Florida
Baton Rouge, La. [illegible]

Pfizer and Bauer, Inc.
[illegible] Southern Boulevard
Flushing, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Blanketed with dry nitrogen
10.4 **Venting:** Pressure [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

X O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not [illegible]
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not [illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm.:** [illegible] K
13.4 **Freezing Point:** [illegible] K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] F/4 F liquid
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible] Btu/lb [illegible] kcal/g [illegible] J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

EPP — ETHYL PHOSPHORODICHLORIDATE

Common Synonyms

Phosphorodichloridic acid ethyl ester
Ethyl dichlorophosphate

Liquid — Colorless — Choking odor

Reacts with water. Irritating gas is produced on contact with water

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY
Wear as gloves, self contained breathing apparatus and rubber suit. Turn off ignition (including pilots)
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Fire, data not available

Exposure

Call for medical aid

VAPOR

Irritating to eyes, nose and throat
Harmful if inhaled
Move victim to fresh air
If breathing is difficult, give oxygen

LIQUID

Will burn skin and eyes.
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning: corrosive water contaminant
Restrict access
Disperse and flush with care

2 LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ethyl dichlorophosphate; Phosphorodichloridic acid ethyl ester
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula** $C_2H_5OCl_2PO$
3 4 **IMCO/United Nations Numerical Designation:** 8/1760

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color:** Colorless
4 3 **Odor** Acrid, choking

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles and face shield, self contained or air line respirator, rubber gloves, boots, and clothing
5 2 **Symptoms Following Exposure.** Inhalation of vapor irritates nose and throat. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach
5 3 **Treatment for Exposure.** INHALATION: remove victim from exposure. If he is breathing has stopped, start artificial respiration, call a doctor. EYES: flush with water for at least 15 min, get medical attention for burns. SKIN: flush with water, get medical attention for burns. INGESTION: do NOT induce vomiting, give large amounts of water, followed by milk or milk of magnesia
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Data not available
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents** Dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water or foam
6 5 **Special Hazards of Combustion Products.** Irritating fumes of hydrogen chloride and phosphoric acid may be formed
6 6 **Behavior in Fire** Contact with water applied to adjacent fires produces irritating fumes of hydrogen chloride
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard** Data not available
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts with water to evolve hydrogen chloride (hydrochloric acid)
7 2 **Reactivity with Common Materials:** Will react with surface moisture to evolve hydrogen chloride which is corrosive to common metals
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 West Saint Paul Ave
Milwaukee, Wis 53233

2 Pfaltz and Bauer, Inc
126 04 Northern Boulevard
Flushing, N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 97%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A O

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 162 9
13 3 **Boiling Point at 1 atm.** 333°F = 167°C = 440°K
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 1 35 at 19°C (liquid)
13 8 **Liquid Surface Tension** (est) 32 5 dynes/cm = 0 0325 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion.** (est) −4 700 Btu/lb = −2 600 cal/g = −110 × 10³ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization.** Not pertinent

(Continued on page 5 each)

NOTES

EPA — 2-ETHYL-3-PROPYLACROLEIN

Common Synonyms
2 Ethyl-2-hexenal
2 Ethyl-3-propyl acrylaldehyde

Liquid — Yellow

Floats on water

[illegible]

Fire

Combustible
Water goggles [illegible] and rubber coated clothing [illegible]
Extinguish with dry chemical or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floating to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** 2 Ethyl 2 hexenal
2 Ethyl 3 propylacrylaldehyde

3 2 **Coast Guard Compatibility Classification** Aldehyde

3 3 **Chemical Formula** $CH_3CH_2CH{=}CC_2H_5CHO$

3 4 **IMCO/United Nations Numerical Designation:** 3 3 1191

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Yellow

4 3 **Odor** Sharp powerful irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Protective clothing eye protection approved respirator for high vapor concentrations

5 2 **Symptoms Following Exposure** Vapor is irritating Contact produces skin and eye irritation

5 3 **Treatment for Exposure** Remove from exposure Wash affected areas of body with water for 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Grade 2 LD50 0 5 to 5 g/kg (rat)

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics** Causes smarting of the skin and first degree burns on short exposure may cause secondary burns on long exposure

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 155°F CC

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents** Alcohol foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** 200 C

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** 52 (theor) 10 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York N Y 10017

10 SHIPPING INFORMATION

10 **Grades or Purity** Technical

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

A T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight.** 126 2

13 3 **Boiling Point at 1 atm:** 283°F = 175°C = 448°K

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity.** 0 85 at 15 C (liquid)

13 8 **Liquid Surface Tension.** 28 2 dynes/cm = 0 0282 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension** not 140 dynes/cm = 0 04 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity.** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion** -15,610 Btu/lb = -8670 cal/g = 363 × 10³ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

ESC	# ETHYL SILICATE

Common Synonym	Water Liquid	Colorless	Mild odor
Tetraethyl silicate Silbond Tetraethyl orthosilicate Ethyl orthosilicate Ethyl silicate 40 Ethyl silicate condensed	May float or sink in water. Reacts slowly with water.		

Stop discharge if possible. Keep people away.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Extinguish with water fog, foam, dry chemical, carbon dioxide.

Exposure

Call for medical aid.
LIQUID
Irritating to eyes.
If swallowed will cause nausea and vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES: hold eyelids open and flush with plenty of water.
IF SWALLOWED and skin is CONSCIOUS: have victim drink large quantities of water; induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS or HAS CONVULSIONS: do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify owners of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush.

2. LABELS

No label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** Ethyl orthosilicate, Ethyl silicate 40, Ethyl silicate condensed, Silbond, Tetraethyl orthosilicate, Tetraethyl silicate.

3.2 **Coast Guard Compatibility Classification** Not applicable.

3.3 **Chemical Formula.** $(C_2H_5O)_4Si$

3.4 **IMCO/United Nations Numerical Designation** 3.3 292

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild and nauseating, residual fruity

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Rubber or polyethylene gloves, safety glasses or other form of eye protection, self contained breathing apparatus or one that absorbs organic vapors.

5.2 **Symptoms Following Exposure.** Inhalation of vapor causes eye and nose irritation, unsteadiness, tremors, salivation, respiratory difficulty and unconsciousness. Contact with liquid irritates eyes and may cause dryness, cracking and inflammation of skin. Ingestion may produce nausea, vomiting and cramps.

5.3 **Treatment for Exposure:** INHALATION: move patient from contaminated atmosphere; if his breathing has ceased start mouth to mouth artificial respiration; oxygen if available should be administered only by an experienced person when authorized by a physician; keep patient warm and comfortable; call physician immediately. EYES: flush immediately with large quantities of running water for at least 15 min; obtain medical attention if irritation persists. SKIN: immediately flush affected areas with large volumes of water; obtain medical attention if irritation persists. INGESTION: give large amounts of water or warm salty water and induce vomiting; milk, eggs or olive oil may then be given; obtain medical attention if abdominal discomfort persists.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm

5.5 **Short-Term Inhalation Limits.** 500 ppm for 30 min

5.6 **Toxicity by Ingestion** Data not available

5.7 **Late Toxicity:** Liver, kidney and lung damage may result from overexposures by inhalation or ingestion.

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

(Continued on page 4)

6. FIRE HAZARDS

6.1 **Flash Point.** 125°F (C.C.) 99°F (C.C.)

6.2 **Flammable Limits in Air:** LEL 2.3%

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Data not available

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate.** 4.4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly forming non-toxic silica and ethyl alcohol

7.2 **Reactivity with Common Materials.** Causes swelling and hardening of some plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Stauffer Chemical Company
   Specialty Chemical Division
   Westport, Conn. 06880
2. Union Carbide Corporation
   Chemicals and Plastics Div.
   270 Park Avenue
   New York, N.Y. 10017
3. Dynamit Nobel of America, Inc.
   105 Stonehurst Court
   Northvale, N.J. 07647

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 98%, 99+%

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere.** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O T U A Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight** 208.3

13.3 **Boiling Point at 1 atm**
336°F = 169°C = 442°K

13.4 **Freezing Point.**
−121.9°F = −85.5°C = 187.7°K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.933 at 20°C (liquid)

13.8 **Liquid Surface Tension.**
22.8 dynes/cm = 0.0228 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13.12 **Latent Heat of Vaporization.** 90 Btu/lb
= 50 cal/g = 2.2 × 10⁵ J/kg

13.13 **Heat of Combustion.** (est.) −12 000 Btu/lb
= −6 700 cal/g = −280 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

5. HEALTH HAZARDS (Cont'd.)

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 88 ppm

ETS — ETHYLTRICHLOROSILANE

Common Synonyms

Trichloroethylsilane
Ethylsilicon trichloride
Ethylsilicone trichloride
Trichloroethylsilane

Liquid — Colorless — Sharp irritating odor

Reacts violently with water. Irritating gas is produced on contact with water

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY
Wear goggles, self-contained breathing apparatus and rubber protective clothing including gloves
Stop all ignition sources. Call fire department
Stop leakage if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus
Extinguish with dry chemical, alcohol foam, carbon dioxide
Water may be ineffective in fire
Cool exposed containers with water

Exposure

Call for medical aid

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing
Move victim to fresh air
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED drink water
IF CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

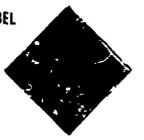
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and pollution officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — high flammability, corrosive
Restrict access
Disperse and dilute with water

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ethylsilicon trichloride
Ethylsilicon trichloride
Trichloroethylsilane
Trichloroethylsilicone

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula.** $C_2H_5SiCl_3$

3.4 **IMCO/United Nations Numerical Designation.** 3.2/1196

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp hydrochloric acid like pungent acrid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Full protective clothing, acid vapor type respirators, protection rubber gloves, chemical worker's goggles, other equipment as necessary to protect skin and eyes

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with liquid causes severe burns of eyes and skin. Ingestion causes burns of mouth and stomach

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure, administer artificial respiration if breathing has stopped, call physician. EYES: flush with water for 15 min, obtain medical attention immediately. SKIN: flush with water, obtain medical attention immediately if irritation persists. INGESTION: give large amounts of water, get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 1,370 mg/kg (rat)

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor causes severe irritation of the eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to the eyes

5.10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6.1 **Flash Point.** 57°F C.C.

6.2 **Flammable Limits in Air** Data not available

6.3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6.5 **Special Hazards of Combustion Products** Toxic hydrogen chloride and phosgene gases are formed

6.6 **Behavior in Fire.** Vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back. Difficult to extinguish. Reignition may occur. Contact with water applied to adjacent fires will produce irritating hydrogen chloride fumes

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate** 2.0 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously evolving hydrogen chloride (hydrochloric acid)

7.2 **Reactivity with Common Materials** Reacts with surface moisture to form hydrogen chloride, which is corrosive to common metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Div
270 Park Avenue
New York, N.Y. 10017

2. Dow Corning Corporation
P.O. Box 592
Midland, Mich. 48640

3. Petrarch Systems
P.O. Box 141
Levittown, Pa. 19059

10. SHIPPING INFORMATION

10.1 **Grades or Purity** 99+%

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XO

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	3
Self Reaction	1

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight.** 163.5

13.3 **Boiling Point at 1 atm**
210°F = 99°C = 372°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity** 1.24 at 25°C (liquid)

13.8 **Liquid Surface Tension** (est.)
25 dynes/cm = 0.025 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity** 4.6

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization:** 104 Btu/lb
= 58 cal/g = 2.4 × 10⁵ J/kg

13.13 **Heat of Combustion.** (est.) −4,400 Btu/lb
= −7,400 cal/g = −1.00 × 10⁷ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

FAC

FERRIC AMMONIUM CITRATE

Common Synonyms
Ammonium ferric citrate
Ferric ammonium citrate, brown
Ferric ammonium citrate, green

Solid — Red, green or brown — Odorless

Sinks and mixes slowly with water

Avoid contact with solid and dust. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids apart and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, give a cup of milk, water, or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR IS RAVING, CONVULSING or vomiting except keep head below hips.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of affected water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Ammonium ferric citrate
Ferric ammonium citrate, brown
Ferric ammonium citrate, green

3 2 **Coast Guard Compatibility Classification**
Not listed

3 3 **Chemical Formula.** Mixture of $FeC_6H_5O_7$ $(NH_4)_3C_6H_5O_7$ and water of hydration

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Red, green, or brown

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved respirator for nuisance dust, chemical goggles or face shield

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes and causes mild irritation of skin on prolonged contact

5 3 **Treatment for Exposure:** INGESTION: give large amount of water. EYES or SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 1 mg/m³ (as iron)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen or ammonia gas may be formed in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1 Pfizer Chemicals Div
235 E 42nd St
New York, N Y 10017

2 Mallinckrodt Chemical Works
223 Westside Ave
P O Box 384
Jersey City, N J 07303

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15° C and 1 atm:** Solid

13 2 **Molecular Weight:** Not pertinent (mixture)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.8 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

FAO

FERRIC AMMONIUM OXALATE

Common Synonyms			
Ammonium ferric oxalate trihydrate Ammonium trioxalatoferrate III trihydrate	Solid powder	Yellowish-green	Light burnt sugar odor
	Sinks and mixes with water		

Avoid contact with solid and dust. Keep people away.
Notify public if large or possible.
Isolate and restrict use of affected area.
Notify local health and pollution control agencies.

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
Prevent dust from spreading by covering with plastic sheet.
If breathing stops, give artificial respiration.
If necessary, give oxygen.

SOLID
Will burn skin and eyes
If swallowed will cause nausea and vomiting
Avoid contact with solid and dust.
Flush affected areas with plenty of water.
IF IN EYES: Hold eyelids open and flush gently with water.
IF SWALLOWED: Never give anything by mouth to unconscious person.
IF SWALLOWED: Induce vomiting if conscious and not showing convulsions.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify downstream users of possible problem.
Notify public if drinking water supplies are affected.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning if water contaminant.
Disperse and flush.

2 LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ammonium ferric oxalate trihydrate; Ammonium trioxalatoferrate trihydrate
3.2 **Coast Guard Compatibility Classification** Not listed
3.3 **Chemical Formula:** $Fe(NH_4)(C_2O_4)_3 \cdot 3H_2O$
3.4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color.** Yellowish green
4.3 **Odor.** Slight burnt sugar odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved dust respirator, rubber or plastic coated gloves, chemical goggles or face shield.
5.2 **Symptoms Following Exposure** Inhalation of dust may cause irritation of nose and throat. Ingestion causes burning pain in throat and stomach, mucous membranes become white; vomiting also causes; weak pulse, cold, vascular collapse and death. Contact with dust irritates eyes and skin, may cause severe skin burns.
5.3 **Treatment for Exposure** *treat victim promptly.* INHALATION: move to fresh air, get medical attention if any symptoms persist. INGESTION: give immediately dilute solution of any soluble calcium salt such as calcium lactate, limewater, chalk or milk; induce vomiting; get medical attention if blisters or edema of the glottis and delayed constriction of esophagus. EYES: flush with water and get medical attention. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m³ (as Fe)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Data not available
5.9 **Liquid or Solid Irritant Characteristics** Data not available
5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air.** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen, ammonia and carbon monoxide
6.6 **Behavior in Fire**
6.7 **Ignition Temperature** Not pertinent
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Not pertinent
7.2 **Reactivity with Common Materials**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Pfizer Chemicals Div.
235 E. 42nd St.
New York, N.Y. 10017
2. Pfizer and Bauer, Inc.
[illegible] Fairfield Ave.
Stamford, Conn. 06902

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature.** Ambient
10.3 **Inert Atmosphere** Not required
10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid
13.2 **Molecular Weight:** 428
13.3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.78 at 20°C (solid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

FCL	# FERRIC CHLORIDE

Common Synonyms			
Iron III chloride Iron perchloride Iron trichloride Ferric chloride anhydrous Ferric chloride, hexahydrate	Solid	Greenish black	Odorless
	Sinks and mixes with water		

[illegible]

Fire

Not flammable

Exposure

CAUTION MELTS AT [illegible]

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
Will burn skin and eyes
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ferric chloride anhydrous, Ferric chloride hexahydrate, Iron (III) chloride, Iron perchloride, Iron trichloride

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $FeCl_3$ or $FeCl_3 \cdot 6H_2O$

3 4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Anhydrous greenish black, Hydrate brown

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator if required, rubber apron and boots, chemical worker's goggles or face shield

5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes. Prolonged contact with skin causes irritation and burns

5 3 **Treatment for Exposure:** INGESTION give large amounts of water, induce vomiting if large amounts have been swallowed. EYES immediately flush with pints of water for at least 15 min, get medical aid as promptly. SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³ (as iron)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used**

6 5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Water solutions are acidic and corrosive to most metals

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute sodium bicarbonate or soda ash solutions

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
1.2 ppm 144 hr stickleback harmful fresh water
1 ppm 240 hr stickleback safe fresh water
18 ppm 96 hr daphnia TL_m fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Pennwalt Corp
Three Parkway
Philadelphia, Pa 19102

2 Dow Chemical Co
Midland, Mich 48640

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Anhydrous, Hydrate Reagent 46% solution in water

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NN

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 162.22 (anhydrous)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.8 at 20°C (anhydrous solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** (anhydrous) = [illegible] Btu/lb
[illegible] J/kg

13 16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

FCP	FERRIC GLYCEROPHOSPHATE

Common Synonyms	Solid — Greenish brown to greenish yellow Sinks and mixes with water

Avoid contact with solid and dust. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID **DUST** **Irritating to eyes, nose and throat** **If inhaled will cause coughing or difficult breathing** If in eyes: hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. **SOLID** **Irritating to skin and eyes** **Harmful if swallowed** Remove contaminated clothing and shoes. Flush affected area with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have him drink water, milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify other users of affected water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush.

2. LABELS

No hazard label required by Coast Guard Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms.
3.2 **Coast Guard Compatibility Classification:** Not listed.
3.3 **Chemical Formula:** (approx.) $Fe[C_3H_5O_6PO_4]_3 \cdot H_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed.

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Greenish brown to greenish yellow
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, dust mask, rubber gloves.
5.2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Contact with dust irritates eyes and can prolonged contact skin.
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water, induce vomiting if large amounts have been swallowed. EYES: flush with water for at least 15 min. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m³ (as Fe)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** Not applicable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Platz and Bauer, Inc.
   [illegible] Fairfield Ave.
   Stamford, Conn. 06902
2. Shepherd Chemical Co.
   [illegible] Beech St.
   Cincinnati, Ohio 45212

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Not required
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

NN

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 470 (approx.)
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 0 C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

FNT	# FERRIC NITRATE

Common Synonyms		
Ferric nitrate nonahydrate Nitric acid, iron(III) salt	Solid — Green, colorless to pale violet	Odorless
	Sinks and mixes with water	

[illegible]

Fire	**Not flammable** **Will increase the intensity of a fire.** [illegible]
Exposure	CALL FOR MEDICAL AID **DUST** **Irritating to eyes, nose and throat** **If inhaled will cause coughing or difficult breathing** [illegible] **SOLID** **Irritating to skin and eyes** **Harmful if swallowed** [illegible] **IF IN EYES** [illegible] **IF SWALLOWED** [illegible] CONSCIOUS [illegible] and have victim induce vomiting **IF SWALLOWED** [illegible] UNCONSCIOUS OR HAVING CONVULSIONS [illegible]
Water Pollution	**Effect of low concentrations on aquatic life is unknown** **May be dangerous if it enters water intakes** [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ferric nitrate nonahydrate
Nitric acid, iron(III) salt

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Fe(NO_3)_3 \cdot 9H_2O$

3 4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Green, colorless to pale violet

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes and can irritate skin on prolonged contact

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water, induce vomiting if large amounts have been swallowed. EYES: flush with water, get medical attention if irritation persists. SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 1 mg/m³ (as iron)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 2 LD50 [illegible] g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** [illegible]

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and nitric acid vapor may form in fires

6 6 **Behavior in Fire:** In contact with combustible materials will increase the intensity of a fire. Apply water to cool containers or spilled material

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Solutions are corrosive to most metals. Contact of solid with wood or paper may cause fire

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Industrial Chemicals Div
P O Box 70
Morristown, N J 07960

2 J T Baker Chemical Co
Phillipsburg, N J 08865

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 99.0%
Analytical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-5)

NN

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 404.02

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 47°C = 320 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** [illegible] at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** 40.8 kcal/lb
= 22 cal/g = 0.92 × 10³ J/kg

13 16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

FSF	FERRIC SULFATE

Common Synonyms Iron(III) sulfate Iron tersulfate Iron sesquisulfate	Solid — Gray to white — Odorless Sinks and mixes slowly with water
	[illegible]
Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Dispersal and flush

2 LABELS

[illegible] Hazardous Materials Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Iron sesquisulfate, Iron(III) sulfate, Iron tersulfate

3.2 **Coast Guard Compatibility Classification.** Not Listed

3.3 **Chemical Formula:** $Fe_2(SO_4)_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** [illegible]

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles, chemical protective clothing

5.2 **Symptoms Following Exposure:** Inhalation of dust: irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes and skin. [illegible]

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water, induce vomiting. Have an emetic [illegible] Immediately. EYES: Flush with water. Get medical attention. [illegible] SKIN: Flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion.** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** [illegible]

6.6 **Behavior in Fire:** [illegible]

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Corrosive to copper, copper alloys, mild steel and galvanized steel

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.[illegible] ppm 72-24 hr shiners, carp suckers killed, fresh water
[illegible] ppm 48 hr mosquito fish TL[illegible] fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. [illegible] Chemical Co, Phillipsburg, N.J. [illegible]
2. Cities Service Co, Industrial Chemicals Div, 3445 Peachtree Road N.E., Atlanta, Ga. 30326
3. Mallinckrodt Chemical Works, 222 Westside Ave, P.O. Box 384, Jersey City, N.J. 07303

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous, Hydrate [illegible] sometimes shipped as water solutions which are acidic

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

NN

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (solids)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

FAS	FERROUS AMMONIUM SULFATE

Common Synonyms		
Mohr's salt Iron ammonium sulfate Ferrous ammonium sulfate hexahydrate	Solid Sinks and mixes slowly with water	Pale blue-green Odorless

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Dilute and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ammonium ferrous sulfate, Ammonium iron sulfate, Ferrous ammonium sulfate hexahydrate, Iron ammonium sulfate, Mohr's salt

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Pale blue-green

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective clothing

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat, repeated exposure causes irritation of mouth and stomach. Dust irritates eyes and can irritate skin when prolonged contact

5 3 **Treatment for Exposure:** INGESTION give large quantities of water, induce vomiting. Large amounts have been swallowed. EYES or SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m³ (as Fe)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 5 g/kg (rat)

5 7 **Late Toxicity:** May cause eye degeneration in rabbits

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating and toxic ammonia and oxides of nitrogen may form in fires

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
General Chemical Div
P O Box 1057
New York, N Y 10006

2 J T Baker Chemical Co
Phillipsburg, N J 08865

3 Mallinckrodt Chemical Works
2 Westside Ave
P O Box 164
Jersey City, N J 07304

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 99 102%, Reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NX

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 1 and 1 atm:** Solid

13 2 **Molecular Weight:** 392.14

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.86 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 3

NOTES

FEC	FERROUS CHLORIDE

Common Synonyms			
Iron dichloride Iron protochloride Ferrous chloride tetrahydrate	Solid	Pale green	Odorless
	Sinks and mixes slowly with water		

[illegible]

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID **DUST** Irritating to eyes, nose and throat If inhaled will cause difficult breathing [illegible] **SOLID** Irritating to skin and eyes If swallowed will cause nausea and vomiting [illegible] IF IN EYES [illegible] IF SWALLOWED [illegible] IF SWALLOWED [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ferrous chloride, tetrahydrate, Iron dichloride, Iron protochloride

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula:** FeCl 4H2O

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Pale green

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes and may cause skin irritation on prolonged contact

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: if large amounts are swallowed, prompt [illegible] and get medical help. EYES: flush with plenty of water [illegible] medical help promptly [illegible] SKIN: wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Solutions may corrode metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** <38 ppm/64 hr daphnia toxic fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co
   Midland, Mich 48640
2. Mallinckrodt Chemical Works
   223 Westside Ave
   P O Box 384
   Jersey City, N J 07303
3. K. A. Chemicals Inc
   2720 Des Plaines Ave
   Des Plaines, Ill 60018

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 35% solution in water

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

FFB	FERROUS FLUOROBORATE

Common Synonyms Ferrous borofluoride	Liquid Sinks and mixes with water	Yellow-green

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY

[illegible]

Fire	Not flammable Irritating gases may be produced when heated
Exposure	CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED [illegible] LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting [illegible] IF IN EYES [illegible] IF SWALLOWED [illegible] IF SWALLOWED [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning - water contaminant
Dispersal and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ferrous borofluoride
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $FeBF_4 \cdot H_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Yellow-green
4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Ingestion causes [illegible] Contact with eyes or skin causes irritation
5.3 **Treatment for Exposure:** INGESTION: give large amount of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

American Hoechst Corp.
Chemicals and Plastics Division
Somerville, N.J. 08876

2 Harstar Chemical Corp.
[illegible] 39th Street
Brooklyn, N.Y. [illegible]

3 Pfaltz and Bauer, Inc.
[illegible] Fairfield Ave.
Stamford, Conn. 06902

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible] in water
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

V/P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 5

NOTES

FOX	FERROUS OXALATE

Common Synonyms	Solid	Yellow	Odorless
Oxalic acid, ferrous salt Ferrous Iron protoxalate Ferrous oxalate dihydrate	Sinks in water		

[illegible]

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Should be removed

Chemical and physical [illegible]

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ferrous oxalate dihydrate; Ferrous iron protoxalate; Oxalic acid ferrous salt

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $FeC_2O_4 \cdot 2H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Pale yellow

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** [illegible] INHALATION [illegible] INGESTION [illegible] EYES [illegible] SKIN [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** [illegible]

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Cities Service Co.
[illegible] Peachtree Road, N.E.
Atlanta, Ga. [illegible]

2. Pfaltz and Bauer, Inc.
[illegible] Fairfield Ave.
Stamford, Conn. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.3 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 5

NOTES

FRS

FERROUS SULFATE

Common Synonyms	Solid	Green	Odorless
Iron vitriol Green vitriol Copperas Iron (ous) sulfate	Sinks and mixes with water		

[illegible] remove discharged material [illegible]

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID SOLID If swallowed will cause nausea, vomiting or loss of consciousness [illegible] [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Copperas
Green vitriol
Iron(ous) sulfate
Iron vitriol

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula** $FeSO_4 \cdot 7H_2O$

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid

4.2 **Color:** Green

4.3 **Odor** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Mask if dust is present

5.2 **Symptoms Following Exposure** INGESTION abdominal pain, retching, diarrhea, dehydration, shock, pallor, cyanosis, rapid or weak pulse, shallow respiration, low blood pressure

5.3 **Treatment for Exposure** INGESTION give milk immediately and then induce vomiting by stroking the pharynx with a blunt object such as a spoon handle. Gastric lavage with 1 pint of [illegible] solution [illegible] monosodium phosphate if promptly available, otherwise use water. Get medical [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion** Grade 2 TDs 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics.** None

5.10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air.** Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
100 ppm 4.2 hr bass lethal fresh water
56 ppm 48 hr shrimp LC salt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Cosmin Corp
830 North East Loop
San Antonio, Tex 78209
2. NL Industries, Inc
Titanium Pigment Division
St Louis, Mo 63111
3. Pfizer, Inc
C. K. Williams & Co. Division
640 N. 13th St
Easton, Pa 18042

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** USP Commercial

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid

13.2 **Molecular Weight** 169.96

13.3 **Boiling Point at 1 atm** Not pertinent

13.4 **Freezing Point** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity** 1.90 at 15°C (solid)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

FXX	# FLUORINE

Common Synonyms

Liquefied gas — Clear to yellow — Very irritating odor

Liquid sinks and boils in water. Poisonous visible vapor cloud is produced

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY
Wear chemical protective suit
Stop discharge if possible
Evacuate area in case of large discharge
Notify local health and pollution control agencies

Fire

Not flammable
WILL CAUSE FIRE AND REACT VIOLENTLY WITH COMBUSTIBLES
POISONOUS GAS IS PRODUCED IN FIRE
Wear chemical protective suit with self-contained breathing apparatus
Combat fires from behind barrier with remote-held hose holder or monitor nozzle
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to eyes
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Will burn skin and eyes
Will cause frostbite
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
DO NOT RUB AFFECTED AREAS

Water Pollution

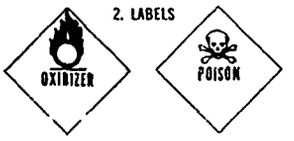
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-7)

Issue warning: poison
Restrict access
Evacuate area

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula** F_2
3.4 **IMCO, United Nations Numerical Designation** 2.0/1045

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Compressed gas
4.2 **Color.** Pale yellow
4.3 **Odor** Strong, choking, intense

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Tight-fitting chemical goggles, special clothing not easily ignited by fluorine gas
5.2 **Symptoms Following Exposure:** Severe burning of eyes, skin and respiratory system. The burns may develop slowly after exposure
5.3 **Treatment for Exposure.** Flush all affected parts with water for at least 15 min. Do NOT use ointments. Administer artificial respiration and oxygen if required
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 1 ppm
5.5 **Short-Term Inhalation Limits** 0.5 ppm for 5 min
5.6 **Toxicity by Ingestion:** Not pertinent
5.7 **Late Toxicity:** Severe burns may develop slowly after exposure
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations
5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes
5.10 **Odor Threshold:** 0.035 ppm

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air.** Not flammable
6.3 **Fire Extinguishing Agents.** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Do not direct water onto fluorine leaks
6.5 **Special Hazards of Combustion Products** Toxic gases generated in fires involving fluorine
6.6 **Behavior in Fire** Dangerously reactive gas. Ignites most combustibles
6.7 **Ignition Temperature** Not flammable
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Reacts with water to form hydrogen fluoride, oxygen and oxygen difluoride
7.2 **Reactivity with Common Materials:** Reacts violently with all combustible materials except the metal cylinders in which it is shipped
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** 2.3 ppm * trout, 11 mg/liter water
*Time period not specified
8.2 **Waterfowl Toxicity.** Data not available
8.3 **Biological Oxygen Demand (BOD).** None
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals, Inc., Allentown, Pa. 18105
2. Allied Chemical Corp., Specialty Chemicals Division, Baton Rouge, La. 70821
3. Union Carbide Corp., Nuclear Division, 270 Park Ave., New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 98+%
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Safety relief

11 HAZARD ASSESSMENT CODE*

(See Hazard Assessment Handbook, CG 446-3)

A C

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Non-Flammable Gas
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	4
	W OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Gas
13.2 **Molecular Weight:** 37.99
13.3 **Boiling Point at 1 atm** −306°F = −188°C = 85 K
13.4 **Freezing Point.** −362°F = −219°C = 54 K
13.5 **Critical Temperature** −199.5°F = −128°C = 144.6 K
13.6 **Critical Pressure** 806.7 psia = 55.0 atm = 5.57 MN/m²
13.7 **Specific Gravity** 1.5 at −188°C (gas)
13.8 **Liquid Surface Tension** Not pertinent
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.362
13.12 **Latent Heat of Vaporization** 71.6 Btu/lb = 39.8 cal/g = 1.67 × 10⁵ J/kg
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

(See Hazard Assessment Handbook)

NOTES

REVISED 1978

FSL

FLUOSILICIC ACID

Common Synonyms
Hydrofluosilicic acid
Hydrogen hexafluorosilicate
Hexafluosilicic acid
Silicofluoric acid
Fluorosilicic acid
Sand acid

Liquid | Colorless | Sharp unpleasant odor

Sinks and mixes with water

Avoid contact with liquid and vapor. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not Flammable
Irritating gases may be produced when heated

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
If exposed flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Will burn skin and eyes
If swallowed will cause nausea
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS give water to drink.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local authorities if fish are killed.
Notify operators of downstream water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Hydrofluosilicic acid, Hexafluosilicic acid, Hydrofluosilicic acid, Hydrogen hexafluorosilicate, Sand acid, Silicofluoric acid
3.2 **Coast Guard Compatibility Classification** Not listed
3.3 **Chemical Formula** H_2SiF_6
3.4 **IMCO/United Nations Numerical Designation.** 8 [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Transparent straw colored or colorless
4.3 **Odor** Acrid, sharp

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, safety glasses, protective clothing
5.2 **Symptoms Following Exposure** Inhalation of vapor produces severe corrosive effect on mucous membrane. Ingestion causes severe burns of mouth and stomach. Contact of liquid or vapor causes severe burns of eyes and skin.
5.3 **Treatment for Exposure** INHALATION remove victim to fresh air and medical attention. INGESTION give large amounts of water, do NOT induce vomiting. EYES immediately wash with water for 15 min, call physician. SKIN wash affected parts with water, treat for hydrogen fluoride burn, wash with bicarbonate of sodium solution.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits** Data not available
5.6 **Toxicity by Ingestion** Data not available
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products** Irritating fumes of hydrogen fluoride may form in fire
6.6 **Behavior in Fire.** Not pertinent
6.7 **Ignition Temperature** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Will corrode most metals producing flammable hydrogen gas which may collect in enclosed spaces
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water, rinse with dilute solution of sodium carbonate or soda ash
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity.** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 W. R. Grace & Co.
Agricultural Chemicals Group
Baltimore, Md. 21203

2 The Harshaw Chemical Co.
1945 E. 97 St.
Cleveland, Ohio 44106

3 Pfizer and Bauer, Inc.
3 Fairfield Ave.
Stratford, Conn. 06602

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 22, 30, 40 solutions in water
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-F

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	[illegible]
Poisons	[illegible]
Water Pollution	
Human Toxicity	
Aquatic Toxicity	[illegible]
Aquatic Toxicity	0
Reactivity	
Other Chemicals	1
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight.** 144.09 (solute only)
13.3 **Boiling Point at 1 atm** (water) ~212°F = ~100°C = ~373°K
13.4 **Freezing Point** (typical) −4°F to −4°F = −20°C to −20°C = 242 to 253°K
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity:** [illegible] (Liquid)
13.8 **Liquid Surface Tension** Not pertinent
13.9 **Liquid Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on page [illegible]

NOTES

FSA	# FLUOSULFONIC ACID

Common Synonyms			
Fluorosulfuric acid Fluorosulfonic acid	Liquid	Colorless to light yellow	Choking odor
	Reacts violently with water. Irritating mist and gas are produced on contact with water.		

[illegible]

Fire

Not flammable
[illegible]

Exposure

VAPOR OR MIST
Irritating to eyes, nose and throat
Harmful if inhaled
[illegible]

LIQUID
Will burn skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning: corrosive air contaminant, water contaminant
Restrict access
Evacuate area
Disperse and flush with care

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Fluorosulfuric acid, Fluorosulfonic acid
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula** FSO_3H
3.4 **IMCO/United Nations Numerical Designation** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Somewhat cloudy, colorless to slightly yellow
4.3 **Odor** Choking, irritating

5 HEALTH HAZARDS

5.1 **Persons' Protective Equipment** Rubber gloves, shoes and clothing, goggles and face shield, acid type canister mask or air line mask
5.2 **Symptoms Following Exposure** Inhalation of fumes causes severe irritation of nose and throat. Contact of liquid with eyes or skin causes very severe burns. Ingestion causes very severe burns of mouth and stomach.
5.3 **Treatment for Exposure** Get medical attention quickly following all exposure to this compound. INHALATION: remove victim to fresh air. If he is unconscious give artificial respiration. EYES: flush with water until medical help arrives, since burns can occur from liquid and solution; pay particular attention to the area around the eyelids. INGESTION: give large amounts of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits** Data not available
5.6 **Toxicity by Ingestion** Data not available
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even in low concentrations.
5.9 **Liquid or Solid Irritant Characteristics** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Do not use water or foam on adjacent fires
6.5 **Special Hazards of Combustion Products** Toxic and irritating fumes of hydrogen fluoride and sulfuric acid may form in fires
6.6 **Behavior in Fire** Contact with water or fire in adjacent fires produces toxic irritating fumes of hydrogen fluoride
6.7 **Ignition Temperature** Not pertinent
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Reacts violently with water to generate hydrogen fluoride and sulfuric acid
7.2 **Reactivity with Common Materials** Reacts with metals generating flammable hydrogen
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Flood with water, rinse with sodium bicarbonate or lime solution
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corporation
   Specialty Chemicals Division
   P. O. Box 9087R
   Morristown, N. J. 07960
2. PCR, Inc.
   P. O. Box 1466
   Gainesville, Fla. 32602

10 SHIPPING INFORMATION

10.1 **Grades or Purity** 98.5%
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Pressure vacuum with protection from moisture in air

11 HAZARD ASSESSMENT CODE

(See Hazardous Assessment Handbook CG-446-3)

X O

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Corrosive
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Toxicity	4
Liquid or Solid Toxicity	4
Poisons	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetic Effect	[illegible]
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** 100.07
13.3 **Boiling Point at 1 atm.** 424.9°F = 162.7°C = 435.9°K
13.4 **Freezing Point** −125.1°F = −87.3°C = 185.9°K
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity.** 1.74 at 25°C (liquid)
13.8 **Liquid Surface Tension** Data not available
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity.** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization** 170 Btu/lb = 94 cal/g = 3.9 × 10⁵ J/kg
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Data not available
13.16 **Heat of Polymerization** Not pertinent

Continued on page FSA-2

NOTES

FMS — FORMALDEHYDE SOLUTION

Common Synonyms
Formalith
Fyde
Formacin
Formic aldehyde solution
Methanal solution

Watery liquid — Colorless — Irritating odor

Sinks and mixes with water

[illegible]

Fire

Combustible
[illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes
If swallowed, will cause nausea, vomiting or loss of consciousness
[illegible]
EYES [illegible]
SKIN [illegible] CONSCIOUS [illegible]
SWALLOWED [illegible] OF VOMITING [illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — Water contaminant
Disperse and flush

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Formalin — Fyde — Formacin — Methanal — Formic aldehyde

3 2 **Coast Guard Compatibility Classification** Miscible

3 3 **Chemical Formula**
H_2CO $HCHO$ CH_2O $HCOH$

3 4 **IMCO United Nations Numerical Designation** [illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pungent irritating characteristic pungent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus chemical goggles protective clothing synthetic rubber or plastic gloves

5 2 **Symptoms Following Exposure** INHALATION vapors are irritating and will cause coughing chest pain nausea and vomiting INGESTION cause nausea vomiting abdominal pain and collapse Contact with skin and eyes causes severe irritation

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air give oxygen if breathing stop if collapsed INGESTION induce vomiting if conscious and repeat until vomit is clear [illegible] SKIN OR EYES flush immediately with plenty of water [illegible] contaminated clothing call a physician for eyes

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 2 ppm

5 5 **Short-Term Inhalation Limits** [illegible]

5 6 **Toxicity by Ingestion** Formaldehyde solution Grade [illegible] LD_{50} [illegible] g/kg

5 7 **Late Toxicity.** None

5 8 **Vapor (Gas) Irritant Characteristics** Vapor is moderately irritating [illegible] personnel will [illegible] at elevated high concentrations

5 9 **Liquid or Solid Irritant Characteristics.** Causes burning [illegible] skin and first degree burns on [illegible] Massive [illegible] prolonged exposure

5 10 **Odor Threshold** [illegible]

6 FIRE HAZARDS

6 1 **Flash Point** [illegible] Formaldehyde
Methanol free 182°F C C
[illegible] methanol 122°F C C

6 2 **Flammable Limits in Air**
[illegible]

6 3 **Fire Extinguishing Agents:** Water dry chemical carbon dioxide or alcohol foam

6 4 **Fire Extinguishing Agents Not to be Used.**
Data not available

6 5 **Special Hazards of Combustion Products**
Toxic vapors are generated

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature:** 806 F

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** (formaldehyde)
[illegible] fresh water
[illegible] 24 hr [illegible] salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
[illegible] days [illegible]

8 4 **Food Chain Concentration Potential.**
None

9. SELECTED MANUFACTURERS

1 Borden Inc
Borden Chemical Division
50 W Broad Street
Columbus Ohio 43215

2 Celanese Corp
Celanese Chemical Co Division
245 Park Ave
New York N Y 10017

3 E I duPont de Nemours & Co Inc
Industrial & Biochemicals Dept
Wilmington Del 19898

10 SHIPPING INFORMATION

10 1 **Grades or Purity:**
[illegible] formaldehyde in water containing [illegible] methyl alcohol

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-5

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	3
Liquid Solid Irritant	3
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight** [illegible]

13 3 **Boiling Point at 1 atm** [illegible]

13 4 **Freezing Point** [illegible]

13 5 **Critical Temperature** [illegible]

13 6 **Critical Pressure** [illegible]

13 7 **Specific Gravity:** [illegible] Compounds

13 8 **Liquid Surface Tension** [illegible]

13 9 **Liquid-Water Interfacial Tension**
[illegible]

13 10 **Vapor (Gas) Specific Gravity**
[illegible]

13 11 **Ratio of Specific Heats of Vapor (Gas).**
[illegible]

13 12 **Latent Heat of Vaporization**
[illegible]

13 13 **Heat of Combustion** [illegible]

13 14 **Heat of Decomposition** [illegible]

13 15 **Heat of Solution** [illegible]

13 16 **Heat of Polymerization** [illegible]

Continued on next page

NOTES

FMA	# FORMIC ACID

Common Synonyms			
Methanoic acid Formylic acid	Liquid	Colorless	Penetrating odor
	Sinks and mixes with water. Freezing point is 47° F		

AVOID CONTACT WITH LIQUID. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber clothing (including gloves).
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Wear goggles, self-contained breathing apparatus, and rubber clothing (including gloves).
Extinguish with water, dry chemical, or alcohol foam.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water (milk).
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep airway open.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Isolate and ventilate area.
Restrict access.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
Methanoic acid
Formylic acid

3.2 **Coast Guard Compatibility Classification**
Organic acid

3.3 **Chemical Formula.** $HCOOH$

3.4 **IMCO United Nations Numerical Designation** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Pungent, [illegible]

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Self-contained breathing apparatus, chemical goggles, face shield, rubber suit, gloves, and boots.

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** INHALATION: [illegible] INGESTION: DO NOT [illegible] SKIN OR EYES: [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits:** Data not available.

5.6 **Toxicity by Ingestion.** Grade 2, oral rat LD_{50} = 1.21 g/kg

5.7 **Late Toxicity:** None.

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor is irritating to the eyes and mucous membranes, especially in high concentrations.

5.9 **Liquid or Solid Irritant Characteristics.** Liquid is corrosive to the eyes and skin and degrees burns after prolonged contact.

5.10 **Odor Threshold.** Data not available.

6. FIRE HAZARDS

6.1 **Flash Point.** 156°F OC

6.2 **Flammable Limits in Air.** [illegible]

6.3 **Fire Extinguishing Agents.** Water, carbon dioxide, dry chemical, or alcohol foam.

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.

6.5 **Special Hazards of Combustion Products.** Toxic vapors are released.

6.6 **Behavior in Fire.** Not pertinent.

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard.** Not pertinent.

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.

7.2 **Reactivity with Common Materials:** No reaction.

7.3 **Stability During Transport.** Stable.

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, then neutralize with lime.

7.5 **Polymerization.** Not pertinent.

7.6 **Inhibitor of Polymerization.** Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] mg/l 24 hr bluegill TL_m freshwater; 120 ppm 48 hr daphnia TL_m freshwater.

8.2 **Waterfowl Toxicity.** Data not available.

8.3 **Biological Oxygen Demand (BOD).** [illegible] days; [illegible] days.

8.4 **Food Chain Concentration Potential.** None.

9. SELECTED MANUFACTURERS

1. E. I. duPont de Nemours & Co., Inc.
Industrial & Biochemicals Dept.
Wilmington, Del. 19898
2. Middlesex Chemicals
Orange, Mass. 01364
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity.** Technical, pharmaceutical, 88–98%

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere.** Not required

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

APQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	[illegible]
Health	
Vapor Toxicity	[illegible]
Liquid or Solid Toxicity	
Poisons	[illegible]
Water Pollution	
Human Toxicity	[illegible]
Aquatic Toxicity	[illegible]
Aesthetic Effects	[illegible]
Reactivity	
Other Chemicals	[illegible]
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight.** 46.03

13.3 **Boiling Point at 1 atm.** 214°F = 101°C = 374°K

13.4 **Freezing Point.** 47°F = 8.4°C = [illegible]°K

13.5 **Critical Temperature:** No [illegible]

13.6 **Critical Pressure.** No [illegible]

13.7 **Specific Gravity.** [illegible] at 20°C (liquid)

13.8 **Liquid Surface Tension.** [illegible] dynes/cm at [illegible]°C

13.9 **Liquid-Water Interfacial Tension.** No [illegible]

13.10 **Vapor (Gas) Specific Gravity.** No [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas).** [illegible]

13.12 **Latent Heat of Vaporization.** [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10⁶ J/kg

13.13 **Heat of Combustion.** [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10⁶ J/kg

13.14 **Heat of Decomposition.** No [illegible]

13.15 **Heat of Solution.** [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10⁶ J/kg

13.16 **Heat of Polymerization.** No [illegible]

[illegible]

NOTES

REVISED 1978

FUM	# FUMARIC ACID

Common Synonyms			
Trans-Butenedioic acid Allomaleic acid Trans-1,2,-ethylenedicarboxylic acid Boletic acid Lichenic acid	Solid	White	Odorless
	Sinks and mixes with water		

Stop discharge if possible. Keep people away
Shut off ignition sources. Call fire department
Avoid contact with solid and dust
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	Combustible Dust cloud may explode if ignited in an enclosed area Irritating gases may be produced when heated Extinguish with water, fire foam, or carbon dioxide
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing, difficult breathing If in eyes, hold eyelids open and flush with plenty of water If breathing has stopped give artificial respiration If breathing is difficult give oxygen SOLID Irritating to skin and eyes Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES hold eyelids open and flush with plenty of water
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of affected water intake

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Allomaleic acid
Boletic acid *trans* Butenedioic acid
trans 1,2 Ethylenedicarboxylic acid
Lichenic acid

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula:** HO CH=CHCO-H

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, gloves, safety glasses, dust cap

5 2 **Symptoms Following Exposure:** Inhalation of dust may cause respiratory irritation. Compound is non toxic when ingested. Prolonged contact with eyes or skin may cause irritation

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. EYES: flush with water, get medical attention if irritation persists. SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6 1 **Flash Point:** Not pertinent

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water spray, dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products.** Irritating fumes of maleic anhydride may form in fires

6 6 **Behavior in Fire:** Dust prevents explosion hazard. Knock down dust with water fog

6 7 **Ignition Temperature.** 1364°F (powder)

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** 61% 5 days

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Tenneco Chemicals Inc
Intermediates Div
Turner Place
P O Box 2
Piscataway N J 08854

2 Pfizer Inc
Chemicals Div
235 East 42 St
New York N Y 10017

3 Monsanto Company
800 North Lindbergh Blvd
St Louis Mo 63166

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
Purified food grade

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 116 07

13 3 **Boiling Point at 1 atm:** Very high

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 635 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** −4 970 Btu/lb = −2 760 cal/g = −116 × 10 J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 5

NOTES

FFA

FURFURAL

Common Synonyms
Pyromucic aldehyde
2 Furaldehyde
Furfuraldehyde
Fural

Oily liquid — Colorless to reddish-brown — Almond odor

Sinks in water

Avoid contact with liquid. Keep people away.
Wear rubber gloves, self-contained breathing apparatus and rubber overclothing (including gloves).
Call fire department.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).
Extinguish with water, dry chemical, alcohol foam, carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not give anything by mouth.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify public health and wildlife officials.
Notify operators of affected water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4)

Issue warning. Water contaminated.
Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms**
Pyromucic aldehyde, Furfural, Furfuraldehyde, Furfuraldehyde, Furaldehyde, Furfuraldehyde, Furfural

3.2 **Coast Guard Compatibility Classification**
Not listed

3.3 **Chemical Formula**
OC_4H_3CHO

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Colorless to reddish-brown
4.3 **Odor:** Almond like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** See Hazard Assessment Handbook
5.2 **Symptoms Following Exposure** [illegible]
5.3 **Treatment for Exposure** INHALATION: [illegible] INGESTION: induce vomiting [illegible] SKIN AND MUCOUS MEMBRANES: [illegible]
5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]
5.5 **Short-Term Inhalation Limits** [illegible]
5.6 **Toxicity by Ingestion** [illegible]
5.7 **Late Toxicity:** Causes liver damage in rats
5.8 **Vapor (Gas) Irritant Characteristics.** [illegible]
5.9 **Liquid or Solid Irritant Characteristics.** [illegible]
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents.** Water, foam, carbon dioxide, dry chemical, alcohol foam
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products** Irritating vapors are generated when heated
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
24 ppm 96 hr bluegill, [illegible] fresh water
32 ppm 24 hr sunfish, [illegible] fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** [illegible] in 5 days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

The Quaker Oats Co.
Chemicals Division
Merchandise Mart Plaza
Chicago, Illinois

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-5

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	-
Health	
Vapor Toxicity	[illegible]
Liquid or Solid Toxicity	[illegible]
Poison	-
Water Pollution	
Harmful to Marine Life	[illegible]
Aquatic Toxicity	[illegible]
Acute Toxicity	[illegible]
Reactivity	
Other Chemicals	[illegible]
Water	0
Self Reaction	-

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** [illegible]
13.3 **Boiling Point at 1 atm** [illegible] °K
13.4 **Freezing Point.** [illegible] °K
13.5 **Critical Temperature** [illegible] °K
13.6 **Critical Pressure.** [illegible] MN
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension.** [illegible]
13.9 **Liquid-Water Interfacial Tension** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization** [illegible]
13.13 **Heat of Combustion** [illegible]
13.14 **Heat of Decomposition** [illegible]
13.15 **Heat of Solution** [illegible]
13.16 **Heat of Polymerization** [illegible]

NOTES

REVISED 1978

FAL	FURFURYL ALCOHOL

Common Synonyms			
2 Furanmethanol Furfurakohol 2 Furylcarbinol 2 Hydroxymethylfuran	Liquid Mixes with water	Colorless to light yellow	Mild irritating

Stop the [illegible] if possible. Keep people away. Call fire department. Evacuate area if [illegible] discharged in storm. No [illegible] available [illegible]

Fire

Combustible

[illegible]

Exposure

[illegible]

LIQUID

Irritating to skin and eyes
Harmful if swallowed

[illegible]

[illegible] SWALLOWED [illegible] NOTIFY [illegible] NOTIFY DOCTOR OR HAVING CONVULSIONS [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

No [illegible] available [illegible]
No [illegible] water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning – water contaminant
Disperse and flush

2. LABELS

No label required by Coast Guard Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 2 Furanmethanol
Furfurakohol alpha Furylcarbinol
2 Furylcarbinol 2 Hydroxymethylfuran

3 2 **Coast Guard Compatibility Classification.** [illegible]

3 3 **Chemical Formula.** $C_5H_6O_2$

3 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless or amber

4 3 **Odor.** Mildly irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes headache, nausea and irritation of nose and throat. Vapor irritates eyes. Liquid causes inflammation and stinging. Contact with liquid causes redness and [illegible]. Ingestion causes headache, nausea, [illegible] mouth and stomach.

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air. Treat as for shock. Administer oxygen if breathing difficult. EYES immediately flush with water for 5 min; get medical attention. SKIN wash promptly with soap and water. INGESTION [illegible] medical attention.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 5 ppm

5 5 **Short-Term Inhalation Limits** 50 ppm 30 min

5 6 **Toxicity by Ingestion** [illegible] LD_{50} [illegible]

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Vapor [illegible] irritation [illegible] will [illegible] concentrations [illegible] appear. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain [illegible] smarting and reddening of the skin.

5 10 **Odor Threshold.** 5 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** [illegible] F C.C. 149°F [illegible]

6 2 **Flammable Limits in Air** [illegible]

6 3 **Fire Extinguishing Agents.** Water, dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agent: Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** [illegible]

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Data [illegible] and forms water soluble material on exposure to air. Avoid particular [illegible]

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 The Quaker Oats Company
Chemicals Division
345 Merchandise Mart Plaza
Chicago, Ill. 60654

2 Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

3 Aldrich Chemical Co.
940 West St. Paul Ave.
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

XPO

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicants	2
Aquatic Toxicants	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 98.1

13 3 **Boiling Point at 1 atm:** 338°F = 170°C = 443°K

13 4 **Freezing Point:** 5°F = −15°C = 258°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.13 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 38 dynes/cm = 0.038 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 3.4

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** 250 Btu/lb = 130 cal/g = 5.4 × 10⁵ J/kg

13 13 **Heat of Combustion:** −11,200 Btu/lb = −6,200 cal/g = −26.0 × 10⁶ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

NOTES

GLA

GALLIC ACID

Common Synonyms
3,4,5-Trihydroxybenzoic acid
Gallic acid monohydrate

Solid | White | Odorless

Sinks in water

Stop discharge if possible. Keep people away.
Shut off ignition sources. Call fire department.
Avoid contact with solid and dust.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with water, dry chemicals, foam, or carbon dioxide.

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
SOLID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Gallic acid monohydrate; 3,4,5-Trihydroxybenzoic acid
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $3,4,5\text{-}(HO)_3C_6H_2COOH \cdot H_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Bu. Mines approved respirator, rubber gloves, safety goggles
5.2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation.
5.3 **Treatment for Exposure:** INGESTION: give large amount of water, induce vomiting. EYES: flush with water for at least 10 min., consult a physician if irritation persists. SKIN: wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 - 5 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:**
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
80 - 95 ppm 6 hr minnow MLD fresh water
15 - 20 ppm 6 hr minnow MLD fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 8% 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. The Harshaw Chemical Co.
1945 E. 97 St.
Cleveland, Ohio 44106
2. Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233
3. Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** N.F., Practical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

HSS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Solid
13.2 **Molecular Weight:** 188
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.7 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** −6,060 Btu/lb = −3,370 cal/g = −14.1 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

GOC	GAS OIL: CRACKED

Common Synonyms	Liquid	Colorless	Gasoline-like odor
	Floats on water		

Stop discharge if possible. Keep [illegible]
Call fire department.
Isolate and remove discharged material.
[illegible]

Fire

Combustible
[illegible]

Exposure

CALL FOR MEDICAL AID
LIQUID
Harmful if swallowed.
IF SWALLOWED [illegible] CONSCIOUS [illegible] drink water [illegible]
DO NOT INDUCE VOMITING

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Floating to shoreline
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook (CG 446-4)

Mechanical containment
Should be removed
Physical and chemical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
No common synonyms

3 2 **Coast Guard Compatibility Classification:**
Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not pertinent (mixture)

3 4 **IMCO-United Nations Numerical Designation:** [illegible] 1202 (gas oil)

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Yellow to Brown

4 3 **Odor:** Like gasoline and petroleum

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective goggles, gloves

5 2 **Symptoms Following Exposure:** INHALATION causes irritation of upper respiratory tract, stimulation, then depression, dizziness, headache, incoordination, anesthesia, coma, respiratory arrest, irregular heartbeat is a complication. ASPIRATION causes severe coughing, gagging, distress, rapid development of pulmonary edema. INGESTION causes irritation of throat and stomach, stimulation, then depression.

5 3 **Treatment for Exposure:** Get medical attention. INHALATION: maintain respiration, administer oxygen if needed. ASPIRATION: enforce bed rest and administer oxygen. INGESTION: give custom water or milk, do NOT induce vomiting, guard against aspiration of lungs. EYES: wash with copious quantities of water. SKIN: remove by wiping, then wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** No single value applicable

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 3 LD50 [illegible] g/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.

5 10 **Odor Threshold:** 0.25 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** [illegible] °C

6 2 **Flammable Limits in Air:**
[illegible]

6 3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products:**
Not pertinent

6 6 **Behavior in Fire:** Not pertinent.

6 7 **Ignition Temperature:** [illegible]

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
96 ppm 24 hr [illegible] shad [illegible] fresh water
96 ppm 24 hr [illegible] shad [illegible] salt water

8 2 **Waterfowl Toxicity:**
Data not available

8 3 **Biological Oxygen Demand (BOD)**
[illegible] 5 days

8 4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1 Exxon Co
50 Rockefeller Plaza
New York, N.Y. [illegible]

2 Shell Oil Co
One Shell Plaza
Houston, Texas [illegible]

3 Sun Oil Co
[illegible] Pa. [illegible]

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Composition varies widely with specific operations involved

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG 446-3)

A T C

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	[illegible]
Health	
Vapor Irritant	
Liquid or Solid Irritant	[illegible]
Poisons	[illegible]
Water Pollution	
Human Toxicity	[illegible]
Aquatic Toxicity	[illegible]
Aesthetic Effect	[illegible]
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** [illegible] °C = [illegible] °F = [illegible] K

13 4 **Freezing Point:** [illegible]

13 5 **Critical Temperature:** [illegible]

13 6 **Critical Pressure:** [illegible]

13 7 **Specific Gravity:** 0.848 16°C (liquid)

13 8 **Liquid Surface Tension:**
[illegible] dynes/cm = [illegible] N/m = [illegible]

13 9 **Liquid-Water Interfacial Tension:**
[illegible] dynes/cm = [illegible] N/m = [illegible]

13 10 **Vapor (Gas) Specific Gravity:** [illegible]

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization.**
[illegible]

13 13 **Heat of Combustion** -18,400 Btu/lb
= 10,200 cal/g = 428 × 10³ J/kg

13 14 **Heat of Decomposition:** [illegible]

13 15 **Heat of Solution:** [illegible]

13 16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

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GAT — GASOLINES: AUTOMOTIVE

(< 4.23g lead/gal)

Common Synonyms

Water: liquid. Colorless to pale brown or pink. Gasoline odor.

Floats on water. Flammable. Irritating vapor is produced.

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness
[illegible]

LIQUID
Irritating to skin and eyes
If swallowed, will cause nausea or vomiting
[illegible]
Flush affected area [illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible]
DO NOT INDUCE VOMITING

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, [illegible]
[illegible]

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible]
3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures
3.3 Chemical Formula: [illegible]
3.4 IMCO United Nations Numerical Designation: [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): [illegible]
4.2 Color: [illegible]
4.3 Odor: [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]
5.2 Symptoms Following Exposure: [illegible]
5.3 Treatment for Exposure: INHALATION [illegible] INGESTION [illegible] EYES [illegible] SKIN [illegible]
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: [illegible]
5.6 Toxicity by Ingestion: [illegible]
5.7 Late Toxicity: [illegible]
5.8 Vapor (Gas) Irritant Characteristics: [illegible]
5.9 Liquid or Solid Irritant Characteristics: [illegible]
5.10 Odor Threshold: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: [illegible]
6.2 Flammable Limits in Air: [illegible]
6.3 Fire Extinguishing Agents: [illegible]
6.4 Fire Extinguishing Agents Not to be Used: [illegible]
6.5 Special Hazards of Combustion Products: [illegible]
6.6 Behavior in Fire: [illegible]
6.7 Ignition Temperature: [illegible]
6.8 Electrical Hazard: [illegible]
6.9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: [illegible]
7.2 Reactivity with Common Materials: [illegible]
7.3 Stability During Transport: [illegible]
7.4 Neutralizing Agents for Acids and Caustics: [illegible]
7.5 Polymerization: [illegible]
7.6 Inhibitor of Polymerization: [illegible]

8 WATER POLLUTION

8.1 Aquatic Toxicity: [illegible]
8.2 Waterfowl Toxicity: [illegible]
8.3 Biological Oxygen Demand (BOD): [illegible]
8.4 Food Chain Concentration Potential: [illegible]

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

*10.1 Grades or Purity: [illegible]
*10.2 Storage Temperature: [illegible]
*10.3 Inert Atmosphere: [illegible]
*10.4 Venting: [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, [illegible]

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: [illegible]
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
[illegible]	

12.3 NFPA Hazard Classifications:

Category	Classification
[illegible]	

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 Physical State at 15°C and 1 atm: [illegible]
13.2 Molecular Weight: [illegible]
*13.3 Boiling Point at 1 atm: [illegible]
*13.4 Freezing Point: [illegible]
*13.5 Critical Temperature: [illegible]
*13.6 Critical Pressure: [illegible]
13.7 Specific Gravity: 0.7321 at 20°C (liquid)
13.8 Liquid Surface Tension: [illegible]
*13.9 Liquid-Water Interfacial Tension: [illegible]
*13.10 Vapor (Gas) Specific Gravity: [illegible]
*13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]
13.12 Latent Heat of Vaporization: [illegible]
*13.13 Heat of Combustion: [illegible]
*13.14 Heat of Decomposition: [illegible]
*13.15 Heat of Solution: [illegible]
13.16 Heat of Polymerization: [illegible]

[illegible]

NOTES

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GAV	GASOLINES: AVIATION (< 4.86g lead/gal)

Common Synonyms	Waters liquid Red blue green brown or purple Gasoline odor Floats on water Flammable irritating vapor is produced

[illegible]

Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat If inhaled will cause dizziness Headache, difficult breathing or loss of consciousness [illegible] LIQUID Irritating to skin and eyes If swallowed will cause nausea or vomiting [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook [illegible]

[illegible]

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible]

3.2 Coast Guard Compatibility Classification. Miscellaneous hydrocarbon mixtures

3.3 Chemical Formula: [illegible]

3.4 IMCO United Nations Numerical Designation [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped) Liquid

4.2 Color [illegible]

4.3 Odor [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment [illegible]

5.2 Symptoms Following Exposure: INHALATION [illegible] ASPIRATION [illegible] INGESTION [illegible]

5.3 Treatment for Exposure: [illegible] INHALATION [illegible] ASPIRATION [illegible] INGESTION [illegible] EYES [illegible] SKIN [illegible]

5.4 Toxicity by Inhalation (Threshold Limit Value) [illegible]

5.5 Short-Term Inhalation Limits: [illegible]

5.6 Toxicity by Ingestion: [illegible]

5.7 Late Toxicity: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: [illegible]

6.2 Flammable Limits in Air: [illegible]

6.3 Fire Extinguishing Agents: Foam carbon dioxide dry chemical

6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective

6.5 Special Hazards of Combustion Products: None

6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flashback

6.7 Ignition Temperature: [illegible]

6.8 Electrical Hazard: Class I group D

6.9 Burning Rate: 4 mm/min

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction

7.2 Reactivity with Common Materials: No reaction

7.3 Stability During Transport: Stable

7.4 Neutralizing Agents for Acids and Caustics: Not pertinent

7.5 Polymerization: Not pertinent

7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: [illegible]

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD) [illegible]

8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 Grades or Purity: [illegible]

10.2 Storage Temperature: [illegible]

10.3 Inert Atmosphere: [illegible]

10.4 Venting: [illegible]

11 HAZARD ASSESSMENT CODE

[illegible]

A T L A W

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations. Flammable liquid

12.2 NAS Hazard Rating for Bulk Water Transportation.

Category	Rating
[illegible]	

12.3 NFPA Hazard Classifications.

Category	Classification
[illegible]	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: [illegible]

13.2 Molecular Weight: [illegible]

13.3 Boiling Point at 1 atm: [illegible]

13.4 Freezing Point: [illegible]

13.5 Critical Temperature: [illegible]

13.6 Critical Pressure: [illegible]

13.7 Specific Gravity: 0.7[illegible] at 15°C (liquid)

13.8 Liquid Surface Tension: [illegible]

13.9 Liquid-Water Interfacial Tension: [illegible]

13.10 Vapor (Gas) Specific Gravity: [illegible]

13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]

13.12 Latent Heat of Vaporization: [illegible]

13.13 Heat of Combustion: [illegible]

13.14 Heat of Decomposition: [illegible]

13.15 Heat of Solution: [illegible]

13.16 Heat of Polymerization: [illegible]

[illegible]

5 HEALTH HAZARDS (Cont'd)

5.8 Vapor (Gas) Irritant Characteristics: [illegible]

5.9 Liquid or Solid Irritant Characteristics: [illegible]

5.10 Odor Threshold: [illegible]

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GAK	GASOLINE BLENDING STOCKS: ALKYLATES

Common Synonyms

Water-white liquid — Colorless — Gasoline odor

Floats on water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away. Shut down waterways and all fire detection systems. Stay upwind and off waterways. Avoid all contact with water. Isolate and remove discharged material. Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, carbon dioxide, or foam.
Water may be ineffective.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with water.
IF IN EYES: hold eyelids open and flush with plenty of water.
IF SWALLOWED: do not induce vomiting. If victim is conscious, give large quantities of water.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Floating to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

See Spill and Leak Manual, Section 1.
Remove all sources of ignition.
Dike and contain.
Do not contact water.

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** None
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** None
3.4 **IMCO United Nations Numerical Designation:** None

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Gasoline odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]
5.2 **Symptoms Following Exposure:** INHALATION: [illegible] INGESTION: [illegible]
5.3 **Treatment for Exposure:** INHALATION: [illegible] INGESTION: [illegible] EYES: [illegible] SKIN: [illegible]
5.4 **Toxicity by Inhalation (Threshold Limit Value):** No data available
5.5 **Short Term Inhalation Limits:** [illegible]
5.6 **Toxicity by Ingestion:** [illegible]
5.7 **Late Toxicity:** None

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** None
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flashback
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Class I, group D
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
96 hour 24 hr survival threshold TL_{96} fresh water
96 hour 24 hr survival threshold TL_{96} salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** [illegible] days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible] Exxon Co.
800 Bellefield Place
New York, N.Y. [illegible]
[illegible] Shell Oil Co.
Shell Plaza
Houston, Tex. [illegible]
[illegible] Sun Oil Co.
St. David's, Pa. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** [illegible]
10.4 **Venting:** Open flame [illegible] pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment handbook, CG-446-3

A T L A W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	[illegible]
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poison	[illegible]
Water Pollution	
Human Toxicity	
Aquatic Toxicity	[illegible]
Aesthetic Effect	[illegible]
Reactivity	
Other Chemicals	n
Water	n
Self Reaction	n

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** [illegible]
13.6 **Critical Pressure:** [illegible]
13.7 **Specific Gravity:** [illegible] liquid
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** [illegible]
13.15 **Heat of Solution:** [illegible]
13.16 **Heat of Polymerization:** [illegible]

Continued on next page

5 HEALTH HAZARD (Cont'd)

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations. Effects are temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Repeated or prolonged contact may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** [illegible]

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GRF — GASOLINE BLENDING STOCKS: REFORMATES

Common Synonyms

Watery liquid — Colorless — Gasoline odor

Floats on water. Flammable, irritating vapor is produced

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Evacuate area.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms.
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not pertinent
3.4 **IMCO/United Nations Numerical Designation.** 3.1, 3.2/1203

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles, gloves.
5.2 **Symptoms Following Exposure:** INHALATION causes irritation of upper respiratory tract, central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest. Irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema. Later signs of bronchopneumonia and pneumonitis, acute onset of central nervous system followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach, stimulation followed by depression of central nervous system, irregular heartbeat.
5.3 **Treatment for Exposure:** Seek medical attention. INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, administer oxygen. INGESTION: do NOT induce vomiting, lavage carefully if appreciable quantity was ingested, guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value).** No single TLV applicable.
5.5 **Short-Term Inhalation Limits:** 500 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg.
5.7 **Late Toxicity:** None.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

6. FIRE HAZARDS

6.1 **Flash Point.**
(a) <0 °F C.C.
(b) 0.73°F C.C.
6.2 **Flammable Limits in Air:**
(a) LFL 1.4%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide.
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
6.5 **Special Hazards of Combustion Products:** None.
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature.** Data not available.
6.8 **Electrical Hazard:** Class I, group D.
6.9 **Burning Rate:** 4 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.
7.2 **Reactivity with Common Materials:** No reaction.
7.3 **Stability During Transport:** Stable.
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
7.5 **Polymerization.** Not pertinent.
7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
90 ppm, 24 hr, juvenile American shad, TL_m, fresh water
91 ppm, 24 hr, juvenile American shad, TL_m, salt water
8.2 **Waterfowl Toxicity:** Data not available.
8.3 **Biological Oxygen Demand (BOD).** No data.
8.4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

1. Exxon Co.
30 Rockefeller Plaza
New York, N.Y. 10020
2. Shell Oil Co.
1 Shell Plaza
Houston, Texas 77001
3. Sun Oil Co.
St. Davids, Pa. 19087

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Composition varies with range of distillation temperatures used.
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere.** No requirement
10.4 **Venting:** Open flame arrester or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T-U-V-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight.** Not pertinent
13.3 **Boiling Point at 1 atm.** 58–275°F = 14–135°C = 287–408°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.7934 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 19–23 dynes/cm = 0.019–0.023 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 49–51 dynes/cm = 0.049–0.051 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 3.4
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization.** 130–150 Btu/lb = 71–83 cal/g = 3.0–3.4 × 10^5 J/kg
13.13 **Heat of Combustion:** −18,720 Btu/lb = −10,400 cal/g = −435.4 × 10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

5. HEALTH HAZARDS (Cont'd.)

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.25 ppm

GCS — GASOLINES: CASINGHEAD

Common Synonyms

Watery liquid — Colorless — Gasoline odor

Floats on water. Flammable, irritating vapor is produced

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

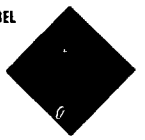
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning — high flammability.
Evacuate area.
Disperse and flash.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Natural gasoline
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not pertinent
3.4 **IMCO/United Nations Numerical Designation:** 3.1, 1257

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles, gloves.
5.2 **Symptoms Following Exposure:** INHALATION causes irritation of upper respiratory tract, central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest, irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema. Later signs of bronchopneumonia and pneumonitis, acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of the mouth, esophagus, and stomach, stimulation followed by depression of central nervous system, irregular heartbeat.
5.3 **Treatment for Exposure:** Seek medical attention. INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, administer oxygen. INGESTION: do NOT induce vomiting. Lavage carefully if appreciable quantity was ingested, guard against aspiration into lungs. EYES: wash with copious quantities of water. SKIN: wipe off and wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** No single TLV applicable.
5.5 **Short-Term Inhalation Limits:** 500 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 2. LD: 0.5 to 5 g/kg.
5.7 **Late Toxicity:** None.

6. FIRE HAZARDS

6.1 **Flash Point:** <0 F (0 C)
6.2 **Flammable Limits in Air:** 1.1 — 7
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** None
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to source of ignition and flash back.
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Class I, group D
6.9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
90 ppm/24 hr/juvenile American shad/TLm/fresh water
91 ppm/24 hr/juvenile American shad/TLm/salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** No data
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Co., 30 Rockefeller Plaza, New York, N.Y. 10020
2. Shell Oil Co., 1 Shell Plaza, Houston, Texas 77001
3. Sun Oil Co., St. Davids, Pa. 19087

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Composition depends on location of oil well
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A T U A-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm.:** 88 — 278 F = 14 — 138 C = 287 — 409 K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.671 at 15°C (liquid)
13.8 **Liquid Surface Tension:** 19 — 23 dyne/cm = 0.019 — 0.023 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 49 — 51 dyne/cm = 0.049 — 0.051 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 3.4
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 130 — 150 Btu/lb = 71 — 83 cal/g = 3.0 — 3.4 × 10^5 J/kg
13.13 **Heat of Combustion:** −18,720 Btu/lb = −10,400 cal/g = −435.4 × 10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

5. HEALTH HAZARDS (Cont'd)

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.25 ppm

GPL

GASOLINES: POLYMER

Common Synonyms

Watery liquid Colorless Gasoline odor

Floats on water. Flammable, irritating vapor is produced

Stop discharge if possible. Keep people away
Shut off ignition sources and call fire department
Stay upwind and use water spray to knock down vapor
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemical, foam, or carbon dioxide
Water may be ineffective in fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, headaches, difficult breathing or loss of consciousness
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Irritating to skin and eyes
If swallowed, will cause nausea or vomiting
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

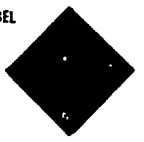
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability
Evacuate area
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification.** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not pertinent
3.4 **IMCO United Nations Numerical Designation:** 3.2, 1215

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles, gloves
5.2 **Symptoms Following Exposure:** INHALATION causes irritation of upper respiratory tract, central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest, irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema, later signs of bronchopneumonia and pneumonitis, acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach, stimulation followed by depression of central nervous system, irregular heartbeat.
5.3 **Treatment for Exposure:** Seek medical attention. INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, administer oxygen. INGESTION: do NOT induce vomiting, lavage carefully if appreciable quantity was ingested, guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** No single TLV applicable
5.5 **Short-Term Inhalation Limits:** 500 ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentration. The effect is temporary.

6. FIRE HAZARDS

6.1 **Flash Point:** 0.73°F C.C.
6.2 **Flammable Limits in Air.** 1.3% - 7.1%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** None
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard.** Class I, group D
6.9 **Burning Rate.** 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
90 ppm/24 hr/juvenile American shad/TL_{50}/fresh water
91 ppm/24 hr/juvenile American shad/TL_{50}/salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** No 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Co.
50 Rockefeller Plaza
New York, N.Y. 10020
2. Shell Oil Co.
1 Shell Plaza
Houston, Texas 77001
3. Sun Oil Co.
St. Davids, Pa. 19087

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Composition varies with range of distillation temperatures used. Contains mainly isohexane substance
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T-L-A-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** 88-275°F = 14-135°C = 287-408°K
13.4 **Freezing Point.** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.71-0.78 at 15°C (liquid)
13.8 **Liquid Surface Tension:** 19-23 dynes/cm = 0.019-0.023 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 40-51 dynes/cm = 0.040-0.051 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 3.4
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 130-150 Btu/lb = 71-83 cal/g = 3.0-3.4 × 10⁵ J/kg
13.13 **Heat of Combustion:** −18,720 Btu/lb = −10,400 cal/g = −435.4 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

5. HEALTH HAZARDS (Cont'd)

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause scarring and reddening of the skin.
5.10 **Odor Threshold:** 0.25 ppm

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GSR

GASOLINES: STRAIGHT RUN

Common Synonyms	Water liquid Colorless Gasoline odor Floats on water. Flammable, irritating vapor is produced
	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline. May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning – high flammability
Evacuate area
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms

3.2 **Coast Guard Compatibility Classification.** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula.** Not pertinent

3.4 **IMCO/United Nations Numerical Designation:** 3.1, 3.2, 1203

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Gasoline.

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles, gloves

5.2 **Symptoms Following Exposure:** INHALATION causes irritation of upper respiratory tract, central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache and incoordination to anesthesia, coma and respiratory arrest, irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress and rapidly developing pulmonary edema, later signs of bronchopneumonia and pneumonitis, acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus and stomach, stimulation followed by depression of central nervous system, irregular heartbeat.

5.3 **Treatment for Exposure:** Seek medical attention. INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: endotracheal intubation, oxygen. INGESTION: do NOT induce vomiting. Lavage carefully if apparently [illegible] was ingested, guard against aspiration into lungs. EYES: wash with [illegible] quantities of water. SKIN: wipe off and wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] single TLV applicable

5.5 **Short-Term Inhalation Limits:** 500 ppm [illegible]

5.6 **Toxicity by Ingestion:** Grade 2 LD[illegible]

5.7 **Late Toxicity:** None

6. FIRE HAZARDS

6.1 **Flash Point:**
(a) <0°F C.C.
(b) 0.73°F C.C.

6.2 **Flammable Limits in Air:**
(a) 1.4% – 7.6%

6.3 **Fire Extinguishing Agents.** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products.** None

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
90 ppm/24 hr/juvenile American shad
TL$_m$/fresh water
91 ppm/24 hr/juvenile American shad
TL$_m$/salt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** [illegible] 5 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Co.
30 Rockefeller Plaza
New York, N.Y. 10020

2. Shell Oil Co.
1 Shell Plaza
Houston, Texas 77001

3. Sun Oil Co.
St. Davids, Pa. 19087

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Composition varies with range of distillation temperatures used

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A.T.L.X-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** [illegible] = 14 – 135°C = 287 – 400°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.71 – 0.747 at 15°C (liquid)

13.8 **Liquid Surface Tension:** 19 – 23 dynes/cm = 0.019 – 0.023 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 49 – 51 dynes/cm = 0.049 – 0.051 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 3.4

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 130 – 150 Btu/lb = 71 – 83 cal/g = 3.0 – 3.4 × 10^5 J/kg

13.13 **Heat of Combustion:** −18,720 Btu/lb = −10,400 cal/g = −43.6 × 10^6 J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 3 and 4)

5. HEALTH HAZARDS (Cont'd)

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.25 ppm

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GTA	GLUTARALDEHYDE SOLUTION

Common Synonyms		
1,5 Pentanedial	Liquid	Light yellow
	Mixes with water	

Stop discharge if possible. Keep people away.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire	Not flammable
Exposure	Call for medical aid **LIQUID** Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: water contaminant.
Restrict access.
Disperse and flush.

2. LABELS

No label required, by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,5 Pentanedial solution
3.2 **Coast Guard Compatibility Classification:** Aldehyde
3.3 **Chemical Formula:** OHC—(CH$_2$)$_3$—CHO (in water)
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Pale yellow
4.3 **Odor:** Like rotten apples

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Contact with liquid causes severe irritation of eyes and irritation of skin. Chemical readily penetrates skin in harmful amounts. Ingestion causes irritation of mouth and stomach.
5.3 **Treatment for Exposure:** EYES: immediately flush with plenty of water for at least 15 min, get medical attention. SKIN: immediately flush with plenty of water for at least 15 min. INGESTION: give large amounts of water and induce vomiting, get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 1,336 mg/kg
5.7 **Late Toxicity:** Induces contact dermatitis in some people
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Non flammable solution
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
   Chemicals and Plastics Division
   270 Park Avenue
   New York, N.Y. 10017
2. Polysciences, Inc.
   Pearl Valley Industrial Park
   Warrington, Pa. 18976

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 25% aqueous solution
50% aqueous solution
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

[illegible]
A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Mixture
13.3 **Boiling Point at 1 atm:** >212°F = >100°C = >373 K
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** [illegible]
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.062–1.124 at 20°C (liquid)
13.8 **Liquid Surface Tension:** (est.) <80 dynes/cm = <0.080 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

GCR	GLYCERINE

Common Synonyms			
1,2,3-Propanetriol 1,2,3-Trihydroxypropane Glycerol	Oily liquid	Colorless	Odorless
	Sinks and mixes with water. Freezing point is 64° F		

Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	Combustible Extinguish with dry chemical, alcohol foam, or carbon dioxide Water may be ineffective on fire Cool exposed containers with water
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Dispersal and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
Glycerol
1,2,3-Propanetriol
1,2,3-Trihydroxypropane

3.2 **Coast Guard Compatibility Classification.**
Alcohol

3.3 **Chemical Formula:**
HOCH$_2$CHOHCH$_2$OH

3.4 **IMCO United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles

5.2 **Symptoms Following Exposure:** No hazard

5.3 **Treatment for Exposure:** No hazard

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor causes [illegible] eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless [illegible]

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:**
Not pertinent

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide, water fog

6.4 **Fire Extinguishing Agents Not to be Used:**
Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:**
Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 698°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
Data not available

8.2 **Waterfowl Toxicity:**
Data not available

8.3 **Biological Oxygen Demand (BOD)**
20% (theor.) 5 days

8.4 **Food Chain Concentration Potential.**
None

9 SELECTED MANUFACTURERS

1. Lever Brothers Co
390 Park Ave
New York, N.Y. 10022
2. Procter & Gamble Co
301 East Sixth St
Cincinnati, Ohio 45201
3. Shell Chemical Co
Industrial Chemicals Division
Houston, Tex. 77001

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
CP 99% USP 96%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame pressure or vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

APQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** 92.10

13.3 **Boiling Point at 1 atm:**
[illegible]

13.4 **Freezing Point.**
[illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension.** Not pertinent

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization:**
[illegible]

13.13 **Heat of Combustion.** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

GCM	GLYCIDYL METHACRYLATE

Common Synonyms
Glycidyl alpha-methyl acrylate
Methacrylic acid 2,3-epoxy propyl ester

Liquid — Colorless — Fruity odor

Floats on water

Avoid contact with liquid. Keep people away.
Wear rubber overclothing (including gloves).
Call fire department.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and wildlife officials.

Fire

Combustible
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with foam, dry chemical, carbon dioxide.
Water may be ineffective on fire.

Exposure

CALL FOR MEDICAL AID
LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelid open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment.
Should be removed.
Chemical and physical treatment.

2 LABELS

No hazard label required by Code of Federal Regulations.

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Glycidyl alpha-methyl acrylate; Methacrylic acid 2,3-epoxypropyl ester.
3.2 **Coast Guard Compatibility Classification:** Not applicable.
3.3 **Chemical Formula:** $CH_2=C(CH_3)COOCH_2CH(O)CH_2$
3.4 **IMCO United Nations Numerical Designation:** Not listed.

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid.
4.2 **Color:** Colorless.
4.3 **Odor:** Data not available.

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Polyethylene coated aprons and gloves and chemical fitting goggles.
5.2 **Symptoms Following Exposure:** The liquid irritates eyes about as much as soap. Prolonged contact with skin produces irritation and dermatitis.
5.3 **Treatment for Exposure:** SKIN: wash thoroughly with soap and water and treat as a chemical burn. EYES: irrigate with clear water for 15 min. and get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm.
5.5 **Short-Term Inhalation Limits:** Data not available.
5.6 **Toxicity by Ingestion:** Grade 2. LD_{50} 0.5 to 5 g/kg (rats).
5.7 **Late Toxicity:** Data not available.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is mildly irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and 1st degree burns on short exposure, may cause secondary burns on long exposure. In eye the irritation is similar to that caused by ordinary soap.
5.10 **Odor Threshold:** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point:** 185°F (C.C.)
6.2 **Flammable Limits in Air:** Data not available.
6.3 **Fire Extinguishing Agents:** Data not available.
6.4 **Fire Extinguishing Agents Not to be Used:** Data not available.
6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
6.6 **Behavior in Fire:** Not pertinent.
6.7 **Ignition Temperature:** Data not available.
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** Data not available.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.
7.2 **Reactivity with Common Materials:** No reaction.
7.3 **Stability During Transport:** Stable.
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
7.5 **Polymerization:** Heat, peroxides, and caustics all cause polymerization; the reaction is not considered hazardous.
7.6 **Inhibitor of Polymerization:** Hydroquinone monomethyl ether (MEHQ).

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.
8.2 **Waterfowl Toxicity:** Data not available.
8.3 **Biological Oxygen Demand (BOD):** Data not available.
8.4 **Food Chain Concentration Potential:** None.

9 SELECTED MANUFACTURERS

1. Nicolas, Inc.
   1440 Fairfield Rd.
   Baltimore, Md. 21229
2. American Aniline & Extract Co., Inc.
   Venango and E St.
   Philadelphia, Pa. 19134
   Polysciences, Inc.
   Warrington, Pa. 18976

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 92%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446

X T U X Y Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 142.1
13.3 **Boiling Point at 1 atm:** Very high
13.4 **Freezing Point:** Data not available
13.5 **Critical Temperature:** Not applicable
13.6 **Critical Pressure:** Not applicable
13.7 **Specific Gravity:** 1.07 (liquid)
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** Not applicable
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** Not applicable
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not applicable
13.15 **Heat of Solution:** Not applicable
13.16 **Heat of Polymerization:** [illegible]

NOTES

GOS	GLYOXAL, 40% SOLUTION

Common Synonyms			
Biformyl Diformyl Ethanedial Oxal Oxaldehyde	Liquid Mixes with water	Light yellow	Weak sour odor

Stop discharge if possible. Keep people away.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire	Not flammable
Exposure	Call for medical aid LIQUID Irritating to skin and eyes. Harmful if swallowed Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify appropriate health and wildlife officials. Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Biformal, Biformyl, Diformyl, Ethanedial, Oxal, Oxaldehyde

3.2 **Coast Guard Compatibility Classification:** To be developed

3.3 **Chemical Formula:** $C_2H_2O_2$ (C_2HO_2H in water)

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Pale yellow

4.3 **Odor:** Weak sour

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves.

5.2 **Symptoms Following Exposure:** Inhalation causes some irritation of nose and throat. Contact with liquid irritates eyes and causes mild irritation of skin; stains skin yellow. No information available on symptoms of ingestion.

5.3 **Treatment for Exposure:** INHALATION: remove from exposure. EYES or SKIN: flood with water for 15 min. INGESTION: no information on treatment.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3. Oral rat LD_{50} 2020 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Non-flammable solution

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Heat may cause polymerization to a combustible viscous material

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Corrosive to most metals. The reaction is slow.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
   Chemicals and Plastics Division
   270 Park Avenue
   New York, N.Y. 10017
2. Eastman Kodak Co.
   Eastman Organic Products
   Rochester, N.Y. 14650
3. Aldrich Chemical Co.
   940 West St. Paul Avenue
   Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 40% in water

10.2 **Storage Temperature:** 60–120°F

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

V P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Mixture

13.3 **Boiling Point at 1 atm:** Data not available

13.4 **Freezing Point:** 55°F = −15°C = 258°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.29 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

HTC	# HEPTACHLOR

Common Synonyms			
1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene 1,4,5,6,7,8,8a-Heptachloro-3a,4-cyclopentadiene E3314	Solid	White to light tan	Camphor-like odor
	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear goggles and self-contained breathing apparatus
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not Flammable
Irritating gases may be produced when heated

Exposure

DUST
POISONOUS IF INHALED
If inhaled will cause headache or loss of consciousness
If breathing stops, perform artificial respiration
If breathing is difficult, give oxygen

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
Remove contaminated clothing
Wash affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and conscious, induce vomiting with fresh water or milk
IF NOT ALLOWED to induce vomiting, NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,3314, 1,4,5,6,7,8,8a-Heptachlorodicyclopentadiene, 1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene, Velsicol
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $C_{10}H_5Cl_7$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White, light tan
4.3 **Odor:** Camphor-like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective respirator, rubber gloves, clean clothes
5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation, tremors, and collapse. Ingestion causes nausea, vomiting, diarrhea, and irritation of the gastrointestinal tract. Contact with dust causes irritation of eyes and moderate irritation of skin
5.3 **Treatment for Exposure:** *Get medical attention following all overexposures to heptachlor*
INHALATION: move to fresh air; if exposure to dust was severe, get medical attention
INGESTION: lavage stomach with warm tap water (unless convulsions are imminent). Fats and oils should be avoided, as they increase the rate of absorption of all chlorinated hydrocarbons
EYES: wash repeatedly with water. SKIN: flush with water, then wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³
5.5 **Short-Term Inhalation Limits:** 2 mg/m³ for 30 min
5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 40 mg/kg (rat)
5.7 **Late Toxicity:** Liver damage may develop
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** 0.02 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.1 ppm/24 hr trout, 80% kill fresh water
0.230 ppm/96 hr goldfish, 11 m fresh water
0.25 ppm/48 hr white shrimp, 11 m salt water
8.2 **Waterfowl Toxicity:** 2000 mg/kg
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Bioconcentration of up to 15,000 in oysters and 5,5 in bluegills. A spill could cause potential problems with shellfish

9. SELECTED MANUFACTURERS

Velsicol Chemical Corp
341 E. Ohio St.
Chicago, Ill. 60611

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, 72+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 373.5
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** 115 - 165°F = 46 - 74°C = 319 - 347°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.66 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

HPT	# HEPTANE

Common Synonyms
n-Heptane

Watery liquid — Colorless — Gasoline-like odor

Floats on water. Flammable vapor is produced.

[illegible] discharge of flammable. Keep people away. Shut off ignition sources and all fire [illegible] stop spreading and the water spray [illegible] vapor. Isolate and remove discharged material. [illegible] health and pollution [illegible]

Fire

FLAMMABLE.
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemical, carbon dioxide, or foam. Water may be ineffective. [illegible]

Exposure

ALERT A MEDICAL AID

VAPOR
Not irritating to eyes, nose or throat
If inhaled, will cause coughing or difficult breathing
Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting
Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with a gentle stream of water. IF SWALLOWED, and victim is fully conscious, give a cup of water. DO NOT INDUCE VOMITING.

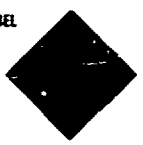
Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify appropriate health and wildlife officials. Notify nearby users of water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.
Fire warning: high flammability.
Flammable.
Dispersant [illegible]

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** n-Heptane
3.2 **Coast Guard Compatibility Classification:** Paraffin
3.3 **Chemical Formula:** $CH_3(CH_2)_5CH_3$
3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Gasoline-like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety glasses, [illegible]
5.2 **Symptoms Following Exposure:** INHALATION: [illegible] depression, cardiac sensitization. ASPIRATION: [illegible] mild coughing, [illegible] depression, headache. INGESTION: [illegible] abdomen, depression, headache.
5.3 **Treatment for Exposure:** INHALATION: [illegible] ASPIRATION: [illegible] oxygen. INGESTION: [illegible] vomiting. SKIN OR EYES: remove contaminated clothing and shoes immediately. Wash skin with soap and water. Wash eyes with plenty of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm
5.5 **Short-Term Inhalation Limits:** [illegible] ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 0. LD[illegible] above [illegible]
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to the eyes and nose.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Prolonged or repeated contact may cause irritation, mild inflammation and reddening of the skin.
5.10 **Odor Threshold:** 220 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] F C.C.
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** [illegible]
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** None needed
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] ppm 24 hr [illegible] Fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** [illegible] days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Various grades available. Spec 99
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No [illegible]
10.4 **Venting:** Open [illegible] pressure vessel

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3.
[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	[illegible]
Health	
Vapor toxicity	[illegible]
Liquid or Solid Toxicity	[illegible]
Poison	[illegible]
Water Pollution	
Harm to Humans	[illegible]
Aquatic Toxicity	[illegible]
Aesthetics Effects	[illegible]
Reactivity	
Other Chemicals	[illegible]
Water	[illegible]
Self Reaction	[illegible]

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** [illegible]
13.6 **Critical Pressure:** [illegible]
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** 51 dynes/cm = 0.051 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** None
13.15 **Heat of Solution:** None
13.16 **Heat of Polymerization:** None

Continued on page [illegible]

NOTES

REVISED 1978

HTN	HEPTANOL

Common Synonyms	
Enanthic alcohol Hydroxyheptane 1-Heptanol Heptyl alcohol	Watery liquid — Colorless — Weak alcohol odor Floats on water

[illegible]

Fire	Combustible [illegible]
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

[illegible]

2. LABELS

[illegible]

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** [illegible]

3.2 **Coast Guard Compatibility Classification:** [illegible]

3.3 **Chemical Formula:** [illegible]

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** [illegible]

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = [illegible] g/kg

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** 0.49 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 170°F O.C.

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]

6.5 **Special Hazards of Combustion Products:** [illegible]

6.6 **Behavior in Fire:** [illegible]

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** [illegible]

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** [illegible]

7.3 **Stability During Transport:** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]

7.5 **Polymerization:** [illegible]

7.6 **Inhibitor of Polymerization:** [illegible]

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD):** [illegible]

8.4 **Food Chain Concentration Potential:** [illegible]

9. SELECTED MANUFACTURERS

[illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** [illegible]

11. HAZARD ASSESSMENT CODE

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** [illegible]

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible] dynes/cm = 0.0077 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** [illegible]

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** [illegible]

[illegible]

NOTES

HTE	1-HEPTENE

Common Synonyms
Heptylene

Water's liquid **Colorless** **Gasoline-like odor**

Floats on water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and person is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

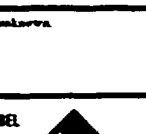
Effect of low concentrations on aquatic life is unknown.
Floating to shoreline.
May be dangerous if it enters water intakes.
Notify state health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability.
Restrict access.
Evacuate area.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
Heptylene

3.2 **Coast Guard Compatibility Classification:**
Olefin

3.3 **Chemical Formula:**
$CH_3CH_2CH_2CH_2CH_2CH=CH_2$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety goggles or face shield, similar to gasoline.
5.2 **Symptoms Following Exposure:** High concentrations may produce slight irritation of eyes and respiratory tract, may also act as simple asphyxiant and affects anesthetic.
5.3 **Treatment for Exposure:** Remove from exposure. Administer artificial respiration if needed.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available.
5.5 **Short-Term Inhalation Limits:** Data not available.
5.6 **Toxicity by Ingestion:** Data not available.
5.7 **Late Toxicity:** Data not available.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** Data not available.

6. FIRE HAZARDS

6.1 **Flash Point:** 25°F (C.C. test)
6.2 **Flammable Limits in Air:**
LEL = 0.9% UEL = 5.8% (estimated)
6.3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent
6.5 **Special Hazards of Combustion Products:**
Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 500°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 6.4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
Data not available
8.2 **Waterfowl Toxicity:**
Data not available
8.3 **Biological Oxygen Demand (BOD):**
Data not available
8.4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

1. American Petrofina, Inc.
Cosden Oil and Chemical Co.
Big Spring, Texas 79720
2. Exxon Chemical Co.
Houston, Texas 77001
3. Phillips Petroleum Co.
Bartlesville, Okla. 74004

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

A T L V W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	0
Water Pollution	
Human Toxicants	0
Aquatic Toxicants	
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**
Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:**
[illegible]
13.4 **Freezing Point:**
[illegible]
13.5 **Critical Temperature:**
[illegible]
13.6 **Critical Pressure:**
[illegible]
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:**
[illegible]
13.9 **Liquid-Water Interfacial Tension:**
[illegible]
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):**
[illegible]
13.12 **Latent Heat of Vaporization:**
[illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** [illegible]
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

NOTES

HCC	HEXACHLOROCYCLOPENTADIENE

Common Synonyms			
Perchlorocyclopentadiene	Liquid	Greenish yellow	Harsh, unpleasant odor
	Sinks in water		

AVOID CONTACT WITH LIQUID AND VAPOR. STOP LEAK IF SAFE TO DO SO
Wear goggles, self contained breathing apparatus and rubber protective clothing (including gloves)
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
Poisonous gases may be produced when heated

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
If inhaled will cause coughing or difficult breathing
If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Will burn skin and eyes.
If swallowed will cause nausea and vomiting.
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contaminant, air contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Perchlorocyclopentadiene
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** C_5Cl_6
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Yellow or greenish yellow
4 3 **Odor:** Harsh pungent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective clothing, including rubber gloves and rubber shoes or boots, self contained breathing apparatus, face shield
5 2 **Symptoms Following Exposure:** Inhalation of mist is highly irritating to mucous membranes causing lachrymation, sneezing and salivation, pulmonary edema may occur. Ingestion causes nausea, vomiting, diarrhea, depression. Contact with eyes causes severe irritation. Liquid is extremely irritating to the skin causing blistering and burning
5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give artificial respiration and/or oxygen as needed. INGESTION: give large amounts of water and induce vomiting, give saline laxative. EYES: flush with water for at least 15 min., if irritation remains, get medical attention. SKIN: wash with soap and water until no odor remains
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 ppm (proposed)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 0.505 mg/kg (mouse) 1.13 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** 0.15 0.33 ppm

6. FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** If water is used on adjacent fires, do not allow water to enter drums or storage tanks
6 5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride, chlorine and phosgene gases may form in fires
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts slowly to form hydrochloric acid. The reaction is not hazardous
7 2 **Reactivity with Common Materials:** In presence of moisture will corrode iron and other metals. Flammable and explosive hydrogen gas may collect in enclosed space
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Rinse with dilute solution of sodium bicarbonate or soda ash
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Highly toxic
8 2 **Waterfowl Toxicity:** Highly toxic
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential:** Possible accumulation of breakdown products

9. SELECTED MANUFACTURERS

1 Hooker Chemical Corporation
Industrial Chemicals Division
Niagara Falls, N Y 14302

2 Velsicol Chemical Corporation
341 East Ohio Street
Chicago Ill 60611

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 97+%, Synthesis grade
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A X

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poison Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 272.7
13 3 **Boiling Point at 1 atm:** 462°F = 239°C = 512°K
13 4 **Freezing Point:** 50°F = 10°C = 283°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.71 at 20°C (liquid)
13 8 **Liquid Surface Tension** 37.5 dynes/cm = 0.0375 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** Data not available
13 10 **Vapor (Gas) Specific Gravity:** 9.42
13 11 **Ratio of Specific Heats of Vapor (Gas)** Data not available
13 12 **Latent Heat of Vaporization.** (est.) 76 Btu/lb = 42 cal/g = 1.8×10^5 J/kg
13 13 **Heat of Combustion.** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

H'

HEXADECYL SULFATE, SODIUM SALT

Common Synonyms			
Sodium cetyl sulfate solution Cetyl sodium sulfate	Solid paste or liquid	White	Mild odor
	May float or sink in water		

Stop discharge if possible. Keep people away.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire	Not Flammable
Exposure	CALL FOR MEDICAL AID LIQUID OR SOLID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES hold eyelid open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cetyl sodium sulfate
Sodium cetyl sulfate solution

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:**
$CH_3(CH_2)_{14}CH_2OSO_3Na-H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)**
Pasty solid or liquid

4.2 **Color:** White

4.3 **Odor:** Mild

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Plastic or rubber gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Contact with eyes causes mild irritation. May cause skin to dry out and become irritated

5.3 **Treatment for Exposure:** EYES or SKIN flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 0.78 ppm 24 hr oryzias 11

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

Alcolac Inc.
3440 Fairfield Rd.
Baltimore, Md. 21226

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

(Liquid) A P
(Solid) SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm**
Solid or liquid

13.2 **Molecular Weight:** Not pertinent (mixture)

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

HAC	HEXADECYLTRIMETHYLAMMONIUM CHLORIDE

Common Synonyms			
Cetyltrimethylammonium chloride solution	Liquid	Clear to pale yellow	Rubbing alcohol odor
	Floats or sinks in water		

Stop discharge if possible. Keep people away.
Shut off ignition sources. Call fire department.
Avoid contact with liquid and vapor.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Irritating gases may be produced when heated
Flashback vapor along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Extinguish with dry chemicals, foam, or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled

If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cetyltrimethylammonium chloride solution

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula** $C_{16}H_{33}(CH_3)_3NCl \cdot H_2O$ $(CH_3)_3COH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Almost clear to pale yellow

4 3 **Odor:** Like rubbing alcohol

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion may produce toxic effects. Contact with eyes or skin may cause severe damage

5 3 **Treatment for Exposure:** INGESTION: do NOT induce vomiting, drink large quantities of fluid and call a physician immediately. EYES: flush with water for at least 15 min and call a physician. SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 LD_{50} 250 mg/kg(rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 69°F C C (for isopropyl alcohol solutions only)

6 2 **Flammable Limits in Air:** 2% 12% (isopropyl alcohol)

6 3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Irritating fumes of hydrogen chloride may form in fires

6 6 **Behavior in Fire:** Solvent vapors are heavier than air and may travel to a source of ignition and flash back

6 7 **Ignition Temperature:** 750°F (isopropyl alcohol)

6 8 **Electrical Hazard** (for isopropyl alcohol) Class I, Group D

6 9 **Burning Rate:** (isopropyl alcohol solutions) 2.3 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Armak Chemicals Div
Box 1805
Chicago, Ill 60690

2 Lonza, Inc
Fair Lawn, N J 07410

3 Ashland Chemical Co
P O Box 2219
Columbus, Ohio 43216

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 25% solution in water, 50% solution in a mixture of isopropyl alcohol and water, which is flammable. If the chemical (or a solution with concentration greater than 50%) is shipped, contact with skin and eyes should be avoided

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 319 (solute only)

13 3 **Boiling Point at 1 atm:** (isopropyl alcohol) 180°F = 82.3°C = 355.5°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (approx.) 0.9 at 25°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 4 and 5)

NOTES

HAL

n-HEXALDEHYDE

Common Synonyms
Caproaldehyde
Caproaldehyde
Hexanal
Caproaldehyde
n Caproylaldehyde

Liquid Colorless Sharp unpleasant odor

Floats on water
Flammable, irritating vapor is produced

Stop discharge if possible. Keep people away
Shut off ignition sources. Call fire department
Avoid contact with liquid and vapor
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Extinguish with dry chemicals, foam or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled

If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

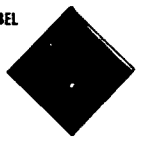
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Caproaldehyde, Caproic aldehyde, Caproaldehyde, n-Caproylaldehyde, Hexanal

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $CH_3(CH_2)_4CHO$

3.4 **IMCO/United Nations Numerical Designation:** 3.3/1207

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Ingestion causes irritation of mouth and stomach. Contact with vapor or liquid irritates eyes. Liquid irritates skin.

5.3 **Treatment for Exposure:** INGESTION: give large amount of water and induce vomiting. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 4,890 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 90°F, O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 5.21 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May attack some forms of plastics

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 W. Saint Paul Ave
Milwaukee, Wis. 53233

2 Pfaltz & Bauer, Inc.
375 Fairfield Ave
Stamford, Conn. 06902

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%, Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 100

13.3 **Boiling Point at 1 atm:** 262°F = 128°C = 401°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.83 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** 3.5

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.061 at 20°

13.12 **Latent Heat of Vaporization:** (est.) 153 Btu/lb = 85 cal/g = 3.6×10^5 J/kg

13.13 **Heat of Combustion:** (est.) −17,000 Btu/lb = −9,430 cal/g = -394×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

HMD — HEXAMETHYLENEDIAMINE

Common Synonyms
1,6-Hexanediamine
1,6-Diaminohexane

Solid or watery liquid — Colorless — Weak ammonia odor

Floats and mixes with water

Avoid contact with liquid. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible

Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with water, foam, dry chemical, or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

LIQUID OR SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Will burn eyes.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: corrosive, water contaminant.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
1,6-Diaminohexane
1,6-Hexanediamine
HMDA

3.2 **Coast Guard Compatibility Classification:** Amine

3.3 **Chemical Formula:** $NH_2(CH_2)_6NH_2$

3.4 **IMCO/United Nations Numerical Designation:** 8.0/1783

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid (anhydrous) or liquid (70% solution)

4.2 **Color:** Glassy solid, clear liquid

4.3 **Odor:** Weak, fishy

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing, eye protection

5.2 **Symptoms Following Exposure:** Vapors cause irritation of eyes and respiratory tract. Liquid irritates eyes and skin; may cause dermatitis.

5.3 **Treatment for Exposure:** SKIN OR EYES: flush immediately with water for 15 min; call a physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Repeated exposure can cause anemia and damage kidney and liver.

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.

5.10 **Odor Threshold:** 0.0041 mg/m^3

6. FIRE HAZARDS

6.1 **Flash Point:** 160°F C.C.

6.2 **Flammable Limits in Air:** 0.7% - 6.3%

6.3 **Fire Extinguishing Agents:** Data not available

6.4 **Fire Extinguishing Agents Not to be Used:** Data not available

6.5 **Special Hazards of Combustion Products:** Data not available

6.6 **Behavior in Fire:** Data not available

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Celanese Corp.
Celanese Chemical Co. Division
245 Park Ave.
New York, N.Y. 10017

2. E. I. duPont de Nemours & Co., Inc.
Plastics Department
Wilmington, Del. 19898

3. Monsanto Co.
Monsanto Textiles Co.
800 N. Lindbergh Blvd.
St. Louis, Mo. 63166

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous, 99.8%; 70% solution

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Nitrogen

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid (anhydrous); Liquid (70% solution)

13.2 **Molecular Weight:** 116.21

13.3 **Boiling Point at 1 atm:** 478°K = 205°C = 401°F

13.4 **Freezing Point:** (anhyd.) 104.9°F = 40.5°C = 313.7°K; (70% soln.) 28°F = −2°C = 269°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** (anhyd.) 0.789 at 60°C (liquid); (70% soln.) 0.933 at 20°C (liquid)

13.8 **Liquid Surface Tension** (anhyd.): 34.6 dynes/cm = 0.0346 N/m at 60°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 203 Btu/lb = 113 cal/g = 4.73 × 10^5 J/kg

13.13 **Heat of Combustion** (est.): −12,200 Btu/lb = −6,790 cal/g = −28.4 × 10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution** (est.): −9 Btu/lb = −5 cal/g = −0.2 × 10^5 J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

HMI	# HEXAMETHYLENEIMINE

Common Synonyms			
Hexahydroazepine Azacycloheptane	Liquid	Colorless to light yellow	Ammonia-like odor
	Floats and mixes slowly with water Irritating vapor is produced		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY
Stop discharge if possible
Isolate and remove discharged
Notify local health and pollution control agencies

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Wear goggles and self-contained breathing apparatus Extinguish with dry chemical, alcohol foam, or carbon dioxide Water may be ineffective in fire Cool exposed containers with water
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing, difficult breathing, or loss of consciousness If in eyes, hold eyelids open and flush with plenty of water If breathing has stopped, give artificial respiration If breathing is difficult, give oxygen LIQUID POISONOUS IF SWALLOWED Will burn skin and eyes If swallowed will cause nausea Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS, dilute with two glasses of water IF SWALLOWED and victim is NOT CONSCIOUS, OR HAVING CONVULSIONS, do nothing except get medical aid DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: corrosive, air contaminant, water contaminant
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Azacycloheptane
Hexahydroazepine, Homopiperidine

3 2 **Coast Guard Compatibility Classification:**
Aliphatic amine

3 3 **Chemical Formula:**
$CH_2CH_2CH_2CH_2CH_2NH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to light yellow

4 3 **Odor:** Ammonia like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus, impervious gloves, chemical safety goggles, impervious apron and boots

5 2 **Symptoms Following Exposure:** Inhalation of vapor irritates respiratory tract, high concentrations may cause disturbance of the central nervous system. Ingestion causes burns of mouth and stomach. Contact with concentrated vapor may cause severe eye injury. Contact with liquid causes burns of eyes and skin

5 3 **Treatment for Exposure:** INHALATION: remove victim to uncontaminated atmosphere, get medical attention. INGESTION: give large amount of water, do NOT induce vomiting, get medical attention if large amount was swallowed. EYES: flush with water for 15 min, and get medical attention. SKIN: flush with water, wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 32 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 99°F O C

6 2 **Flammable Limits in Air:** 1 6% - 2 3%

6 3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.**
Water may be ineffective

6 5 **Special Hazards of Combustion Products:**
Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):**
Data not available

8 4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

1 Celanese Chemical Company
245 Park Avenue
New York, N Y 10017

2 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee, Wis 53233

3 Pfaltz and Bauer, Inc
375 Fairfield Ave
Stamford, Conn 06902

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial, Pure

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Corrosive liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Liquid

13 2 **Molecular Weight:** 99

13 3 **Boiling Point at 1 atm.**
270°F = 132°C = 405°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 880 at 20°C (liquid)

13 8 **Liquid Surface Tension.**
Data not available

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization.**
Data not available

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

HMT	HEXAMETHYLENETETRAMINE

Common Synonyms	
HEXA Urotropin Hexamine Methenamine Ammonioformaldehyde	Solid crystals or powder White Mild ammonia odor Sinks and mixes with water

Avoid contact with solid
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with water foam dry chemical or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
SOLID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Aminoform
Ammoform
Hexamine
Methenamine
Urotropin

3 2 **Coast Guard Compatibility Classification** Aldehyde or amine

3 3 **Chemical Formula:** $C_6H_{12}N_4$

3 4 **IMCO United Nations Numerical Designation.** 4 1 1328

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** White

4 3 **Odor:** Mild ammonia like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Gloves for dusty or spatter conditions use dust filter respirator and goggles

5 2 **Symptoms Following Exposure** Prolonged and repeated contact may cause skin irritation

5 3 **Treatment for Exposure** Wash skin or eyes thoroughly with water Call a physician

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent

5 5 **Short-Term Inhalation Limits.** Not pertinent

5 6 **Toxicity by Ingestion** Grade 2 LD_{50} 0.5 to 5 g/kg (human)

5 7 **Late Toxicity** None

5 8 **Vapor (Gas) Irritant Characteristics** Vapors are non irritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 482°F C C

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water foam carbon dioxide dry chemical

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products.** Formaldehyde gas and ammonia may be given off when hot

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** >700°F

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Borden Inc
Borden Chemical Division
50 W Broad St
Columbus Ohio 43215

2 Hooker Chemical Corp
Walck Rd
N Tonawanda N Y 14120

3 Wright Chemical Corp
Riegelwood N C 28456

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical USP

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 140 19

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 1 35 at 20 C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** −13 500 B/u lb = −7400 cal/g = −310 × 10 J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

HXA	# HEXANE

Common Synonyms
n-Hexane

Watery liquid Colorless Gasoline-like odor

Floats on water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to nose and throat.
If inhaled, will cause coughing or dizziness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Floating to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Evacuate area.
Disperse and flash.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms.
3.2 **Coast Guard Compatibility Classification:** Paraffin
3.3 **Chemical Formula:** $CH_3(CH_2)_4CH_3$
3.4 **IMCO/United Nations Numerical Designation:** 1.1, 1208

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Eye protection (like gasoline)
5.2 **Symptoms Following Exposure:** INHALATION causes irritation of respiratory tract, cough, mild depression, cardiac arrhythmias. ASPIRATION causes severe lung irritation, coughing, pulmonary edema, extremities followed by depression. INGESTION causes nausea, vomiting, swelling of abdomen, headache, depression.
5.3 **Treatment for Exposure:** Call a doctor. INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, give oxygen if needed. INGESTION: do NOT induce vomiting. SKIN OR EYES: wipe off, wash skin with soap and water, wash eyes with copious amounts of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 500 ppm
5.5 **Short-Term Inhalation Limits:** 500 ppm for 30 min
5.6 **Toxicity by Ingestion:** Very slight
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** −7°F C.C.
6.2 **Flammable Limits in Air:** 1.2% – 7.7%
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapors may explode
6.7 **Ignition Temperature:** 437°F
6.8 **Electrical Hazard:** Class I, group D
6.9 **Burning Rate:** 7.4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0% (theor.) 7 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Humphrey Chemical Co.
   Devine St.
   North Haven, Conn. 06473
2. Phillips Petroleum Co.
   Bartlesville, Okla. 74004
3. Skelly Oil Co.
   Kansas City, Mo. 64141

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Research grade, technical grade
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

X U V W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicants	1
Aquatic Toxicants	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 86.17
13.3 **Boiling Point at 1 atm:** 155.7°F = 68.7°C = 341.9°K
13.4 **Freezing Point:** −219.3°F = −139.6°C = 133.6°K
13.5 **Critical Temperature:** 453.6°F = 234.2°C = 507.4°K
13.6 **Critical Pressure:** 436.6 psia = 29.7 atm = 3.01 MN/m²
13.7 **Specific Gravity:** 0.659 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 18.4 dynes/cm = 0.0184 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 51.1 dynes/cm = 0.0511 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 3.0
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.054
13.12 **Latent Heat of Vaporization:** 144 Btu/lb = 80.0 cal/g = 3.35 × 10⁵ J/kg
13.13 **Heat of Combustion:** −19,248 Btu/lb = −10,692 cal/g = −447.65 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

HXN	# HEXANOL

Common Synonyms
1-Hexanol
n-Hexyl alcohol
n-Amylcarbinol

Clear liquid — Colorless — Sweet odor

Floats on water

No discharge is possible. Keep people away.
Call fire department.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn eyes.
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Floating to shoreline
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Amylcarbinol
1-Hexanol
Hexyl alcohol
1-Hydroxyhexane

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $CH_3(CH_2)_5OH$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sweet, mild

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical gloves, chemical goggles

5.2 **Symptoms Following Exposure:** Liquid causes eye burns and skin irritation. Breathing vapors is not expected to cause systemic illness.

5.3 **Treatment for Exposure:** In case of contact, immediately flush skin and eyes with plenty of water. Wash eyes at least 15 min and get medical aid.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns on short exposure; may cause second-degree burns on long exposure

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 149°F O.C., 145°F C.C.

6.2 **Flammable Limits in Air:** 1.2% - 7.7% (calc.)

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 560°F (est.)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 57% ± 10 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Continental Oil Co.
Conoco Chemicals Division
Park 80 Plaza East
Saddle Brook, N.J. 07662

2. Ethyl Corp.
Industrial Chemicals Division
451 Florida St.
Baton Rouge, La. 70801

3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 102.18

13.3 **Boiling Point at 1 atm:** 312.8°F = 157°C = 430.2°K

13.4 **Freezing Point:** −48.3°F = −44.6°C = 228.6°K

13.5 **Critical Temperature:** 676.8°F = 358°C = 631.2°K

13.6 **Critical Pressure:** 455 psia = 31 atm = 3.14 MN/m²

13.7 **Specific Gravity:** 0.8192 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 24.5 dynes/cm = 0.0245 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 6.8 dynes/cm = 0.0068 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** 299 Btu/lb = [illegible] cal/g = 2.56 × 10⁶ J/kg

13.13 **Heat of Combustion:** [illegible] × 10³ Btu/lb = −9183 cal/g = −38.1 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

HXE	1-HEXENE

Common Synonyms
alpha-Hexene
Hexyene

Watery liquid — Colorless — Mild pleasant odor

Floats on water. Flammable, irritating vapor is produced

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid and vapor.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
If inhaled, will cause dizziness, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

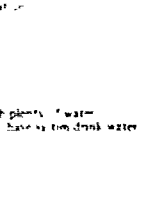
Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning: high flammability.
Evacuate area.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** alpha-Hexene
3.2 **Coast Guard Compatibility Classification:** Olefin
3.3 **Chemical Formula:** $CH_2CH_2CH_2CH$
3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mild pleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved organic vapor respirator or air line mask, protective goggles or face shield.
5.2 **Symptoms Following Exposure:** Inhalation may cause giddiness, incoordination, irritation that forms gaseous vapor. Prolonged exposure to high concentrations may induce loss of consciousness or death.
5.3 **Treatment for Exposure:** SKIN OR EYES: wash exposed skin or eyes with soap and water. Thoroughly flush eyes with water to remove any splashes. Launder contaminated clothing before reuse.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 500 ppm (suggested)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Slight smarting of the eyes or respiratory system if present in high concentrations. Effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** −15°F (C.C.)
6.2 **Flammable Limits in Air:** LEL (est.) = 2%; UEL not listed
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 521°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 1.5% 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Gulf Oil Corp.
   Petrochemicals Division
   Cedar Bayou, Texas 77520
2. The Humphrey Chemical Co.
   Doane St.
   North Haven, Conn. 06473
3. Phillips Petroleum Co.
   Bartlesville, Okla. 74004

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Technical 95-98%; Pure 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arrester or pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-2

A T L V W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Liquid
13.2 **Molecular Weight:** 84.16
13.3 **Boiling Point at 1 atm:** 146.3°F = 63.5°C = 336.7°K
13.4 **Freezing Point:** −219.2°F = −139.6°C = 133.4°K
13.5 **Critical Temperature:** 447.4°F = 230.8°C = 504.0°K
13.6 **Critical Pressure:** 469 psia = 31.9 atm = 32.3 MN/m²
13.7 **Specific Gravity:** 0.675 at 20/4°C
13.8 **Liquid Surface Tension:** 18.8 dynes/cm = 0.0188 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 31.6 dynes/cm = 0.0316 N/m at 22.7°C
13.10 **Vapor (Gas) Specific Gravity:** 2.9
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.066
13.12 **Latent Heat of Vaporization:** 140 Btu/lb = 80 cal/g = 3.3 × 10⁵ J/kg
13.13 **Heat of Combustion:** −19,134 Btu/lb = −10,630 cal/g = −445 (kcal/g-mole) = −1.86 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

HXG	HEXYLENE GLYCOL

Common Synonyms
2-Methyl-
2,4-pentanediol

Oily liquid — Colorless — Mild sweet odor

Floats and mixes slowly with water

Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, alcohol foam, or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, corrosive
Restrict access
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** None commonly used
3.2 **Coast Guard Compatibility Classification:** Glycol
3.3 **Chemical Formula:** NH_3
3.4 **IMCO United Nations Numerical Designation:** NO 2080

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Ammonia like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Ammonia type gas mask, self-contained breathing apparatus, protective clothing, gloves, chaps, and apron, safety shower must be available

5.2 **Symptoms Following Exposure:** Vapors cause itching, smarting, and blistering of eyelids, nose and throat; symptoms may be delayed for several hours. Temporary blindness may occur. Liquid causes caustic like burns if not washed off at once. Ingestion or absorption through skin causes nausea, dizziness, headache. Severe exposure may cause death

5.3 **Treatment for Exposure:** Call a doctor at once. INHALATION: remove to fresh air, observe for development of delayed symptoms. Keep quiet. INGESTION: do NOT induce vomiting, give egg whites or other emollient. SKIN OR EYES: wash with large amounts of water for at least 15 min

5.4 **Toxicity by Inhalation (Threshold Limit Value):** ppm

5.5 **Short-Term Inhalation Limits:** ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 1 LD50 (oral) 500-5000 mg/kg (rat)

5.7 **Lake Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact; severe burns on the eyes

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 200°F O.C.
6.2 **Flammable Limits in Air:** 1.2% - 7.6%
6.3 **Fire Extinguishing Agents:** Water, alcohol foam, carbon dioxide, or dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Irritant vapors generated when heated
6.6 **Behavior in Fire:** May explode if confined
6.7 **Ignition Temperature:** May ignite spontaneously 500°F (plus)
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** (minimum test)

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Can catch fire when in contact with porous materials such as wood, asbestos, cloth, earth and rusty metals
7.3 **Stability During Transport:** Stable at ordinary temperatures. When heated can decompose to nitrogen and ammonia gases. Hot decomposition is not hazardous unless material is confined
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water. Neutralize the resulting solution with calcium hypochlorite (HTH) or hydrogen peroxide (hydrazine)
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 146 ppm 0.5 hr rainbow trout, dried fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 100%
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Fairmount Chemical Co., Inc.
   117 Blanchard St
   Newark, N.J. 07105
2. Olin Corp.
   Chemicals Division
   120 Long Ridge Rd
   Stamford, Conn. 06904
3. Universal Inc.
   Universal Chemical Division
   Spencer St
   Naugatuck, Conn. 06770

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous, 35-64% water solutions
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Padded
10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	4
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	4

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 118.18
13.3 **Boiling Point at 1 atm:** 396.8°F = 202°C = 475°K
13.4 **Freezing Point:** 34.7°F = 1.5°C = 274.7°K
13.5 **Critical Temperature:** 716°F = 380°C = 653°K
13.6 **Critical Pressure:** 2130 psia = 145 atm = 14.7 MN/m²
13.7 **Specific Gravity:** 0.908 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.19
13.12 **Latent Heat of Vaporization:** 315 Btu/lb = 200 cal/g = 12.5 × 10³ J/kg
13.13 **Heat of Combustion:** −8345 Btu/lb = −4636 cal/g = −194.1 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** −218 Btu/lb = −121 cal/g = −5.07 × 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

(continued on page 5 and 6)

NOTES

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HDZ — HYDRAZINE

Common Synonyms

Watery liquid — Colorless — Ammonia odor

Mixes with water. Poisonous, flammable vapor is produced. Freezing point is 35° F.

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible. Call fire department.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear chemical protective suit with self-contained breathing apparatus.
Combat fires from safe distance or protected location.
Flood discharge area with water.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Cool exposed containers with water.
Continue cooling after fire has been extinguished.

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.
Irritating to eyes.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

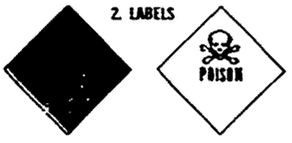
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability, corrosive.
Restrict access.
Chemical and physical treatment.

2. LABELS



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** None common synonyms.
3.2 **Coast Guard Compatibility Classification:** Not applicable.
3.3 **Chemical Formula:** N_2H_4
3.4 **IMCO United Nations Numerical Designation:** NA 2030

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Ammonia like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Ammonia type gas mask, self-contained breathing apparatus, plastic coated or rubber gloves, clothes, and apron; safety shower must be available.

5.2 **Symptoms Following Exposure:** Vapors cause itching, swelling, and blistering of eyelids, skin, nose and throat; symptoms may be delayed for several hours. Temporary blindness may occur. Liquid causes a caustic, like burn if not washed off at once. Ingestion or absorption through skin causes nausea, dizziness, headache. Severe exposure may cause death.

5.3 **Treatment for Exposure:** Call a doctor at once. INHALATION: remove to fresh air, observe for development of delayed symptoms. Keep quiet. INGESTION: do NOT induce vomiting, give egg whites or other emollients. SKIN OR EYES: wash with large amounts of water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 ppm

5.5 **Short-Term Inhalation Limits:** 1 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 3 LD50 (50 to 500 mg/kg rat)

5.7 **Late Toxicity:** Causes lung cancer in mice

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact; very injurious to the eyes.

5.10 **Odor Threshold:** 3 - 4 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 100°F O.C.
6.2 **Flammable Limits in Air:** 4.7% - 100%
6.3 **Fire Extinguishing Agents:** Water, alcohol foam, carbon dioxide, or dry chemical.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
6.5 **Special Hazards of Combustion Products:** Toxic vapors generated when heated.
6.6 **Behavior in Fire:** May explode if confined.
6.7 **Ignition Temperature:** May ignite spontaneously. [illegible]
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive.
7.2 **Reactivity with Common Materials:** Can ignite when in contact with porous materials such as wood, cotton, chalk, earth and rust; metal.
7.3 **Stability During Transport:** Stable at ordinary temperatures. When heated, can decompose to nitrogen and ammonia gases, but decomposition not hazardous unless material is confined.
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water. Neutralize the resulting solution with calcium hypochlorite (HTH) 1 lb per lb of hydrazine.
7.5 **Polymerization:** Not pertinent.
7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 148 ppm/96 hr (rainbow trout, distilled fresh water)
8.2 **Waterfowl Toxicity:** Data not available.
8.3 **Biological Oxygen Demand (BOD):** 100%
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Fairmount Chemical Co., Inc.
[illegible] Blanchard St.
Newark, N.J. 07105
2. Olin Corp.
Chemicals Division
120 Long Ridge Rd.
Stamford, Conn. 06904
3. Uniroyal, Inc.
Uniroyal Chemical Division
Spencer St.
Naugatuck, Conn. 06770

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous, 35% and 64% water solutions
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Padded
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A P-Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	[illegible]
Aesthetic Effect	[illegible]
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	4

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	[illegible]
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 32.0
13.3 **Boiling Point at 1 atm:** 236.1°F = 113.4°C = 386.5°K
13.4 **Freezing Point:** 34.7°F = 1.5°C = 274.7°K
13.5 **Critical Temperature:** 716°F = 380°C = 653°K
13.6 **Critical Pressure:** 2140 psia = 145 atm = 14.7 MN/m²
13.7 **Specific Gravity:** 1.0104 at 20/4°C
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** 2[illegible] Btu/lb = 12[illegible] cal/g = [illegible] kcal/gmole
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

HCL — HYDROCHLORIC ACID

Common Synonyms
Muriatic Acid

Watery liquid — Colorless — Sharp, irritating odor

Sinks and mixes with water. Irritating vapor is produced.

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
Flammable gas may be produced on contact with metals.
Wear chemical protective suit with self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause coughing or difficult breathing.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have him drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Neutralize with lime or soda ash.
Notify operator of municipal water system.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning — corrosive.
Restrict access.
Disperse and flush.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Muriatic acid
3.2 **Coast Guard Compatibility Classification:** Non-oxidizing mineral acid
3.3 **Chemical Formula:** HCl; HCl
3.4 **IMCO United Nations Numerical Designation:** 8.0, 1789

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to light yellow
4.3 **Odor:** Pungent, sharp, pungent, irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing equipment; air line mask; or industrial acid or type gas mask; rubber or rubber-coated gloves; aprons; coat; overalls; shoes.

5.2 **Symptoms Following Exposure:** Inhalation of fumes results in coughing and choking sensation and irritation of nose and lungs. Liquid causes burns.

5.3 **Treatment for Exposure:** INHALATION: remove person to fresh air; keep him warm and quiet and get medical attention immediately; start artificial respiration if breathing stops. INGESTION: have person drink water or milk; do NOT induce vomiting. EYES: immediately flush with plenty of water for at least 15 min and get medical attention; continue flushing if another 15 min if physician does not arrive promptly. SKIN: immediately flush with water; removing contaminated clothing; get medical attention promptly; use soap and wash area for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5.5 **Short-Term Inhalation Limits:** 5 ppm for 5 min.
5.6 **Toxicity by Ingestion:** Data not available.
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Highly severe skin irritant; may cause pain and second degree burns after a few minutes contact.
5.10 **Odor Threshold:** 1.5 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors are generated when heated.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Corrosive to most metals with evolution of hydrogen gas which may form explosive mixtures with air.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
282 ppm/96 hr mosquito fish; 11 m fresh water
100-180 ppm/48 hr shrimp; 10 m salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Diamond Shamrock Corp.
Hooker Chemicals Division
801 Union Commerce Bldg.
Cleveland, Ohio 44115
2. Stauffer Chemical Co.
Industrial Chemicals Division
300 Park Ave.
New York, N.Y. 10017
3. Vulcan Materials Co.
Chemicals Division
Wichita, Kan. 67201

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
Food processing or technical
18° Be' — 27.9% — 20 Be' — 22.5%
22° Be' — 31.5%
Reagent, ACS and USP 23° Be' — 37.1%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	1
Liquid or Solid Irritant	3
Poisons	
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES*

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** 121.4°C = 250.5°F = 394.5°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.19 at 20°C (water)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 178 Btu/lb = 98.6 cal/g = 4.13 × 10⁵ J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** -840 Btu/lb = -480 cal/g = -20 × 10⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

*Physical properties are for 37% HCl unless noted.

*Indicated on page 2 and 3

NOTES

REVISED 1978

HFA — HYDROFLUORIC ACID

Common Synonyms	Watery liquid	Colorless to green	Irritating odor
	Sinks and causes with water. Harmful vapor is produced		

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective clothing with self-contained breathing apparatus.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
Flammable gas may be produced on contact with metals.
Wear chemical protective clothing with self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID

VAPOR
Will burn eyes, nose and throat.
Harmful if inhaled.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
IF IN EYES, hold eyelids open and flush with plenty of water.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning / evacuate
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Non-oxidizing mineral acid
3.3 **Chemical Formula:** HF H_2O
3.4 **IMCO/United Nations Numerical Designation:** 4.0 / 1790

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to slightly yellow
4.3 **Odor:** Pungent / irritating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Proper protective clothing must be worn that encapsulates the body, including the face. All persons handling this product must be familiar with and must observe all the precautions contained in the Manufacturing Chemists' Association Chemical Safety Data Sheet SD-25. A shower and an eye wash must be available.
5.2 **Symptoms Following Exposure:** Severe burns and painful burns of eyes and skin.
5.3 **Treatment for Exposure:** INGESTION: have victim drink water or milk; do NOT induce vomiting. SKIN: if victim has come in contact with liquid or vapor, put him in a shower and call a physician. EYES: flush with water for at least 15 min and consult physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 3 ppm
5.5 **Short-Term Inhalation Limits:** 50 ppm for 60 min
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Severe tissue irritant. Causes second- and third-degree burns on short contact; very dangerous to the eyes.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors are generated when heated.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive
7.2 **Reactivity with Common Materials:** Will attack glass, concrete and certain metals containing silica, such as cast iron. Will attack natural rubber, leather and many organic materials. May generate flammable hydrogen in contact with some metals.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; apply powdered limestone, slaked lime, soda ash or sodium bicarbonate.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 60 ppm* fish lethal fresh water
*Time period not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Allied Chemical Corp.
Industrial Chemicals Division
P.O. Box 1139R
Morristown, N.J. 07960

E.I. duPont de Nemours & Co., Inc.
Industrial & Biochemicals Dept.
duPont Bldg.
Wilmington, Del. 19898

Kaiser Aluminum & Chemical Corp.
Kaiser Chemicals Division
P.O. Box 37
Gramercy, La. 70052

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent 48%; technical 52-55%; 70% grade
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES*

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** [illegible]
13.6 **Critical Pressure:** [illegible]
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 649 Btu/lb = 360 cal/g = 15.1 × 10^3 J/kg
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** [illegible]
13.15 **Heat of Solution:** 46.6 Btu/lb = 37.0 cal/g = 1.55 × 10^3 J/kg
13.16 **Heat of Polymerization:** [illegible]

*Physical properties are those of anhydrous HF

Continued on page [illegible]

NOTES

REVISED 1978

HBR — HYDROGEN BROMIDE

Common Synonyms

Hydrobromic Acid
anhydrous

Liquefied compressed gas — Colorless — Irritating odor

Sinks and mixes with water. Poisonous visible vapor cloud is produced

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove any large liquid spill.
Notify local health and pollution control agencies.

Fire

Not flammable
Flammable gas may be produced on contact with metals
Wear chemical protective clothing with self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes
Will cause frostbite
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.
DO NOT RUB AFFECTED AREAS.

Water Pollution

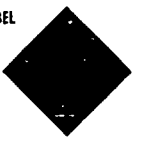
Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Neutralize chemical in drainage ditches.
Notify proper authorities of nearby water intake.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, corrosive, air contaminant
Restrict access
Evacuate area
*Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Hydrobromic acid, anhydrous; Hydrogen bromide, anhydrous
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** HBr
3 4 **IMCO/United Nations Numerical Designation:** 2/1048

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Compressed liquefied gas
4 2 **Color:** Colorless
4 3 **Odor:** Sharp, pungent, irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Full face mask and acid gas canister, self-contained breathing apparatus, chemical goggles, rubber apron and gloves, acid-proof clothing, safety shower
5 2 **Symptoms Following Exposure:** Inhalation causes severe irritation of nose and upper respiratory tract, lung injury. Ingestion causes burns of mouth and stomach. Contact with eyes causes severe irritation and burns. Contact with skin causes irritation and burns.
5 3 **Treatment for Exposure** *Get medical attention after all overexposures to this chemical.* INHALATION: move victim to fresh air and keep him warm and quiet; if a qualified person is available to give oxygen, such treatment may be helpful. INGESTION: give large amounts of water or milk; do NOT induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water; treat acid burns.
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 3 ppm
5 5 **Short-Term Inhalation Limits.** 5 ppm for 5 min
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Pressurized container may explode and release toxic irritating vapor
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Moderate reaction with evolution of heat
7 2 **Reactivity with Common Materials:** Rapidly absorbs moisture forming hydrobromic acid. Highly corrosive to most metals with evolution of flammable hydrogen gas
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 10–100 ppm/96 hr/*/TL$_m$/*
*Species and water type not specified
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Union Carbide Corp
Linde Division
270 Park Avenue
New York, N.Y. 10017

2 Matheson Gas Products
932 Paterson Plank Road
East Rutherford, N.J. 07073

3 Air Products and Chemicals, Inc.
Industrial Gas Division
Box 538
Allentown, Pa. 18105

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99.8+%
10 2 **Storage Temperature** Ambient or lower
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting.** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A C K-M N O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Nonflammable compressed gas
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Gas
13 2 **Molecular Weight:** 80.92
13 3 **Boiling Point at 1 atm.** −88.2°F = −66.8°C = 206.4°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature.** 193.6°F = 89.8°C = 363.0°K
13 6 **Critical Pressure** 1,235 psia = 84 atm = 8.52 MN/m
13 7 **Specific Gravity:** 2.14 at −67°C (liquid)
13 8 **Liquid Surface Tension.** 27.1 dynes/cm = 0.0271 N/m at −67.1°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 2.71
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.38
13 12 **Latent Heat of Vaporization:** 92.3 Btu/lb = 51.3 cal/g = 2.15 × 10^5 J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** 445 Btu/lb = 247 cal/g = 10.3 × 10^5 J/kg
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

HDC — HYDROGEN CHLORIDE

Common Synonyms
Hydrochloric Acid, anhydrous

Liquefied compressed gas — Colorless to slightly yellow — Irritating odor

Sinks and mixes with water. Poisonous visible vapor cloud is produced

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
Flammable gas may be produced on contact with metals.
Wear chemical protective suit with self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes.
Will cause frostbite.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.
DO NOT RUB AFFECTED AREAS.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison, corrosive, air contaminant.
Restrict access.
Evacuate area.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Hydrochloric acid, anhydrous
3.2 **Coast Guard Compatibility Classification:** Inorganic acid
3.3 **Chemical Formula:** HCl
3.4 **IMCO/United Nations Numerical Designation:** 2.0/1050

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Compressed liquefied gas
4.2 **Color:** Colorless to slightly yellow
4.3 **Odor:** Sharp, pungent, irritating.

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full face mask and acid gas canister, self contained breathing apparatus, chemical goggles, rubber apron and gloves, acid-proof clothing, safety shower.
5.2 **Symptoms Following Exposure:** Severely irritating to nose and upper respiratory tract, lung injury.
5.3 **Treatment for Exposure:** INHALATION: immediately remove patient to fresh air, keep him warm and quiet, and call a physician immediately, if a qualified person is available to give oxygen, such treatment may be helpful. INGESTION: have victim drink water or milk, do NOT induce vomiting. EYES OR SKIN: immediately flush with plenty of water for at least 15 min., for eyes get medical attention promptly, air contaminated clothing and wash before reuse.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5.5 **Short-Term Inhalation Limits:** 5 ppm for 5 min.
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant, may cause pain and second degree burns after a few minutes contact.
5.10 **Odor Threshold:** 1-5 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Pressurized container may explode and release toxic, irritating vapors.
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Moderate reaction with evolution of heat
7.2 **Reactivity with Common Materials:** Rapidly absorbs moisture forming hydrochloric acid. Highly corrosive to most metals with evolution of flammable hydrogen gas
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 282 ppm/96 hr/mosquito fish/TLm/fresh water; 100-330 ppm/48 hr/shrimp/LC50/salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Diamond Shamrock Corp.
   Electro Chemicals Division
   300 Union Commerce Bldg.
   Cleveland, Ohio 44115
2. Stauffer Chemical Co.
   Industrial Chemicals Division
   299 Park Ave.
   New York, N.Y. 10017
3. Vulcan Materials Co.
   Chemical Division
   Wichita, Kan. 67201

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 97.5-99%
10.2 **Storage Temperature:** Ambient or lower
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A C-K M N-O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Nonflammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	2
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 36.46
13.3 **Boiling Point at 1 atm:** −121°F = −85.0°C = 188.2°K
13.4 **Freezing Point:** −175°F = −115°C = 158°K
13.5 **Critical Temperature:** 124.5°F = 51.4°C = 324.6°K
13.6 **Critical Pressure:** 1200 psia = 81.6 atm = 8.27 MN/m²
13.7 **Specific Gravity:** 1.191 at −85°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 1.3
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.398
13.12 **Latent Heat of Vaporization:** 185 Btu/lb = 103 cal/g = 4.31 × 10³ J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** −884 Btu/lb = −491 cal/g = −20.6 × 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

HCN — HYDROGEN CYANIDE

Common Synonyms
Hydrocyanic acid
Prussic acid

Watery liquid, or gas — Colorless — Bitter almond odor

Sinks and mixes with water. Poisonous, flammable vapor is produced and rises. Boiling point is 78° F

AVOID CONTACT WITH LIQUID AND VAPOR. EVACUATE AREA
WEAR CHEMICAL PROTECTIVE SUIT WITH SELF CONTAINED BREATHING APPARATUS
Stop discharge if possible. Call fire department.
Shut off ignition sources.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
WEAR CHEMICAL PROTECTIVE SUIT WITH SELF CONTAINED BREATHING APPARATUS
Stop discharge if possible.
Cool exposed containers and protect men effecting shutoff with water.
Let fire burn.

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes
Move to fresh air.
If breathing has stopped, give artificial respiration (but NOT mouth to mouth).
If breathing is difficult, give oxygen.
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

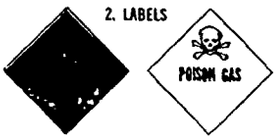
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, water contaminant.
Restrict access.
Evacuate area.

2. LABELS



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Hydrocyanic acid, Prussic acid
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** HCN
3.4 **IMCO/United Nations Numerical Designation:** 2.0 1051

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to bluish white
4.3 **Odor:** Characteristic sweetish, like almond

5. HEALTH HAZARDS

CAUTION: Close approach with station can be caused by ingestion, inhalation, or absorption of liquid or vapor through skin, particularly eyes, mucous membranes, and feet.

5.1 **Personal Protective Equipment:** Escape purposes only: air escape mask with 5-minute air cylinder. Work purposes: vapor proof emergency suit or vinyl coated coveralls plus air mask with clear view facepiece, speaking diaphragm, demand regulator, and 30-minute air cylinder. Rubber gloves, chemical safety goggles, quick opening safety shower.

5.2 **Symptoms Following Exposure:** Irritation of throat, perspiration, difficult breathing, reddening of eyes, salivation, nausea, headache, weakness of arms and legs, giddiness, followed by collapse and convulsions.

5.3 **Treatment for Exposure:** Call a doctor. If breathing has stopped, give artificial respiration until doctor arrives. INHALATION: remove patient to fresh air. SKIN CONTACT: remove contaminated clothing and wash skin thoroughly with copious quantities of water and soap. EYE CONTACT: hold eyelids apart and wash eye with continuous gentle stream of water for at least 15 min.
If patient is unconscious, administer amyl nitrite by crushing a pearl (ampule) in a cloth and holding this under patient's nose for 15 seconds in every minute. Do not interrupt artificial respiration. Replace amyl nitrite pearl when its strength is spent. Continue treatment until patient's condition improves or doctor arrives.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm
5.5 **Short-Term Inhalation Limits:** 20 ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 4: Dose less than 50 mg/kg

Continued on page 4

6. FIRE HAZARDS

6.1 **Flash Point:** 0 F C.C.
6.2 **Flammable Limits in Air:** 5.6% - 40.0%
6.3 **Fire Extinguishing Agents:** Stop flow of gas.
6.4 **Fire Extinguishing Agents Not to be Used:** None
6.5 **Special Hazards of Combustion Products:** Extremely toxic vapors are generated even at ordinary temperatures.
6.6 **Behavior in Fire:** Containers may explode with ignition of contents.
6.7 **Ignition Temperature:** 1000°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 1.5 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves with a moderate reaction.
7.2 **Reactivity with Common Materials:** None
7.3 **Stability During Transport:** May become unstable and subject to explosion if stored for extended time or exposed to high temp. and pressure.
7.4 **Neutralizing Agents for Acids and Caustics:** The weak acidity can be neutralized by slaked lime, but this does not destroy the poisonous property.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.16 ppm/72 hr/young bass/TLm/fresh water
0.069 ppm/24 hr/pink perch/TLm/salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** *Data not available*
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. E. I. duPont de Nemours & Co., Inc.
Electrochemicals Dept.
Wilmington, Del. 19898
2. Monsanto Polymers & Petrochemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. 63166
3. Rohm and Haas Co.
Independence Mall West
Philadelphia, Pa. 19105

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 96% sometimes shipped as a water solution or absorbed on an inert solid. All forms are extremely toxic.
10.2 **Storage Temperature:** Data not available
10.3 **Inert Atmosphere:** May be padded
10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A B C K I M N

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Poisonous gas or liquid, Class A
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	4
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	4
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid
13.2 **Molecular Weight:** 27.03
13.3 **Boiling Point at 1 atm:** 78.3°F = 25.7°C = 298.9°K
13.4 **Freezing Point:** 5.1°F = −13.3°C = 259.9°K
13.5 **Critical Temperature.** 362.3°F = 183.5°C = 456.7°K
13.6 **Critical Pressure:** 735 psia = 50 atm = 5.07 MN/m²
13.7 **Specific Gravity:** 0.689 at 20°C (liquid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 0.9
13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.303
13.12 **Latent Heat of Vaporization** 444 Btu/lb = 247 cal/g = 10.3 × 10³ J/kg
13.13 **Heat of Combustion:** −10,560 Btu/lb = −5864 cal/g = −245.3 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

5. HEALTH HAZARDS (Cont'd)

5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Vapor is not very irritating but is extremely poisonous.
5.9 **Liquid or Solid Irritant Characteristics:** Liquid is not irritating but is extremely poisonous if absorbed through skin or eyes.
5.10 **Odor Threshold:** 1 mg/m³

HFX — HYDROGEN FLUORIDE

Common Synonyms
Hydrofluoric acid anhydrous

Liquid — Colorless — Sharp irritating odor

Sinks and mixes with water. Poisonous vapor is produced and slowly rises. Boiling point is 67° F

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit including self-contained breathing apparatus.
Stop discharge if possible.
Stay upwind and use water spray to knock down vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
Flammable gas may be produced on contact with metals

Wear chemical protective suit including self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat

Move to fresh air.
If breathing has stopped give artificial respiration.
If breathing is difficult give oxygen.

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, corrosive
Restrict access
Evacuate area
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Hydrofluoric acid, anhydrous
3.2 **Coast Guard Compatibility Classification:** Inorganic acid
3.3 **Chemical Formula:** HF
3.4 **IMCO/United Nations Numerical Designation:** 2.0 1052

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pungent, irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid resistant hat, safety goggles, face shield, jacket, overalls, gauntlet type gloves, and boots. The goggles and face shield must have plastic lenses. There must be a shower and an eye wash. Observe all precautions contained in the Manufacturing Chemists Association Chemical Safety Data Sheet SD-25.
5.2 **Symptoms Following Exposure:** Serious and painful burns of eyes, skin and respiratory tract, pulmonary edema.
5.3 **Treatment for Exposure:** INGESTION: have victim drink water or milk, do NOT induce vomiting. SKIN: flush with water, consult physician. EYES: flush with water for at least 15 min, consult physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 3 ppm
5.5 **Short-Term Inhalation Limits:** 3 ppm for 15 min
5.6 **Toxicity by Ingestion:** Oral LDL_0 = 80 mg/kg (guinea pig)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact. Very injurious to the eyes.
5.10 **Odor Threshold:** 0.03 mg/m^3

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors are generated when heated
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves with liberation of heat
7.2 **Reactivity with Common Materials:** Will attack glass, concrete and certain metals, especially those containing silica, such as cast iron. Will attack natural rubber, leather, and many organic materials. May generate flammable hydrogen gas in contact with some metals
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 60 ppm * fish lethal, fresh water
*Time period not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp
Industrial Chemicals Division
Morristown, N.J. 07960
2. E. I. duPont de Nemours & Co. Inc.
Industrial & Biochemicals Dept.
Wilmington, Del. 19898
3. Kaiser Aluminum & Chemical Corp.
Kaiser Chemicals Division
Gramercy, La. 70052

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.99.9%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A C K M N O

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive material
12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	2
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 20.01
13.3 **Boiling Point at 1 atm.** 67.1°F = 19.5°C = 292.7°K
13.4 **Freezing Point:** −134°F = −92.2°C = 181.0°K
13.5 **Critical Temperature:** 447°F = 230.6°C = 503.8°K
13.6 **Critical Pressure:** 1100 psia = 74 atm = 7.48 MN/m
13.7 **Specific Gravity:** 0.992 at 19.5°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 0.7
13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.369
13.12 **Latent Heat of Vaporization:** 145 Btu/lb = 80.5 cal/g = 3.37 × 10^5 J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** −1322 Btu/lb = −734.6 cal/g = −30.76 × 10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

HXX HYDROGEN, LIQUEFIED

Common Synonyms

Liquid hydrogen

Liquefied compressed gas Colorless Odorless

Floats and boils on water Flammable visible vapor cloud is produced

Shut off ignition sources Call fire department
Avoid contact with liquid Keep people away
Stop discharge if possible
Stay upwind Use water spray to knock down vapor

Fire

FLAMMABLE
Flame is almost invisible
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Evacuate surrounding area
Stop flow of gas if possible
Cool exposed containers and protect nearby effecting shutoff with water

Exposure

VAPOR
If inhaled in high concentrations will cause difficult breathing or loss of consciousness

Move victim to fresh air
If breathing has stopped give artificial respiration

LIQUID
Will cause frostbite

Flush affected areas with plenty of water
DO NOT REMOVE FROZEN AREAS

Water Pollution

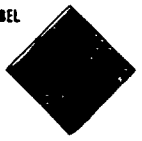
Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Liquid hydrogen
para Hydrogen

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** H

3 4 **IMCO/United Nations Numerical Designation** 2 1966

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety goggles or face shield insulated gloves and long sleeves cuffless trousers worn outside boots or over high top shoes to shed spilled liquid self-contained breathing apparatus containing air (never use oxygen)

5 2 **Symptoms Following Exposure:** If atmosphere does not contain enough oxygen inhalation can cause dizziness unconsciousness or even death Contact of liquid with eyes or skin causes freezing similar to a burn

5 3 **Treatment for Exposure.** The only effect of exposure to liquid hydrogen is that caused by its unusually low temperature and its action as a simple asphyxiant INHALATION if victim is unconscious (due to oxygen deficiency) move him to fresh air and apply resuscitation methods call physician EYES treat for frostbite SKIN treat for frostbite, soak in lukewarm water get medical attention if burn is severe

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Gas is non poisonous but can act as a simple asphyxiant

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion.** Not pertinent (gas with low boiling point)

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not pertinent

6 2 **Flammable Limits in Air:** 4 0% 7 0%

6 3 **Fire Extinguishing Agents:** Let fire burn shut off gas supply

6 4 **Fire Extinguishing Agents Not to be Used:** Carbon dioxide

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Burns with an almost invisible flame

6 7 **Ignition Temperature.** 1,065°F

6 8 **Electrical Hazard:** Class I Group B

6 9 **Burning Rate:** 9 9 mm min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Ambient temperature of water will cause vigorous vaporization of hydrogen

7 2 **Reactivity with Common Materials:** No chemical reaction, but low temperature causes most materials to become very brittle

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** None

8 2 **Waterfowl Toxicity:** None

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Union Carbide Corporation
Linde Division
Morristown N J 03857

2 Air Products and Chemicals Inc
Specialty Gases Division
P O Box 538
Allentown Pa 18105

3 Chemetron Corp
Industrial Gases Division
111 E Wacker Drive
Chicago Ill 60601

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** −434°F

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B C D E F G

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight:** 2 0

13 3 **Boiling Point at 1 atm:**
−422°F = −253°C = 20°K

13 4 **Freezing Point:**
−435°F = −259°C = 14°K

13 5 **Critical Temperature:**
−400°F = −240°C = 33°K

13 6 **Critical Pressure:**
188 psia = 12 8 atm = 1 30 MN/m

13 7 **Specific Gravity:** 0 071 at −253°C (liquid)

13 8 **Liquid Surface Tension**
2 3 dynes/cm = 0 023 N m at −255°C

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 0 067

13 11 **Ratio of Specific Heats of Vapor (Gas).** 1 3962

13 12 **Latent Heat of Vaporization:** 190 5 Btu/lb
= 105 8 cal/g = 4 427 × 10³ J/kg

13 13 **Heat of Combustion:** −50 080 Btu/lb
= −27 823 cal/g = −1164 1 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

HPO — HYDROGEN PEROXIDE

Common Synonyms
Peroxide
Albone
Superoxol

Watery liquid — Colorless — Slightly sharp odor

Sinks and mixes with water. Irritating vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit including self-contained breathing apparatus.
Stop discharge if possible. Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable
May cause fire and explode on contact with combustibles and metals
Containers may explode when heated
Wear chemical protective suit including self-contained breathing apparatus.
Flood discharge area with water.

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — corrosive
Restrict access
Disperse and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Peroxide, Albone, Superoxol
3.2 **Coast Guard Compatibility Classification.** Not applicable
3.3 **Chemical Formula:** H_2O_2
3.4 **IMCO United Nations Numerical Designation** 5.1/2015

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Slightly sharp

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective garments, both outer and inner, made of a woven polyester fabric, or of modacrylic or polyvinylidene fabrics, impermeable apron made of polyvinyl chloride or polyethylene film, neoprene gloves and boots, goggles.
5.2 **Symptoms Following Exposure:** Although solutions and vapors are nontoxic, they are irritating. Vapor causes discomfort of eyes and nose. Moderately concentrated liquid can cause burning of the skin and severe stinging sensation. In most cases the stinging subsides quickly and the skin gradually returns to normal without any damage. Highly concentrated liquid can cause blistering of skin if left on for any length of time, can also cause eye damage.
5.3 **Treatment for Exposure:** Contact should be avoided, but immediate flushing with water will prevent any reaction in case of accidental contact.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 1 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion** Data not available
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation, such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics** Fairly severe skin irritant. May cause pain and second degree burns after a few minutes' contact.
5.10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point.** Not flammable but may cause fire and react violently on contact with combustibles and metals.
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Water for fires resulting from spillage
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire:** May explode in fire
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Dirt and many metals cause a rapid decomposition with liberation of oxygen gas. Occurs particularly if concentration is above 40%.
7.3 **Stability During Transport:** Pure grades are quite stable, but contamination with metals or dirt can cause rapid or violent decomposition.
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** >40 ppm *(fingerling trout, fresh water)
* Time period not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. E. I. du Pont de Nemours & Co., Inc.
   Electrochemicals Dept.
   Wilmington, Del. 19898
2. FMC Corp.
   Inorganic Chemicals Division
   633 Third Ave.
   New York, N.Y. 10017
3. Shell Chemical Co.
   Industrial Chemicals Division
   Houston, Texas 77001

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Common commercial strengths are 27.5%, 35%, 50%, 70%, 90% and 98%. "High Strength" means greater than 52% Purity. Technical, Mil Spec, ACS. The hazard increases with the strength.
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief or pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

V P /

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizer
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemical	4
Water	1
Self Reaction	1

12.3 **NFPA Hazard Classifications**

Category	Classification	
% by wt =	27.5%	5%
Health Hazard (Blue)	2	2
Flammability (Red)	0	0
Reactivity (Yellow)	1 OX	3 OX

13 PHYSICAL AND CHEMICAL PROPERTIES*

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 34.01
13.3 **Boiling Point at 1 atm:** 257°F = 125°C = 398°K
13.4 **Freezing Point:** −40.5°F = −40.3°C = 232.9°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity:** 1.29 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.241
13.12 **Latent Heat of Vaporization** 592 Btu/lb = 301 cal/g = 12.6 × 10⁵ J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition** −1220 Btu/lb = −678 cal/g = −28.3 × 10⁵ J/kg
13.15 **Heat of Solution:** −20.2 Btu/lb = −11.2 cal/g = −0.469 × 10⁵ J/kg
13.16 **Heat of Polymerization** Not pertinent

*Physical properties apply to 70% solution

Continued on page 5 and 6

NOTES

REVISED 1978

HDS — HYDROGEN SULFIDE

Common Synonyms:
Sulphuretted hydrogen

Liquefied compressed gas — Colorless — Rotten egg odor, but odorless at poisonous concentrations

Sinks and boils in water. Poisonous, flammable, visible vapor cloud is produced

[illegible]

Fire

FLAMMABLE.
Flashback along vapor trail may occur
May explode if ignited in an enclosed area
[illegible]

Exposure

[illegible] FOR MEDICAL AID

VAPOR
POISONOUS IF INHALED
Irritating to eyes
[illegible]

Water Pollution

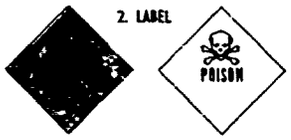
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, poison
Restrict access
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Sulfuretted hydrogen
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** H_2S
3.4 **IMCO/United Nations Numerical Designation:** 2.0 1053

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid under pressure
4.2 **Color:** Colorless
4.3 **Odor:** Offensive odor like rotten eggs

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber-framed goggles, approved respirators, protective
5.2 **Symptoms Following Exposure:** Irritation of eyes, nose and throat. If high concentrations are inhaled, hyperpnea and respiratory paralysis may occur. Very high concentrations may produce pulmonary edema
5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure, if breathing has stopped, give artificial respiration, administer oxygen if needed, consult physician. EYES: wash with plenty of water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm
5.5 **Short-Term Inhalation Limits:** 200 ppm for 10 min, 100 ppm for 30 min, and 50 ppm for 60 min
5.6 **Toxicity by Ingestion:** Hydrogen sulfide is present as a gas at room temperature, so ingestion not likely
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5.10 **Odor Threshold:** 0.0047 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Flammable gas
6.2 **Flammable Limits in Air:** 4.3% - 45%
6.3 **Fire Extinguishing Agents:** Stop flow of gas
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic gases are generated in fires
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature:** 500°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 2.3 mm/min (liquid)

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 1.35 ppm/48 hr fathead minnows, 11 m fresh water; [illegible] 0 hr bullfrog lethal, salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. PPG Industries Inc
   Industrial Chemicals Division
   One Gateway Center
   Pittsburgh, Pa 90670
2. Union Oil Co of California
   Union Oil Center
   Los Angeles, Cal 90017
3. Stauffer Chemical Co
   Stauffer Gas Products Division
   East Rutherford, N.J. 07073

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Purified technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A B C D E F G

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 34.08
13.3 **Boiling Point at 1 atm:** −76.5°F = −60.4°C = 212.8°K
13.4 **Freezing Point:** −117°F = −82.8°C = 190.4°K
13.5 **Critical Temperature:** 212.7°F = 100.4°C = 373.6°K
13.6 **Critical Pressure:** 1300 psia = 88.9 atm = 9.01 MN/m²
13.7 **Specific Gravity:** 0.916 at −80°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.03 N/m at −61°C
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** 1.2
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.322
13.12 **Latent Heat of Vaporization:** 234 Btu/lb = 130 cal/g = 5.44 × 10⁵ J/kg
13.13 **Heat of Combustion:** −6552 Btu/lb = −3640 cal/g = −15.24 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page [illegible])

NOTES

REVISED 1978

HDQ — HYDROQUINONE

Common Synonyms
1,4-Benzenediol
p-Dihydroxybenzene
Hydroquinol
Pyrogentisic acid
Quinol

Solid — White, light tan to gray

Sinks and mixes with water

Avoid contact with solid and dust. Keep people away.
Shut off ignition sources. Call fire department.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Dust cloud may explode if ignited in an enclosed area.
Extinguish with water, dry chemicals, foam, or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat.
Harmful if inhaled.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Will burn eyes.
Irritating to eyes.
If swallowed will cause headache, dizziness, nausea, vomiting, or loss of consciousness.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is NONCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: water contaminant.
Disperse and flush.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,4-Benzenediol, p-Dihydroxybenzene, Hydroquinol, Pyrogentisic acid, Quinol
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $1,4\text{-}C_6H_4(OH)_2$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Light tan to light gray, white
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles, respirators, protection if dust is present
5.2 **Symptoms Following Exposure:** Ingestion can cause ringing in the ears, nausea, dizziness, a sense of suffocation, increased respiration rate, vomiting, pallor, muscular twitchings, headache, dyspnea, cyanosis, delirium, and collapse; the urine is green or brownish green. Lethal adult dose is 2 grams. Direct contamination of the eye with particles of hydroquinone can cause immediate irritation and may result in ulceration of the cornea. Contact with skin may cause dermatitis.
5.3 **Treatment for Exposure:** INGESTION: induce vomiting, perform gastric lavage, and follow with a saline cathartic and demulcents; get medical attention. EYES: flush immediately with plenty of water for 15 min. and get medical attention. SKIN: wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 2 mg/m³
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3, LD₅₀ 320 mg/kg (rat)
5.7 **Late Toxicity:** Causes bladder cancer in mice; discoloration of eyelids and eye changes in men
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** (molten) 350°F (176°C)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:**
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:** Dust explosion is possible
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 0.287 ppm/48 hr, goldfish/TLm/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 53%, 5 days; 25% (theo.), 0.5 days, as catechol
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastman Chemical Products, Inc., Kingsport, Tenn. 37662
2. Allied Chemical Corp., Specialty Chemicals Div., P.O. Box 1087R, Morristown, N.J. 07960
3. Aldrich Chemical Co., 940 W. Saint Paul Ave., Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure, Technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

NS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 110.11
13.3 **Boiling Point at 1 atm:** 545°F = 285°C = 558°K
13.4 **Freezing Point:** 338°F = 170°C = 443°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.33 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** −11,200 Btu/lb = −6,220 cal/g = −260 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

HAI	2-HYDROXYETHYL ACRYLATE, INHIBITED

Common Synonyms			
beta-hydroxyethyl acrylate 2 Hydroxyethyl 2-propenoate	Liquid	Colorless	Sweet pleasant odor
	Mixes with water		

[illegible]

Fire	Combustible Containers may explode in fire [illegible]
Exposure	[illegible] medical aid LIQUID Will burn skin and eyes Harmful if swallowed remove contaminated clothing and shoes FLUSH affected area with plenty of water EYES [illegible] and flush with plenty of water INGESTION [illegible] CONSULT [illegible] water DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Restrict access
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** beta Hydroxyethyl acrylate
2 Hydroxyethyl 2 propenoate

3 2 **Coast Guard Compatibility Classification:** Monomers (14)

3 3 **Chemical Formula:** $CH_2{=}CHCOOCH_2CH_2OH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Sweet pleasant

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat Contact with liquid irritates eyes and skin

5 3 **Treatment for Exposure:** INHALATION remove victim from exposure support respiration call physician if needed EYES wash with large amounts of water for 15 min call physician SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 2 oral LD_{50} = 1 0"0 mg kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury They cannot be tolerated even at low concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant Causes second and third-degree burns on short contact and is very injurious to the eyes

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 220°F O C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Water dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Containers may explode

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 2 0 mm min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** In the absence of inhibitor, polymerization will occur especially when heated

7 6 **Inhibitor of Polymerization.** Monomethyl ether of hydroquinone 400 ppm

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland Mich 48640

2 Pfaltz and Bauer Inc
126-04 Northern Boulevard
Flushing, N Y 11368

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

A P Q Z

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	3

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 116 1

13 3 **Boiling Point at 1 atm:** > 346°F = > 210°C = > 483°K

13 4 **Freezing Point:** −76°F = −60°C = 213°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 10 at 25°C (liquid)

13 8 **Liquid Surface Tension:** (est) 28 dynes/cm = 0 028 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est) −10 800 Btu/lb = −6 000 cal/g = −250 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** (est) −218 Btu/lb = −121 cal/g = −5 06 × 10³ J/kg

Continued on pages 7 and 8

NOTES

HAS — HYDROXYLAMINE SULFATE

Common Synonyms			
Oxammonium sulfate	Solid	White	Odorless
	Sinks and mixes with water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not Flammable
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing or loss of consciousness
If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea or loss of consciousness
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Restrict access
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Oxammonium sulfate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $(NH_3OH)_2H_2SO_4$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Crystals
4 2 **Color:** White
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Acid resistant protective clothing including coveralls wrist length gloves, cap, goggles and dust mask
5 2 **Symptoms Following Exposure:** Inhalation of dust or ingestion may cause systemic poisoning characterized by cyanosis methemoglobinemia convulsions and coma Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air, get medical attention if symptoms occur INGESTION give large amounts of water, induce vomiting, get medical attention EYES flush with water for at least 15 min and get medical attention SKIN flush immediately with plenty of water then wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3 LD_{50} 50 - 500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Sulfuric acid fumes may form in fires
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May be corrosive to metals in presence of moisture
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Commercial Solvents Corp
245 Park Avenue
New York N Y 10017
2 Virginia Chemicals Inc
3340 W Norfolk Road
Portsmouth Va 23703
3 Dow Badische Co
Williamsburg Va 23188

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 97 99%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **HAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 164 14
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** >1 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

HPA	HYDROXYPROPYL ACRYLATE

Common Synonyms	Liquid	Colorless	Faint unpleasant odor
Propylene glycol mono acrylate 1,2 Propanediol-1-acrylate	May float or sink in water		

Avoid contact with liquid and vapor. Keep people away.
Shut off ignition sources. Call fire department.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
CONTAINERS MAY EXPLODE IN FIRE
Extinguish with dry chemicals, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.
COMBAT FIRE FROM SAFE DISTANCE OR PROTECTED LOCATION.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.
If in eyes: hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
If swallowed will cause nausea.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES: hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: water contaminant
Restrict access
Disperse and flush

2. LABELS

No Hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2-Propanediol-1-acrylate; Propylene glycol mono-acrylate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $CH_2OHCH(OH)COOCH{=}CH_2$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Slightly acrylic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, apron and boots, worker's goggles or face shield

5.2 **Symptoms Following Exposure:** Inhalation irritates nose and throat and causes coughing; lung injury may occur. Ingestion causes irritation and burning of mouth and stomach. Vapor irritates eyes. Contact with liquid causes severe burns of eyes and burns of skin.

5.3 **Treatment for Exposure:** INHALATION: if ill effects occur, get patient to fresh air, keep him quiet and warm, and get medical attention; if breathing stops, start artificial respiration. INGESTION: force milk or water immediately, induce vomiting only at physician's recommendation. EYES: promptly flush with plenty of water and get medical attention. SKIN: promptly flush with plenty of water; get medical attention if burning occurs.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 1,230 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third degree burns on short contact and is very injurious to the eyes.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 212°F (C.C.)

6.2 **Flammable Limits in Air:** 1.8% (LEL)

6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerizables:** May occur, avoid exposure to high temperatures, ultraviolet light, free radical initiators

7.6 **Inhibitor of Polymerization:** 200 ppm hydroquinone

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co
   Design Products Dept
   Midland, Mich. 48640
2. Polysciences, Inc
   Paul Valley Industrial Park
   Warrington, Pa. 18976

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 97%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446)

A P Q Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicants	2
Aquatic Toxicants	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	1
Self-Reaction	3

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 130

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.06 at 25°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** 4.5

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Data not available

13.13 **Heat of Combustion:** (est.) −12,300 Btu/lb = −6,850 cal/g = −287 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Data not available

(continued on page 7 and 8)

NOTES

HPM	HYDROXYPROPYL METHACRYLATE

Common Synonyms			
Propylene glycol monomethacrylate 1,2 Propanediol 1-methacrylate	Liquid	White	Slight unpleasant odor
	May float or sink in water		

Fire

Combustible
CONTAINERS MAY EXPLODE IN FIRE
Extinguish [illegible]
Water may be ineffective [illegible]
Do not exposed [illegible]
COMBUSTIBLE OPEN FLOW [illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

LIQUID
Will burn eyes
Irritating to eyes
If swallowed will cause nausea and vomiting
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning water contaminant
Restrict access
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 2 propanediol 1 methacrylate, Propylene glycol monomethacrylate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $CH_2CHOHCH_2OCOC(CH_3)=CH_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Slight acrylic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes coughing and irritation of nose and throat lung injury may occur Ingestion causes irritation and burning of mouth and stomach Contact of vapor with eyes causes irritation Liquid may cause severe eye burns and irritation of skin

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air, if required start artificial respiration and call a doctor INGESTION force milk or water at once get medical attention EYES flush with water for at least 15 min, get medical attention if irritation persists SKIN flush with water get medical attention for burns

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1, LD_{50} 5 15 g/kg (mouse)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 290°F (C)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:** Compound may polymerize when hot and burst container

6 7 **Ignition Temperature:** Data not available

5 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** May polymerize when hot or when exposed to ultraviolet light and free radical catalysts

7 6 **Inhibitor of Polymerization:** 200 ppm hydroquinone

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Rohm and Haas
Independence Mall
W Philadelphia Pa 19105

2 Polysciences Inc
Paul Valley Industrial Park
Warrington Pa 18976

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 95+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

VPQ7

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 144

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 06 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Data not available

Continued on page 4 and 5

NOTES

IAA

ISOAMYL ALCOHOL

Common Synonyms
Fusel oil
Fermentation amyl alcohol
Isopentyl alcohol
3-Methyl-1-butanol

Liquid — Colorless — Mild, choking alcohol odor

Floats and mixes with water. Irritating vapor is produced.

Stop discharge if possible. Keep people away.
Call fire department.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Extinguish with water, dry chemical, alcohol foam, or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose, and throat
Harmful if inhaled
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to eyes.
IF IN EYES: Hold eyelids open and flush with plenty of water.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-2)

Disperse and flush.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Fermentation amyl alcohol; Fusel oil; Isobutylcarbinol; Isopentyl alcohol; 3-Methyl-1-butanol; Pentyl alcohol
3.2 **Coast Guard Compatibility Classification:** Alcohol
3.3 **Chemical Formula:** $(CH_3)_2CHCH_2CH_2OH$
3.4 **IMCO United Nations Numerical Designation:** 3.3 (UN 1105)

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mild odor, alcoholic, non-persistent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Face shield to avoid splash.
5.2 **Symptoms Following Exposure:** Very high vapor concentrations irritate eyes and upper respiratory tract. Continued contact with skin may cause irritation.
5.3 **Treatment for Exposure:** EYES: immediately flush with plenty of water for at least 15 min; get medical attention. SKIN: Flush with water; wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2. LD50 [illegible] g/kg
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Liquid may irritate skin.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 114°F (46°C)
6.2 **Flammable Limits in Air:** 1.2% - 9.0% (112°F)
6.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 662°F
6.8 **Electrical Hazard:** Class I, Group C
6.9 **Burning Rate:** 3.6 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 100 ppm 82 hr goldfish survival (fresh water); 400-600 ppm 24 hr green crab survival range (river water)
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 1.96% 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Publicker Industries Inc.
   1429 Walnut St.
   Philadelphia, Pa. 19102
2. Union Carbide Corp.
   Chemicals and Plastics Division
   270 Park Ave.
   New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure fusel oil
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arrester

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A.P.Q.T.U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 88.15
13.3 **Boiling Point at 1 atm:** 270°F = 132°C = 405°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** [illegible]°F = [illegible]°C = [illegible]°K
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.81 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 23.3 dynes/cm = 0.0233 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** [illegible] dynes/cm = 0.0[illegible] N/m at 15°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] kcal/kg = [illegible] J/kg
13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] kcal/kg = [illegible] J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** [illegible] Btu/lb = [illegible] cal/g = [illegible] kcal/kg = [illegible] J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

IBT	# ISOBUTANE

Common Synonyms		
2-Methylpropane	Liquefied compressed gas — Colorless — Odorless Floats and boils on water. Flammable visible vapor cloud is produced	

[illegible]

Fire

FLAMMABLE.
Flashbacks along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes.
If inhaled, will cause dizziness, difficult breathing or loss of consciousness.
[illegible]

Water Pollution

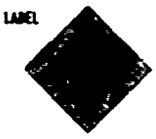
Not harmful to aquatic life.

1. RESPONSE TO DISCHARGE

(See Hazardous Materials Handbook, CG-446-4)

Issue warning: high flammability.
Restrict access.
Evacuate area.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Methylpropane
3.2 **Coast Guard Compatibility Classification:** Paraffin
3.3 **Chemical Formula:** $CH_3CH(CH_3)CH_3$
3.4 **IMCO United Nations Numerical Designation:** 2.0 1969

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied under pressure
4.2 **Color:** Colorless
4.3 **Odor:** Like gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus; safety goggles
5.2 **Symptoms Following Exposure:** Central nervous system depression; ranging from dizziness and intoxication to anesthesia and respiratory arrest, dependent on concentration and extent of inhalation. Irregular heartbeat is rare but is a dangerous complication as anesthesia lightens.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; if he is not breathing, confined or anesthetized, apply artificial respiration; if breathing has stopped, avoid administration of epinephrine or other sympathomimetic amines; prevent aspiration of vomitus by proper positioning of head; give symptomatic and supportive treatment. INGESTION OR ASPIRATION: no treatment required.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Not pertinent
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** None
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to skin. Substance is very volatile and evaporates quickly. Some frostbite possible.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible] °C
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Stop flow of gas
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** [illegible] mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** None
8.2 **Waterfowl Toxicity:** None
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Atlantic Richfield Co.
ARCO Chemical Co. Division
260 South Broad St.
Philadelphia, Pa. 19101
2. Cities Service Co., Inc.
Petrochemicals Division
60 Wall St.
New York, N.Y. 10005
3. Phillips Petroleum Co.
Bartlesville, Okla. 74004

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure; technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

A.G.F. D.E.F.G.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 58.12
13.3 **Boiling Point at 1 atm:** [illegible] °C = [illegible] °K
13.4 **Freezing Point:** [illegible] °C = [illegible] °K
13.5 **Critical Temperature:** [illegible] °C = [illegible] °K
13.6 **Critical Pressure:** [illegible] atm = [illegible] MPa
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page [illegible])

NOTES

REVISED 1978

IBA	# ISOBUTYL ACETATE

Common Synonyms	
Acetic acid, isobutyl ester	Watery liquid Colorless Pleasant fruity odor Floats on water. Flammable, irritating vapor is produced

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
May explode if ignited in an enclosed area
[illegible]

Exposure

CAUTION MEDICAL
VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea, vomiting, dizziness or loss of consciousness
[illegible]

LIQUID
Irritating to skin and eyes
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Evacuate area
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Acetic acid isobutyl ester
2 Methyl-1 propyl acetate
Beta Methylpropyl ethanoate

3 2 **Coast Guard Compatibility Classification** Ester

3 3 **Chemical Formula** $CH_3COOCH_2CH(CH_3)$

3 4 **IMCO/United Nations Numerical Designation** 3 2, 1213

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color** Colorless

4 3 **Odor:** Agreeable fruity odor in low concentrations disagreeable in higher concentrations mild characteristic ester nonresidual

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air pack or organic canister mask chemical goggles

5 2 **Symptoms Following Exposure:** Vapor may irritate upper respiratory tract and cause nausea vomiting dizziness and loss of consciousness Liquid irritates eyes and may irritate skin

5 3 **Treatment for Exposure** INHALATION remove from exposure if breathing is irregular or has stopped start resuscitation and give oxygen call a doctor EYES flush with water for at least 15 minutes

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 150 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 62°F C C, 85°F O C

6 2 **Flammable Limits in Air:** 2 4% 10 5%

6 3 **Fire Extinguishing Agents:** Foam carbon dioxide and dry chemical

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 793°F

6 8 **Electrical Hazard.** Class I group D

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Softens and dissolves many plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 1200 ppm/24 hr/brine shrimp/TLm

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 47% of theoretical in 5 days, freshwater, acclimated seed

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Eastman Kodak Co
Tennessee Eastman Division
Kingsport Tenn 37662

2 Fritzsche Dodge and Olcott Inc
76 Ninth Ave
New York N Y 10011

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 95 99+%

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 116 16

13 3 **Boiling Point at 1 atm** 243 1°F = 117 3°C = 390 5°K

13 4 **Freezing Point** −142 5°F = −97 1°C = 176 1°K

13 5 **Critical Temperature.** 565°F = 296°C = 569°K

13 6 **Critical Pressure** 470 psia = 32 atm = 3 2 MN/m

13 7 **Specific Gravity** 0 871 at 20°C (liquid)

13 8 **Liquid Surface Tension** 23 7 dynes/cm = 0 0237 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** (est) 40 dynes/cm = 0 04 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** 133 Btu/lb = 73 5 cal/g = 3 09 × 10⁵ J/kg

13 13 **Heat of Combustion** (est) −13 000 Btu/lb = −7220 cal/g = −302 × 10⁵ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

IAL

ISOBUTYL ALCOHOL

Common Synonyms
Isobutanol
Isopropylcarbinol
2-Methyl-1-propanol

Oily liquid — Colorless — Mild alcohol, choking odor

Floats and mixes slowly with water. Irritating vapor is produced

Stop discharge if possible
Call fire department
Avoid contact with liquid and vapor
Stay upwind and use water spray to knock down vapor
Isolate and remove discharged material
Notify local health and pollution control officials

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemical, foam, carbon dioxide
Water may be ineffective
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea, dizziness or headache
Move to fresh air
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

LIQUID
Irritating to eyes
Harmful if swallowed
IF IN EYES Hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk

Water Pollution

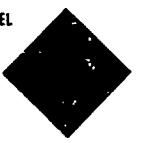
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes,
Notify local health and wildlife officials
Notify operators of affected water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Isobutanol
Isopropylcarbinol
2 methyl 1-propanol
Fermentation butyl alcohol

3 2 **Coast Guard Compatibility Classification:** Alcohol

3 3 **Chemical Formula:** $(CH_3)_2CHCH_2OH$

3 4 **IMCO/United Nations Numerical Designation:** 3 3/1212

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Slightly suffocating nonresidual alcoholic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air pack or organic canister chemical goggles

5 2 **Symptoms Following Exposure:** Contact with eyes is extremely irritating and may cause burns. Breathing vapors will be irritating to the nose and throat. In high concentrations, may cause nausea, dizziness, headache and stupor

5 3 **Treatment for Exposure:** INHALATION: if victim is overcome by vapors, remove him from exposure immediately, call a physician, if breathing is irregular or has stopped, start resuscitation, administer oxygen. EYES: flush with water for at least 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5 5 **Short-Term Inhalation Limits:** 200 ppm for 60 min

5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 to 5 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 82°F C.C. 90°F O.C.

6 2 **Flammable Limits in Air:** 1.6% - 10.9%

6 3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 800°F

6 8 **Electrical Hazard:** Class I, group D

6 9 **Burning Rate:** 3.5 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

3 1 **Aquatic Toxicity:** 4686 ppm/1 hr/fish/lethal/fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 162%, 5 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Eastman Kodak Co
Tennessee Eastman Division
Kingsport, Tenn 37662

2 Oxochem Enterprises
Penuelas, Puerto Rico 00724

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P-Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.**
Flammable Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 74.12

13 3 **Boiling Point at 1 atm:** 226.2°F = 107.9°C = 381.1°K

13 4 **Freezing Point:** -162°F = -108°C = 165°K

13 5 **Critical Temperature:** 526.3°F = 274.6°C = 547.8°K

13 6 **Critical Pressure:** 623 psia = 42.4 atm = 4.30 MN/m²

13 7 **Specific Gravity:** 0.802 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 248 Btu/lb = 138 cal/g = 5.78 × 10⁵ J/kg

13 13 **Heat of Combustion:** -14 220 Btu/lb = -7 900 cal/g = -330.8 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

IAM — ISOBUTYLAMINE

Common Synonyms
Monoisobutylamine
1-Amino-2-methylpropane

Liquid | Colorless | Strong ammonia odor

Floats and mixes with water

Stay far away if possible. Keep people away.
Shut off ignition sources. Call fire department.
Avoid contact with liquid and vapor.
Isolate area until gas has dispersed.
Notify appropriate authorities.

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemicals, "alcohol" foam, carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing, difficult breathing, or loss of consciousness
If in eyes, hold eyelids open and flush with plenty of water.
If breathing, assist with mechanical respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
If swallowed will cause nausea or loss of consciousness
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is CONSCIOUS, [illegible] drink water or milk and induce vomiting.

Water Pollution

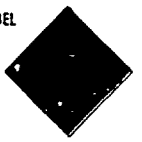
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability, air contaminant, water contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1-Amino-2-methylpropane; iso-Butylamine; Monoisobutylamine
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $(CH_3)_2CHCH_2NH_2$
3.4 **IMCO/United Nations Numerical Designation:** 3.2/1214

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Strong ammoniacal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus, butyl rubber gloves, chemical face shield, butyl rubber apron
5.2 **Symptoms Following Exposure:** Inhalation causes severe coughing and chest pain due to irritation of air passages; can cause lung edema. Compound is sympathomimetic and is also a cardiac depressant, and convulsant. Ingestion causes nausea and profuse salivation. Contact with eyes causes severe irritation and edema of the cornea. Contact with skin causes severe irritation.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; if he is not breathing, give artificial respiration; if breathing is difficult, give oxygen; call a physician. INGESTION: give large amount of water followed by dilute vinegar or lemon juice; keep patient warm. EYES: flush with water for 15 min. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3; oral LD_{50} = 120 mg/kg (rabbit); 250 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 15°F C.C.
6.2 **Flammable Limits in Air:** 1.8% - 9%
6.3 **Fire Extinguishing Agents:** Dry chemical, "alcohol" foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may be formed in fire
6.6 **Behavior in Fire.** Vapor is heavier than air and may travel to a source of ignition and flash back. Containers may explode.
6.7 **Ignition Temperature:** 712°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 6.03 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals, Inc.
   U.S. Highway 90
   Pace, Fla. 32502
2. Pennwalt Corp.
   Three Parkway
   Philadelphia, Pa. 19102
3. Aldrich Chemical Co.
   940 W. Saint Paul Ave.
   Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q-R-S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 73.1
13.3 **Boiling Point at 1 atm:** 153.3°F = 67.4°C = 340.6°K
13.4 **Freezing Point:** −121.9°F = −85.5°C = 187.7°K
13.5 **Critical Temperature:** 469.4°F = 243.0°C = 516.2°K
13.6 **Critical Pressure:** 620 psia = 42 atm = 4.3 MN/m²
13.7 **Specific Gravity.** 0.739 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 23.70 dynes/cm = 0.0237 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.073 at 20°C
13.12 **Latent Heat of Vaporization:** 182 Btu/lb = 101 cal/g = 4.23 × 10³ J/kg
13.13 **Heat of Combustion:** −17,550 Btu/lb = −9,760 cal/g = −408 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** −148 Btu/lb = −82 cal/g = −3.4 × 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

IBL	ISOBUTYLENE

Common Synonyms
Isobutene
2-Methylpropene

Liquefied compressed gas Colorless Sweet gasoline like odor

Floats and boils on water. Flammable visible vapor cloud is produced

No discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and low; water may be used to knock down vapor.
Avoid contact with liquid.
Isolate and remove leaking gas if safe.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Stop flow of gas if possible.
Cool exposed containers with water. Use spray shut off with water.
Fight fire burn.
Extinguish small fires with water, dry chemical, carbon dioxide, etc.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose, and throat
If inhaled, will cause dizziness or loss of consciousness
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing difficult, give oxygen.

LIQUID
Will cause frostbite
Flush affected areas with plenty of water.
DO NOT RUB AFFECTED AREAS

Water Pollution

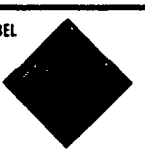
Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability
Restrict access
Evacuate area

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Isobute
2-Methylpropene

3.2 **Coast Guard Compatibility Classification**
Olefin

3.3 **Chemical Formula:** $(CH_3)_2C=CH_2$

3.4 **IMCO/United Nations Numerical Designation:** 2-1055

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid under pressure

4.2 **Color:** Colorless

4.3 **Odor:** Mild sweetish

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical gloves and eye protection, organic vapor canister or self-contained breathing apparatus

5.2 **Symptoms Following Exposure:** Inhalation of moderate concentrations causes dizziness, drowsiness and unconsciousness. Contact with eyes or skin may cause irritation. The liquid may cause frostbite.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air and apply resuscitation; call a physician promptly if victim is unconscious. EYES: if irritated, wash with water. SKIN: if irritated, wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1000 ppm (8 hr)

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to skin because it is very volatile and evaporates quickly. May cause frostbite.

5.10 **Odor Threshold:** Data not available

FIRE HAZARDS

6.1 **Flash Point:** −105°F (−76°C)

6.2 **Flammable Limits in Air:**
1.8% − 9.6%

Fire Extinguishing Agents: Let fire burn; stop flow of gas. Water fog, dry chemical or carbon dioxide may be used for small fires.

6.4 **Fire Extinguishing Agents Not to be Used.**
Not pertinent

6.5 **Special Hazards of Combustion Products.**
Not pertinent

6.6 **Behavior in Fire.** Containers may explode in fire. Vapor is heavier than air and may travel a long distance to a source of ignition and flashback.

6.7 **Ignition Temperature:** 869°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization**
Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD).**
None

8.4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1. Petro-Tex Chemical Corp
8600 Park Place
Houston, Texas 77017

2. Exxon Chemical Co
Houston, Texas 77001

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
Commercial polymerization

10.2 **Storage Temperature:**
Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3)

A B C D-E F G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 56.10

13.3 **Boiling Point at 1 atm:**
19.6°F = −6.9°C = 266.3°K

13.4 **Freezing Point.**
−220°F = −140.3°C = 132.9°K

13.5 **Critical Temperature:**
292.5°F = −144.2°C = 417.9°K

13.6 **Critical Pressure:**
580 psia = 39.48 atm = 3.99 MN/m²

13.7 **Specific Gravity:** 0.59 at 20°C (liquid)

13.8 **Liquid Surface Tension**
15.8 dynes/cm = 0.0158 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.**
(est.) 40 dynes/cm = 0.04 N/m at −10°C

13.10 **Vapor (Gas) Specific Gravity:** 1.9

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.061

13.12 **Latent Heat of Vaporization**
170 Btu/lb = 94.3 cal/g = 3.95 × 10⁵ J/kg

13.13 **Heat of Combustion:** −19,359 Btu/lb
= −10,755 cal/g = −450.29 × 10⁵ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

IBR

ISOBUTYRIC ACID

Common Synonyms
Dimethylacetic acid
Isopropylformic acid
2 Methylpropanoic acid
Propane-2-carboxylic acid

Liquid — Colorless — Unpleasant, acrid odor

Floats and mixes with water

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self contained breathing apparatus, and rubber over clothing including gloves.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Not
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
Move to fresh air.
If breathing has stopped give artificial respiration.
If breathing is difficult give oxygen.
LIQUID
Will burn skin and eyes.
Harmful if swallowed
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and pollution control agencies.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Dimethylacetic acid, Isopropylformic acid, 2 Methylpropanoic acid, Alpha Methylpropionic acid, Propane-2-carboxylic acid
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $(CH_3)_2CHCOOH$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Unpleasant, acrid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic chemical respirator, goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation.
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min, get medical attention if irritation persists. SKIN: flush with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 280 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 170°F (C.C.)
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** 935°F
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 2.6 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** Corrosive to aluminum and other metals. Flammable hydrogen gas may accumulate in enclosed spaces.
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibiter of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 American Hoechst Corp.
Route 202 - 206 North
Somerville, N.J. 08876

2 BASF Wyandotte
1609 Biddle Avenue
Wyandotte, Mich. 48192

3 Eastman Organic Chemicals
343 State Street
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 88
13 3 **Boiling Point at 1 atm:** 309°F = 154°C = 427°K
13 4 **Freezing Point:** −51°F = −46°C = 227°K
13 5 **Critical Temperature:** 637°F = 336°C = 609°K
13 6 **Critical Pressure:** 588 psia = 40 atm = 4.06 MN/m²
13 7 **Specific Gravity:** 0.949 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 25.1 dynes/cm = 0.0251 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 3.0
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** 202 Btu/lb = 112 cal/g = 4.68 × 10⁵ J/kg
13 13 **Heat of Combustion:** −10 600 Btu/lb = −5 880 cal/g = −246 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** −20.5 Btu/lb = −11.4 cal/g = −0.477 × 10⁵ J/kg
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

IBN — ISOBUTYRONITRILE

Common Synonyms
Isopropyl Cyanide
IBN
2 Methylpropanenitrile
2 Methylpropionitrile

Liquid — Colorless — Almond-like

Floats on water. Flammable vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes

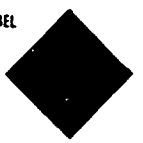
Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

Issue warning: high flammability, poison
Restrict access
Evacuate area
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** IBN, Isopropyl cyanide, 2-Methylpropanenitrile, 2-Methylpropionitrile
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula:** $(CH_3)_2CHCN$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Like almonds or benzaldehyde

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus, goggles, rubber gloves
5 2 **Symptoms Following Exposure:** Inhalation, ingestion, or skin contact causes weakness, headache, confusion, nausea, vomiting, acute cyanide poisoning may result. Contact with eyes causes irritation
5 3 **Treatment for Exposure:** *Get medical attention following all overexposures to this chemical. Watch for symptoms of cyanide poisoning.* INHALATION: move patient to fresh air, apply artificial respiration if breathing stops. INGESTION: break an amyl nitrite pearl in a cloth and hold lightly under patient's nose for 15 sec; if he is conscious, induce vomiting and repeat until vomit is clear, repeat inhalation of amyl nitrite 5 times at 15 sec intervals. EYES: flush with water for at least 15 min. SKIN: flush with water, remove contaminated clothing, destroy contaminated shoes
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Grade 3, oral LD_{50} = 100 mg/kg (rats)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 47°F (C.C.)
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents.** Dry chemical, foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Air Products and Chemicals, Inc.
P. O. Box 538
Allentown, Pa. 18105

2 Ivemstar Corp.
P. O. Box 68
Scarborough, N. Y. 10510

3 Eastman Chemical Products, Inc.
Kingsport, Tenn. 37662

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, Pure
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A T U-Y-W

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 69.1
13 3 **Boiling Point at 1 atm:** 219°F = 104°C = 377°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Data not available
13 6 **Critical Pressure:** Data not available
13 7 **Specific Gravity:** 0.774 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 24.9 dynes/cm = 0.0249 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** 2.4
13 11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13 12 **Latent Heat of Vaporization:** 200 Btu/lb = 110 cal/g = 4.7 × 10⁵ J/kg
13 13 **Heat of Combustion:** 14,960 Btu/lb = 8,310 cal/g = 348 × 10⁵ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

IOC	ISOOCTALDEHYDE

Common Synonyms			
6-Methyl-1 heptanal Oxo octaldehyde Isooctylaldehyde	Liquid	Colorless	Mild fruity odor
	Floats on water		

Stop discharge if possible
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	Combustible Extinguish with dry chemical, foam, carbon dioxide
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to eyes IF IN EYES: Hold eyelids open and flush with plenty of water
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-2)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Dimethylhexanals
Isooctyl aldehyde
6-Methyl-1 heptanal

3 2 **Coast Guard Compatibility Classification:** Aldehyde

3 3 **Chemical Formula:** $(CH_3)_2CH(CH_2)_4CHO$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild fruity

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical goggles

5 2 **Symptoms Following Exposure:** High vapor concentrations produce eye irritation Liquid may irritate eyes

5 3 **Treatment for Exposure:** Remove from exposure Wash eyes with water for 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard Practically harmless to the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 104°F C C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Data not available

6 4 **Fire Extinguishing Agents Not to be Used:** Data not available

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 320°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Exxon Chemical Co
Houston, Texas 77001

2 Getty Oil Co
Los Angeles, Calif 90054

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 128 22

13 3 **Boiling Point at 1 atm:** 307 352°F = 153 178°C = 426 451°K

13 4 **Freezing Point:** −180°F = −118°C = 155°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 82[illegible] at 20°C (liquid)

13 8 **Liquid Surface Tension:** 26 9 dynes/cm = 0 0269 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est) 40 dynes/cm = 0 04 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** (est) 1 040

13 12 **Latent Heat of Vaporization:** 140 Btu/lb = 77 cal/g = 3 2 × 10⁵ J/kg

13 13 **Heat of Combustion:** (est) −17 000 Btu/lb = −9600 cal/g = −400 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page [illegible])

NOTES

IPA	ISODECALDEHYDE

Common Synonyms Isodecaldehyde mixed isomers	Liquid Floats on water	Colorless	Fruity odor

[illegible]

Fire	Combustible [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Isodecaldehyde mixed isomers; Trimethylheptanals

3.2 **Coast Guard Compatibility Classification:** Aldehyde

3.3 **Chemical Formula:** $C_9H_{18}CHO$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Somewhat [illegible]

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing, chemical goggles

5.2 **Symptoms Following Exposure:** Low general toxicity. Liquid may [illegible] and skin

5.3 **Treatment for Exposure:** Wash eyes and skin with plenty of water for at least 15 min

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the [illegible] system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spoiled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 185°F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A T D

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classification:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 156.28

13.3 **Boiling Point at 1 atm:** Data not available

13.4 **Freezing Point:** Data not available

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** (est.) 0.84 at 15° (liquid)

13.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.02 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Data not available

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

IAI ISODECYL ACRYLATE, INHIBITED

Common Synonyms

Isodecyl acrylate

Liquid | Colorless | Weak odor

Floats on water

Stop discharge if possible. Keep people away.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with dry chemicals, foam, carbon dioxide.
Water may be ineffective.
Cool exposed containers with water.

Exposure

Call for medical aid.

LIQUID
Irritating to skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES: Hold eyelids open and flush with plenty of water.
IF SWALLOWED: If victim is CONSCIOUS, have victim drink water.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of affected water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** iso Decyl acrylate
3.2 **Coast Guard Compatibility Classification:** Monomers (14)
3.3 **Chemical Formula:** $CH_2{=}CHCOOC_{10}H_{21}$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Weak acrylate

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Inhalation causes mild irritation of nose and throat. Eyes are mildly irritated by vapor, more severely by liquid. Prolonged contact of liquid with skin may cause irritation.
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. EYES: flush with water for at least 15 min. after contact with liquid. SKIN: wipe off, wash well with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1 LD50 to 15 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 240°F O.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** May polymerize to gummy solid. Reaction is not violent.
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable if inhibited
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** In the absence of inhibitor polymerization will occur, especially when heated.
7.6 **Inhibitor of Polymerization:** Monomethyl ether of hydroquinone, 25 ppm

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 97.5+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

X I U /

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetic Effect	2
Reactions	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 212.4
13.3 **Boiling Point at 1 atm:** Not pertinent (polymerizes)
13.4 **Freezing Point:** −148°F = −100°C = 173°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.885 at 20°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 110 Btu/lb = 61 cal/g = 2.6 × 10⁵ J/kg
13.13 **Heat of Combustion:** (est.) −16,300 Btu/lb = −9,100 cal/g = −3.8 × 10⁷ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** (est.) −119 Btu/lb = −66 cal/g = −2.8 × 10⁵ J/kg

Continued on pages 5 and 6

NOTES

ISA	ISODECYL ALCOHOL

Common Synonyms	Liquid — Colorless — Mild alcohol odor [illegible] on water
[illegible]	
Fire	Combustible [illegible]
Exposure	[illegible] LIQUID Will burn skin and eyes [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Alcohol
3.3 **Chemical Formula:** $C_{10}H_{21}OH$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Weak alcoholic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles
5.2 **Symptoms Following Exposure:** Direct contact with skin can produce irritation
5.3 **Treatment for Exposure:** Wash affected area with water for 15 min
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to the eyes and throat
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 220°F O.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemicals or carbon dioxide
6.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co
   Houston, Texas 77001
2. Getty Oil Co
   Los Angeles, Calif 90054
3. Union Carbide Corp
   Chemicals and Plastics Division
   270 Park Ave
   New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical mixed isomers
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	2
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 158.29
13.3 **Boiling Point at 1 atm:** 428°F = 220°C = 493°K
13.4 **Freezing Point:** <140°F = <60°C = <333°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.841 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.032
13.12 **Latent Heat of Vaporization:** (est.) 120 Btu/lb = 67 cal/g = 2.8×10^5 J/kg
13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

IHA	ISOHEXANE

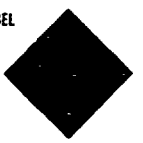
Common Synonyms * Methylpentane	Water: Insoluble Gasoline-like odor Floats on water. Flammable, irritating vapor is produced
	[illegible]
Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area [illegible]
Exposure	CAUTIOUS REPORT ALL VAPOR Irritating to eyes, nose and throat If inhaled: will cause dizziness, headache, difficult breathing or loss of consciousness [illegible] LIQUID Irritating to skin and eyes If swallowed: will cause nausea or vomiting [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Evacuate area
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Methylpentane

3.2 **Coast Guard Compatibility Classification:** Paraffin

3.3 **Chemical Formula:** $CH_3CH(CH_3)CH_2CH_2CH_3$

3.4 **IMCO/United Nations Numerical Designation:** 3.1/1208

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Eye protection (as for gasoline)

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory tract, cough, mild depression, cardiac arrhythmias. Aspiration causes severe lung irritation, coughing, pulmonary edema, excitement followed by depression. Ingestion causes nausea, vomiting, swelling of abdomen, headache, depression

5.3 **Treatment for Exposure:** INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, give oxygen. INGESTION: do NOT induce vomiting, call a doctor. EYES: wash with copious amount of water. SKIN: wipe off, wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** −20°F C.C.

6.2 **Flammable Limits in Air:** 1.2% - 7.7%

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 585°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 8.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. The Humphrey Chemical Co.
   Devine Street
   North Haven, Conn. 06473
2. Penzoil United, Inc.
   Atlas Processing Co.
   3546 Midway St.
   Shreveport, La. 71109
3. Phillips Petroleum Co.
   Bartlesville, Okla. 74004

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Research 99.95% pure, 99.0%, technical 95.0%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U-V-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 86.18

13.3 **Boiling Point at 1 atm:** 140.5°F = 60.3°C = 333.5°K

13.4 **Freezing Point:** −244.6°F = −153.7°C = 119.5°K

13.5 **Critical Temperature:** 435.7°F = 224.3°C = 497.5°K

13.6 **Critical Pressure:** 437 psia = 29.7 atm = 3.01 MN/m²

13.7 **Specific Gravity:** 0.653 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 17.38 dynes/cm = 0.01738 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 2.9

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.062

13.12 **Latent Heat of Vaporization:** 139 Btu/lb = 77.1 cal/g = 3.23×10^5 J/kg

13.13 **Heat of Combustion:** −19,147 Btu/lb = −10,637 cal/g = -445.35×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

10A ISOOCTYL ALCOHOL

Common Synonyms			
6-Methyl-1-heptanol Octyl alcohol	Liquid	Colorless	Mild odor
	Floats on water		

[illegible]

Fire	Combustible [illegible]
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentration on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Mechanical containment
Should be retained
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dimethyl-1-hexanols
6-Methyl-1-heptanol

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $(CH_3)_2CH(CH_2)_5CH_2OH$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild, characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask in confined areas, plastic gloves, goggles, eye bath and safety shower

5.2 **Symptoms Following Exposure:** Inhalation hazard slight. Skin contact results in moderate irritation. Liquid contact with eyes causes severe irritation and possible eye damage

5.3 **Treatment for Exposure:** Remove to fresh air. Flush skin and eye contact area at once for at least 15 min. Get medical care for eyes

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2. LD$_{50}$ 0.5 to 5 g/kg (lab animals)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 180°F (O.C.)

6.2 **Flammable Limits in Air:** 0.9% (calc.) - 5.7% (est.)

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 530°F (est.)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co
   Houston, Texas 77001
2. Getty Oil Co
   Los Angeles, Calif. 90054
3. Union Carbide Corp
   Chemicals and Plastics Division
   270 Park Ave
   New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+% (mixed isomers)

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 130.22

13.3 **Boiling Point at 1 atm:** 367°F = 186°C = 459°K

13.4 **Freezing Point:** <212°F = <100°C = <173°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.832 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 29.5 dynes/cm = 0.0295 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.040

13.12 **Latent Heat of Vaporization:** (est.) 140 Btu/lb = 77 cal/g = 3.2 × 10^5 J/kg

13.13 **Heat of Combustion:** (est.) −17,500 Btu/lb = −9650 cal/g = −404 × 10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

IPT	ISOPENTANE

Common Synonyms
2-Methylbutane

Watery liquid — Colorless — Gasoline-like odor

Floats on water. Flammable, irritating vapor is produced.
Boiling point is 82°F

Wear goggles and [illegible]

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

[illegible]

VAPOR
Irritating to nose and throat.
If inhaled, will cause coughing, difficult breathing, or loss of consciousness.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Evacuate area.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Methylbutane
3.2 **Coast Guard Compatibility Classification:** Paraffin
3.3 **Chemical Formula:** $(CH_3)_2CHCH_2CH_3$
3.4 **IMCO United Nations Numerical Designation:** 3.1 1217

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Use protection (as for gasoline)
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory tract, cough, mild depression, irregular heartbeat. Aspiration causes severe lung irritation, coughing, pulmonary edema, excitement followed by depression. Ingestion causes nausea, vomiting, swelling of abdomen, headache, depression.
5.3 **Treatment for Exposure:** INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, give oxygen. INGESTION: do NOT induce vomiting, call a doctor. EYES: wash with copious amounts of water. SKIN: wipe off, wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1 [illegible]
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating to the eyes and throat.
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** −70°F (C.C. [illegible])
6.2 **Flammable Limits in Air:** 1.4% [illegible]
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Highly volatile liquid. Vapors may explode when mixed with air
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** [illegible] mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibition of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Pennzoil United, Inc.
   Atlas Processing Co.
   1546 Midway St.
   Shreveport, La. 71109
2. Phillips Petroleum Co.
   Bartlesville, Okla. 74004

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** Research 99.9%; pure 99.4%; technical 95%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester or pressure-vacuum)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A T U V W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poison	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 72.15
13.3 **Boiling Point at 1 atm:** 82.2°F = 27.9°C = 301.1°K
13.4 **Freezing Point:** −255.8°F = −159.9°C = 113.3°K
13.5 **Critical Temperature:** 369.0°F = 187.2°C = 460.4°K
13.6 **Critical Pressure:** 490.0 psia = 33.3 atm = 3.38 MN/m²
13.7 **Specific Gravity:** 0.620 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 15.05 dynes/cm = 0.0150 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 31 dynes/cm = 0.031 N/m at 22.7°C
13.10 **Vapor (Gas) Specific Gravity:** 2.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.07
13.12 **Latent Heat of Vaporization:** 146 Btu/lb = 81 Cal/g = 3.4 × 10⁵ J/kg
13.13 **Heat of Combustion:** −19,314 Btu/lb = −10,730 Cal/g = −449.24 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 back

NOTES

REVISED 1978

IPH	ISOPHORONE

Common Synonyms			
3,5,5-Trimethyl-2-cyclohexene-1-one	Liquid	Colorless	Camphor-like odor
	Floats and mixes slowly with water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Immediate notification
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required. Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 3,5,5-Trimethyl-2-cyclohexene-1-one

3.2 **Coast Guard Compatibility Classification:** Acetone

3.3 **Chemical Formula:** $C_9H_{14}O$ [illegible]

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Camphor-like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** Inhalation irritates eyes, nose and throat, causes central depression and has some anesthetic effect. Contact: Liquid with eyes causes severe corrosion and possible [illegible] damage. Not absorbed by intact skin and not [illegible]. Ingestion: [illegible]

Treatment for Exposure: INHALATION: [illegible] EYES: [illegible] SKIN: [illegible] INGESTION: DO NOT induce vomiting [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation of eyes and throat, personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes irritation of the eyes and to a degree burns on short exposure, may cause second degree burns on long exposure.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. [illegible]

2. Exxon Chemical
P.O. Box [illegible]
Houston, Texas [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

XPQTT

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	[illegible]
Poison	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	[illegible]
Aquatic Effect	[illegible]
Reactivity	
Other Chemicals	[illegible]
Water	[illegible]
Self Reaction	[illegible]

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible] °K

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (liquid)

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

IPL	ISOPHTHALIC ACID

Common Synonyms			
benzene 1,3-dicarboxylic acid m Phthalic acid	Solid Sinks in water	White	Slight unpleasant odor

Avoid contact with solid and dust. Keep people away.
Stop discharge if possible.
Shut off ignition sources. Call fire department.
Isolate and recover discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Dust cloud may explode if ignited in an enclosed area.
Extinguish with water, dry chemicals, foam, or carbon dioxide.

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.

If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and water officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Method, Handbook CG 446-4)

Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Benzene 1,3-dicarboxylic acid, m Phthalic acid

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula**
1,3 $C_6H_4(COOH)_2$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Slightly acrid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** If without adequate ventilation, use respirator with dust filter, goggles, and gloves.

5.2 **Symptoms Following Exposure:** May cause slight to moderate irritation of eyes, skin, and mucous membranes on prolonged contact. Ingestion may cause gastrointestinal irritation.

5.3 **Treatment for Exposure:** INHALATION: remove victim to uncontaminated area, get medical attention if complications arise. INGESTION: get medical attention if complications arise. EYES: flush with large amounts of water for 15 min, get prompt medical attention. SKIN: wash with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 LD_{50} 12.2 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, dry powder, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.**

6.5 **Special Hazards of Combustion Products**

6.6 **Behavior in Fire.** Dust forms explosive mixture in air

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1. Amoco Chemicals Corp
130 East Randolph Drive
Chicago, Ill. 60601
2. Arco Chemical Co.
260 South Broad St.
Philadelphia, Pa. 19101
3. Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 82–99%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Inerted

10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications.**
Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:**
Solid

13.2 **Molecular Weight:** 166

13.3 **Boiling Point at 1 atm:** Not pertinent (sublimes)

13.4 **Freezing Point:**
653°F = 345°C = 618°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.54 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13.12 **Latent Heat of Vaporization:**
Not pertinent

13.13 **Heat of Combustion:** −8,340 Btu/lb
= −4,630 cal/g = −194 × 10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

IPR	ISOPRENE

Common Synonyms
2-Methyl-1,3-butadiene
beta-Methylbinnyl

Watery liquid — Colorless — Mild odor

Floats on water. Flammable. Irritating vapor is formed.
Boiling point is 93°F

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind. Use water spray to knock down vapor.
Avoid contact with liquid and vapor.
Evacuate area. Neutralize with caution.
Notify health and fire officials.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Containers may explode in fire.
Vapor may explode if ignited in an enclosed area.
Wear self-contained breathing apparatus.
Combat fire from behind barricade.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Remove contaminated clothing and shoes.
Dry skin: test area with pH paper.
IF IN EYES hold lids open and flush with plenty of water.

Water Pollution

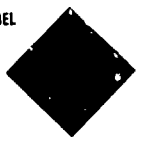
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Restrict access.
Evacuate area.

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** beta-Methylbinnyl
2-Methyl-1,3-butadiene

3.2 **Coast Guard Compatibility Classification**
Olefin

3.3 **Chemical Formula:**
$CH_2{=}C(CH_3){-}CH{=}CH_2$

3.4 **IMCO/United Nations Numerical Designation** 3.1/1218

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Vapor proof goggles, self contained breathing apparatus, leather or rubber safety shoes, rubber gloves.

5.2 **Symptoms Following Exposure:** Vapor produces no effects other than slight irritation of the eyes and upper respiratory tract. Liquid may irritate eyes, like gasoline.

5.3 **Treatment for Exposure:** INHALATION: remove victim promptly from irritating or asphyxiating atmosphere; if symptoms of asphyxiation persist, administer artificial respiration and oxygen; treat symptomatically thereafter; call a physician. EYES: flush with water for at least 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 0.005 ppm

6. FIRE HAZARDS

6.1 **Flash Point** −65°F C.C.

6.2 **Flammable Limits in Air:**
2% - 9%

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.

6.5 **Special Hazards of Combustion Products.** Toxic vapors are generated when heated.

6.6 **Behavior in Fire:** May polymerize in containers and explode.

6.7 **Ignition Temperature:** 428°F

6.8 **Electrical Hazard:** Class I, Group C.

6.9 **Burning Rate.** 8.6 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Polymerization is accelerated by heat and by oxygen, even by the presence of rusty iron. Iron surfaces should be treated with a suitable reducing agent such as sodium nitrite before they are placed into isoprene service.

7.6 **Inhibitor of Polymerization.** Tertiary butyl catechol (0.06%). Di-n-butylamine, phenyl beta-naphthyl amine and phenyl alpha naphthylamine are also used. IPR must be inhibited when transported interstate.

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 75 ppm/96 hr/fathead minnow/Flow/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. B.F. Goodrich Co.
B.F. Goodrich Chemical Co. Division
6100 Oak Tree Blvd.
Cleveland, Ohio 44131

2. Goodyear Tire & Rubber Co.
Chemical Division
Beaumont, Texas 77704

3. Shell Chemical Co.
Petrochemical Division
Houston, Texas 77001

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Research grade 99.99%, polymerization grade 99.8%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A T U A W-2

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	4
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effects	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 68.12

13.3 **Boiling Point at 1 atm:**
93.4°F = 34.1°C = 307.3°K

13.4 **Freezing Point:**
−230.7°F = −145.9°C = 127.3°K

13.5 **Critical Temperature.**
412°F = 211.1°C = 484.3°K

13.6 **Critical Pressure.**
550 psia = 37.4 atm = 3.79 MN/m²

13.7 **Specific Gravity:** 0.681 at 20°C (liquid)

13.8 **Liquid Surface Tension**
19 dynes/cm = 0.0189 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
(est.) 40 dynes/cm = 0.04 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 2.3

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.091

13.12 **Latent Heat of Vaporization:**
150 Btu/lb = 88 cal/g = 3.6 × 10⁵ J/kg

13.13 **Heat of Combustion** −18,848 Btu/lb
= −10,471 cal/g = −438.40 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** −499 Btu/lb
= −277 cal/g = −11.6 × 10⁵ J/kg

(Continued on pages 5 and 6)

NOTES

REVISED 1978

IAC

ISOPROPYL ACETATE

Common Synonyms
Acetic acid isopropyl ester
2-Propyl acetate

Water: liquid | Colorless | Pleasant fruity odor

Floats and mixes slowly with water. Flammable. Irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Extinguish with dry chemical, foam, carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat

Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, give him drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of affected water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability.
Evacuate area.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetic acid isopropyl ester; 2-Propyl acetate
3.2 **Coast Guard Compatibility Classification:** Ester
3.3 **Chemical Formula:** $CH_3COOCH(CH_3)_2$
3.4 **IMCO United Nations Numerical Designation:** 3.2/1220

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pleasant, fruity, not persistent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister or air-supplied mask, chemical goggles or face splash shield
5.2 **Symptoms Following Exposure:** Vapors irritate eyes and respiratory tract; high concentrations can be anesthetic. Liquid irritates eyes, but is not serious; prolonged contact may cause dermatitis. No serious effects if swallowed.
5.3 **Treatment for Exposure:** INHALATION: If victim is unconscious, remove from exposure immediately, call a physician; if breathing is irregular or stopped, start resuscitation and administer oxygen. EYES: flush with water for at least 15 min.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 250 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2. LD50 [illegible] g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause slight swelling of the eyes and respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 37°F (C.C.) 60°F (O.C.)
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 860°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 26% 5 days (theor.)
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastman Kodak Co.
Tennessee Eastman Co. Division
Kingsport, Tenn. 37662
2. Exxon Chemical Co.
Houston, Texas 77001
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 95-99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-P-Q-T-U-V-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 102.13
13.3 **Boiling Point at 1 atm.:** 191.3°F = 88.5°C = 361.7°K
13.4 **Freezing Point:** −92.7°F = −69.3°C = 203.9°K
13.5 **Critical Temperature:** 509.1°F = 265°C = 538°K
13.6 **Critical Pressure:** 529 psia = 36 atm = 3.65 MN/m²
13.7 **Specific Gravity:** 0.872 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 26 dynes/cm = 0.026 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** 3.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.024
13.12 **Latent Heat of Vaporization:** 150 Btu/lb = 81 cal/g = 3.4 × 10⁵ J/kg
13.13 **Heat of Combustion:** -9420 Btu/lb = -5230 cal/g = -219 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

IPA — ISOPROPYL ALCOHOL

Common Synonyms
Isopropanol
2 Propanol
Dimethylcarbinol
sec Propyl Alcohol
Rubbing alcohol

Water liquid — Colorless — Unpleasant alcohol odor like rubbing alcohol

Floats and mixes with water. Flammable. Irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, alcohol foam, carbon dioxide.
Water may be ineffective.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to eyes.
Harmful if swallowed.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have him drink water or milk.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify downstream users of spill.
Notify operators of affected water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning: high flammability.
Disperse and flush.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
Dimethylcarbinol — 2 Propanol
Isopropanol — sec Propyl Alcohol
Petrohol — Rubbing alcohol

3.2 **Coast Guard Compatibility Classification**
Alcohol

3.3 **Chemical Formula:**
$CH_3CHOHCH_3$

3.4 **IMCO United Nations Numerical Designation:** 32 1219

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Like ethyl alcohol, but somewhat less pleasant; characteristic rubbing alcohol odor; not evident.

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Organic vapor canister mask; chemical goggles or face splash shield.

5.2 **Symptoms Following Exposure.** Vapor causes mild irritation of eyes and upper respiratory tract; high concentrations may be narcotic. Liquid causes severe eye irritation; harmless to skin. Ingested causes drunkenness and vomiting.

5.3 **Treatment for Exposure** INHALATION: If victim is conscious, he may be given a mild sedative and removed from exposure; if not breathing, artificial respiration; if breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min.

5 **Toxicity by Inhalation (Threshold Limit Value)** 400 ppm

5.5 **Short-Term Inhalation Limits** 400 ppm for 10 min

5.6 **Toxicity by Ingestion:** Grade 1 LD_{50} [illegible] g/kg; rat LD_{50} [illegible] g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor causes slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics** Not appreciable hazard. Practically harmless to the skin.

5.10 **Odor Threshold:** 90 mg/m³

6 FIRE HAZARDS

6.1 **Flash Point** 60°F (O.C.) 53°F (C.C.)

6.2 **Flammable Limits in Air**
2.5 – 12.7

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used**
Water may be ineffective.

6.5 **Special Hazards of Combustion Products.**
Not pertinent.

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature** 750°F

6.8 **Electrical Hazard** Class I, Group D

6.9 **Burning Rate** 2.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization.**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.**
900-1100 ppm 24 hr shock [illegible] fresh water

8.2 **Waterfowl Toxicity:**
Data not available

8.3 **Biological Oxygen Demand (BOD)**
[illegible] days

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 ARCO Chemical Co
200 South Broad St
Philadelphia, PA 19101

2 Shell Chemicals
Industrial Chemical Division
Houston, Tex 77001

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 91 – 99%
Anhydrous

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A P Q R S

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Toxicity	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight** 60.10

13.3 **Boiling Point at 1 atm.**
180.1°F = 82.3°C = 355.3°K

13.4 **Freezing Point**
−127.3°F = −88.5°C = 184.7°K

13.5 **Critical Temperature**
455.4°F = 235.2°C = 508.4°K

13.6 **Critical Pressure**
691 psia = 47 atm = 4.76 MN/m²

13.7 **Specific Gravity** 0.785 at 20°C (liquid)

13.8 **Liquid Surface Tension** [illegible]

13.9 **Liquid-Water Interfacial Tension.**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):**
1.08

13.12 **Latent Heat of Vaporization**
287 Btu/lb = [illegible] cal/g = [illegible] J/kg

13.13 **Heat of Combustion** −13,900 Btu/lb
= −[illegible] cal/g = −[illegible] J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** [illegible]
= [illegible] cal/g = [illegible] J/kg

13.16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

REVISED 1978

IPP — ISOPROPYLAMINE

Common Synonyms
2-Aminopropane
Monoisopropylamine

Liquid — Colorless — Strong ammonia odor

Floats and mixes with water
Flammable irritating vapor is produced
Boiling point is 91°F

Stop discharge if possible. Keep people away.
Shut off ignition sources; call fire department.
Stay upwind. Use water spray to knock down vapor.
Avoid contact with liquid and vapor.
Isolate area and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemicals, foam, carbon dioxide.
Water may be ineffective.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing, difficult breathing or loss of consciousness

If eyes affected, flush immediately with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes
If swallowed will cause nausea

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES: If severely irritated, get medical attention immediately.
IF SWALLOWED and victim is CONSCIOUS: Give quart of drink water immediately.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: Do not give anything by mouth.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

Notify local health and wildlife officials.
Notify operators of affected water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning: high flammability, airborne irritant, water contaminant
Restrict access
Evacuate area
Disperse and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** 2-Aminopropane; Monoisopropylamine; Isopropylamine
3.2 **Coast Guard Compatibility Classification.** Data not available
3.3 **Chemical Formula** $(CH_3)_2CHNH_2$
3.4 **IMCO/United Nations Numerical Designation** UN 1221

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color** Colorless
4.3 **Odor** Strong ammoniacal, pungent, irritating, typical amine

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Self-contained breathing apparatus, butyl rubber gloves and apron, chemical face shield or vented goggles
5.2 **Symptoms Following Exposure** Inhalation causes nose and throat irritation, severe coughing and chest pain; due to irritation of air passages, can cause lung edema and loss of consciousness. Ingestion causes nausea, salivation and severe irritation of mouth and stomach. Contact with eyes causes severe irritation and possible edema of the cornea. Contact with skin causes severe irritation.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; if he is not breathing give artificial respiration; if breathing is difficult give oxygen; call a physician. INGESTION: call a physician immediately; encourage the drinking of large quantities of water, followed by dilute vinegar, lemon juice, cider or other weak acids; keep patient warm. EYES: flush with water for 15 min; hold eyelids apart; call physician as soon as possible; preferably an eye specialist. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** [illegible]
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are moderately irritating, such that personnel will not usually tolerate moderate or high concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns; in short exposure may cause second-degree burns on long exposure.
5.10 **Odor Threshold** 5 ppm

6 FIRE HAZARDS

6.1 **Flash Point** −15°F (OC)
6.2 **Flammable Limits in Air** 2.3% – 12%
6.3 **Fire Extinguishing Agents** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire
6.6 **Behavior in Fire** Burning isopropylamine is difficult to control because of the ease of ignition of the vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Containers may explode.
6.7 **Ignition Temperature** 756°F
6.8 **Electrical Hazard.** Data not available
6.9 **Burning Rate** 0.33 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials**
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** 40–69 ppm 24 hr creek chub; critical range fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals, Inc.
U.S. Highway 90
Pace, Fla. 32502
2. Pennwalt Corporation
Three Parkway
Philadelphia, Pa. 19102
3. Virginia Chemicals, Inc.
3340 W. Norfolk Rd.
Portsmouth, Va. 23703

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 99.0%
10.2 **Storage Temperature.** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

VPQRS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight.** 59.11
13.3 **Boiling Point at 1 atm:** 90.3°F = 32.4°C = 305.6°K
13.4 **Freezing Point** −139°F = −95°C = 178°K
13.5 **Critical Temperature:** 396°F = 202°C = 475°K
13.6 **Critical Pressure:** 740 psia = 50 atm = 5.1 MN/m²
13.7 **Specific Gravity** (sp. gr. at 20°C liquid)
13.8 **Liquid Surface Tension.** 16.8 dynes/cm = 0.0168 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.04
13.11 **Ratio of Specific Heats of Vapor (Gas):**
13.12 **Latent Heat of Vaporization** 193 Btu/lb = 10⁷ cal/g = 4.48 × 10⁷ J/kg
13.13 **Heat of Combustion:** −16,940 Btu/lb = −9,420 cal/g = −394 × 10⁷ J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** [illegible]
13.16 **Heat of Polymerization.** Not pertinent

(Continued on page [illegible])

NOTES

IPE — ISOPROPYL ETHER

Common Synonyms

Diisopropyl ether
Diisopropyl oxide
2 Isopropoxypropane

Liquid | Colorless | Sweet odor

Floats and mixes slowly with water Flammable irritating vapor is produced

Shut off ignition sources Call fire department
Stop discharge if possible keep people away
Stay upwind Use water spray to knock down vapor
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemicals alcohol foam or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

Call for medical aid

VAPOR
Irritating to eyes nose and throat
If inhaled will cause headache dizziness or nausea
Move victim to fresh air
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

LIQUID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES Hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk

Water Pollution

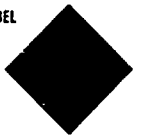
Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Diisopropyl ether
Diisopropyl oxide
2 Isopropoxypropane

3 2 **Coast Guard Compatibility Classification.** Ethers (21)

3 3 **Chemical Formula:** $(CH_3)_2CHOCH(CH_3)_2$

3 4 **IMCO/United Nations Numerical Designation:** 3 1 1159

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Sweet sightly sharp characteristic pungent ethereal, like camphor and ethyl ether

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air pack or organic canister mask rubber gloves goggles

5 2 **Symptoms Following Exposure:** Inhalation causes anesthesia nausea headache dizziness and irritation of the eyes and nose Contact of liquid with eyes causes only minor injury repeated contact with skin will remove natural oils and may cause dermatitis

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air and obtain medical attention immediately keep him warm and at rest and give artificial respiration if breathing stops maintain an open airway EYES flush with water for 15 min SKIN flush with water INGESTION do NOT induce vomiting get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 250 ppm (tentative)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 oral LD_{50} 8 470 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** −18°F O C −18°F C C

6 2 **Flammable Limits in Air** 1 4% 7 9%

6 3 **Fire Extinguishing Agents** Dry chemical alcohol foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back Containers may explode when heated

6 7 **Ignition Temperature:** 830°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate** 5 0 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport:** Unstable peroxides may form on long standing in contact with air these may explode spontaneously or when heated

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Shell Chemical Company
Industrial Chemicals Division
P O Box 2463
Houston Texas 77001

2 Exxon Chemical Company
P O Box 2180
Houston Texas 77001

3 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 94+% May contain 0 01% hydroquinone or other inhibitor to prevent peroxide formation

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V P Q T U V-W

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 102 2

13 3 **Boiling Point at 1 atm.** 156°F = 69 C = 342°K

13 4 **Freezing Point:** −123°F = −86°C = 187 K

13 5 **Critical Temperature:** 440 4°F = 226 9°C = 500 1 K

13 6 **Critical Pressure:** 418 psia = 28 4 atm = 2 88 MN/m

13 7 **Specific Gravity:** 0 724 at 20°C (liquid)

13 8 **Liquid Surface Tension** 17 1 dynes/cm = 0 017 N/m at 25 C

13 9 **Liquid-Water Interfacial Tension:** 7 1 dynes/cm = 0 017 N/m at 25 C

13 10 **Vapor (Gas) Specific Gravity** 3 5

13 11 **Ratio of Specific Heats of Vapor (Gas).** 1 0590

13 12 **Latent Heat of Vaporization** 131 Btu/lb = 73 cal/g = 3 1 × 10 J/kg

13 13 **Heat of Combustion:** 17 441 Btu/lb = 9 390 cal/g = 3 93 × 10⁷ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 3 and 4

NOTES

IPM	# ISOPROPYL MERCAPTAN

Common Synonyms			
2 Propanethiol Propane-2 thiol	Liquid	White	Strong Skunk Odor
	Floats and mixes with water. Flammable, irritating vapor is produced		

[illegible]

Fire

FLAMMABLE:
Irritating gases may be produced when heated
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing or loss of consciousness
[illegible]

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability
air contaminant, water contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 2 Propanethiol
Propane 2 thiol

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $(CH_3)_2CHSH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Powerful skunk

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes loss of sense of smell, muscular weakness, convulsions, respiratory paralysis. Ingestion causes nausea and vomiting. Contact with eyes or skin causes irritation

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, start artificial respiration and give oxygen if required, observe for signs of pulmonary edema, get medical attention. INGESTION: give large amount of water and induce vomiting. EYES or SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = [illegible] mg/kg rats

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** 0.25 ppb

6 FIRE HAZARDS

6 1 **Flash Point:** −40°F, O.C.

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Irritating sulfur dioxide gas is formed in fire

6 6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back. Containers may explode

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Pennwalt Corporation
Three Parkway
Philadelphia, Pa. 19102

2 Phillips Petroleum Co.
Special Products Div.
Chemical Dept.
Bartlesville, Okla. 74004

3 Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 98.0+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

VPQRS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 76.2

13 3 **Boiling Point at 1 atm:** 126.6°F = 52.5°C = 325.8°K

13 4 **Freezing Point:** −202.8°F = −130.5°C = 142.7°K

13 5 **Critical Temperature:** Data not available

13 6 **Critical Pressure:** Data not available

13 7 **Specific Gravity:** 0.814 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 22.0 dynes/cm = 0.022 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 2.6

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.0964 at 15.6°C

13 12 **Latent Heat of Vaporization:** 165.7 Btu/lb = 92 Cal/g = 3.83 × 10⁵ J/kg

13 13 **Heat of Combustion:** [illegible] = 8,290 cal/g = [illegible] × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

IPC	ISOPROPYL PERCARBONATE

Common Synonyms	
Peroxydicarbonic acid diisopropyl ester Diisopropyl percarbonate Diisopropyl peroxydicarbonate Isopropyl peroxydicarbonate Peroxydicarbonic acid bis(1-methylethyl) ester	Solid (Packed in Dry Ice) White Sharp Unpleasant Odor Sinks in water Freezing point is 45 F

Stop discharge if possible [illegible]
Shut off ignition sources [illegible]
Avoid contact with combustibles [illegible]
Isolate area from [illegible]
Notify local health and pollution control agencies [illegible]

Fire

COMBUSTIBLE
May cause fire on contact with combustibles
Will increase the intensity of a fire
Containers may explode in fire

DO NOT USE DRY CHEMICAL, CARBON DIOXIDE OR FOAM ON FIRE
Flood fire area with water [illegible]
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]
If breathing has stopped [illegible]
If breathing difficult [illegible]

SOLID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning, high flammability and oxidizing material
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Diisopropyl percarbonate
Diisopropyl peroxydicarbonate
Isopropyl peroxydicarbonate, Peroxydicarbonic acid bis(1-methylethyl) ester
Peroxydicarbonic acid diisopropyl ester

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula** $C_8H_{14}O_6$ OOCOOCH

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid contained packed in Dry Ice

4.2 **Color:** White

4.3 **Odor:** Detectable [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Rubber gloves and shoes, hard hat, [illegible] plastic apron, respirator (independent [illegible] when used)

5.2 **Symptoms Following Exposure** Inhalation [illegible] but prolonged exposure may cause lung edema. Contact with eyes may cause [illegible] irritation

5.3 **Treatment for Exposure** INHALATION [illegible] Artificial [illegible] oxygen. EYES Flush [illegible] water. SKIN [illegible] soap and water [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air** Not pertinent

6.3 **Fire Extinguishing Agents.** Water

6.4 **Fire Extinguishing Agents Not to be Used** All extinguishing agents may be ineffective

6.5 **Special Hazards of Combustion Products** Flammable and toxic gases or vapors; these include acetone, isopropyl alcohol, acetaldehyde and ethane

6.6 **Behavior in Fire** Undergoes self accelerative decomposition and may self ignite. Contact with metal may lead to decomposition. Fires very difficult to extinguish; cooling may be needed

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May decompose and formation of oxygen when in contact with metals

7.3 **Stability During Transport:** Unstable above 0 F with formation of oxygen gas

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 PPG Industries Inc
Chemical Division
One Gateway Center
Pittsburgh, Pa. [illegible]

2 Pennwalt Corp. Laucks Div.
1740 Military Road
Buffalo, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical [illegible]

10.2 **Storage Temperature** Below [illegible] F

10.3 **Inert Atmosphere:** Not required

10.4 **Venting:** Pressure vent [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12 HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations.** Organic Peroxide

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

*13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13.4 **Freezing Point:** [illegible]

*13.5 **Critical Temperature:** Not pertinent

*13.6 **Critical Pressure:** Not pertinent

*13.7 **Specific Gravity:** [illegible]

*13.8 **Liquid Surface Tension.** Not pertinent

*13.9 **Liquid-Water Interfacial Tension.** Not pertinent

*13.10 **Vapor (Gas) Specific Gravity** Not pertinent

*13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

*13.12 **Latent Heat of Vaporization** None

*13.13 **Heat of Combustion.** [illegible]

13.14 **Heat of Decomposition** [illegible]

*13.15 **Heat of Solution** Not pertinent

*13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

IVA	ISOVALERALDEHYDE

Common Synonyms	
3-Methylbutyraldehyde Isovaleric aldehyde Isovaleral 3-Methylbutanal	Liquid Colorless Weak suffocating odor Floats on water. Flammable, irritating vapor is produced

[illegible]

Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat If inhaled will cause headache, nausea, vomiting or difficult breathing [illegible] LIQUID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

[illegible]

2. LABEL

3. CHEMICAL DESIGNATIONS

- **Synonyms** [illegible]
- **Coast Guard Compatibility Classification** Aldehyde [illegible]
- **Chemical Formula** CH_3CHCH_2CHO
- **IMCO/United Nations Numerical Designation** [illegible]

4. OBSERVABLE CHARACTERISTICS

- **Physical State (as shipped)** Liquid
- **Color** [illegible]
- **Odor** [illegible]

5. HEALTH HAZARDS

- **Personal Protective Equipment** [illegible]
- **Symptoms Following Exposure** [illegible]
- **Treatment for Exposure** INHALATION [illegible] EYES [illegible] SKIN [illegible] INGESTION [illegible]
- **Toxicity by Inhalation (Threshold Limit Value)** [illegible]
- **Short Term Inhalation Limits** [illegible]
- **Toxicity by Ingestion** [illegible]
- **Late Toxicity** [illegible]
- **Vapor (Gas) Irritant Characteristics** [illegible]
- **Liquid or Solid Irritant Characteristics** [illegible]
- **Odor Threshold** [illegible]

6. FIRE HAZARDS

- **Flash Point** [illegible]
- **Flammable Limits in Air** Data not available
- **Fire Extinguishing Agents** [illegible] foam, carbon dioxide
- **Fire Extinguishing Agents Not to be Used** Water [illegible]
- **Special Hazards of Combustion Products** Not pertinent
- **Behavior in Fire** Not pertinent
- **Ignition Temperature** Data not available
- **Electrical Hazard** Data not available
- **Burning Rate** [illegible]

7. CHEMICAL REACTIVITY

- **Reactivity with Water** No reaction
- **Reactivity with Common Materials** No reaction
- **Stability During Transport** Stable
- **Neutralizing Agents for Acids and Caustics** Not pertinent
- **Polymerization** Not pertinent
- **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

- **Aquatic Toxicity** Data not available
- **Waterfowl Toxicity** Data not available
- **Biological Oxygen Demand (BOD)** Data not available
- **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

- Aldrich Chemical Co., Inc.
  940 West St. Paul Avenue
  Milwaukee, Wis. [illegible]
- Eastern Chemical Division
  [illegible] Marcus Boulevard
  Hauppauge, L. I., N. Y. [illegible]
- Pfaltz and Bauer, Inc.
  [illegible] Northern Boulevard
  Flushing, N. Y. [illegible]

10. SHIPPING INFORMATION

- **Grades or Purity** Commercial
- **Storage Temperature** Ambient
- **Inert Atmosphere** No requirement
- **Venting** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A I U V W

12. HAZARD CLASSIFICATIONS

- **Code of Federal Regulations** Flammable liquid
- **NAS Hazard Rating for Bulk Water Transportation** Not listed
- **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- **Physical State at 15°C and 1 atm** Liquid
- **Molecular Weight** [illegible]
- **Boiling Point at 1 atm.** [illegible]
- **Freezing Point** [illegible]
- **Critical Temperature** Not pertinent
- **Critical Pressure** Not pertinent
- **Specific Gravity** [illegible]
- **Liquid Surface Tension** [illegible]
- **Liquid-Water Interfacial Tension** [illegible]
- **Vapor (Gas) Specific Gravity** [illegible]
- **Ratio of Specific Heats of Vapor (Gas)** [illegible]
- **Latent Heat of Vaporization** [illegible]
- **Heat of Combustion** [illegible]
- **Heat of Decomposition** Not pertinent
- **Heat of Solution** Not pertinent
- **Heat of Polymerization** Not pertinent

Continued on page 7 and 8

NOTES

JPO	JET FUELS: JP-1

Common Synonyms Kerosine Range oil Fuel Oil No. 1	Water: liquid Colorless Fuel oil odor Floats on water
[illegible]	
Fire	Combustible [illegible]
Exposure	ALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations Fouling to shoreline Not [illegible] dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-1

[illegible]

2 LABELS

[illegible]

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** [illegible]

3.2 **Coast Guard Compatibility Classification.** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** [illegible]

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** ASPIRATION [illegible] INGESTION [illegible] EYES [illegible] SKIN [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits:** 2500 mg/m³ for 60 min

5.6 **Toxicity by Ingestion** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics** [illegible]

5.9 **Liquid or Solid Irritant Characteristics** [illegible]

5.10 **Odor Threshold.** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Foam [illegible] carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature:** 444 F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** [illegible] days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-1

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** [illegible]

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
[illegible]	

12.3 **NFPA Hazard Classifications.**

Category	Classification
[illegible]	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas)** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion.** [illegible]

13.14 **Heat of Decomposition.** [illegible]

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization.** [illegible]

Continued on page 1 and 2

NOTES

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JPT	JET FUELS: JP-3

Common Synonyms	Water Liquid	Colorless	Fuel oil odor
	Floats on water. Irritating combustible vapor may be produced.		

Fire

Combustible

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause coughing, dizziness, headache or difficult breathing

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms
3.2 Coast Guard Compatibility Classification. Miscellaneous hydrocarbon mixtures
3.3 Chemical Formula: C_nH_{2n}
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped)
4.2 Color
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: ASPIRATION
INGESTION
EYES
SKIN
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits. 2500 mg/m³ for 60 min
5.6 Toxicity by Ingestion.
5.7 Lethal Toxicity:
5.8 Vapor (Gas) Irritant Characteristics.
5.9 Liquid or Solid Irritant Characteristics.
5.10 Odor Threshold

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air.
6.3 Fire Extinguishing Agents.
6.4 Fire Extinguishing Agents Not to be Used
6.5 Special Hazards of Combustion Products.
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard
6.9 Burning Rate

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials
7.3 Stability During Transport
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization.

8 WATER POLLUTION

8.1 Aquatic Toxicity
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Combustible Liquid
12.2 NAS Hazard Rating for Bulk Water Transportation.

Category	Rating
Health	
Vapor Toxicity	
Liquid or Solid Toxicity	
Poison	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Acute Toxicity	
Reactivity	
Other Chemicals	
Water	
Air Reactivity	

12.3 NFPA Hazard Classifications:

Category	Classification
Health (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension: Data not available
13.9 Liquid-Water Interfacial Tension. Data not available
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion.
13.14 Heat of Decomposition:
13.15 Heat of Solution
13.16 Heat of Polymerization.

NOTES

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JPF	JET FUELS: JP-4

Common Synonyms	Watery liquid	Colorless	Fuel oil odor
	Floats on water		

[illegible]

Fire

FLAMMABLE

[illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed

[illegible]

DO NOT INDUCE VOMITING

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

[illegible]

2. LABEL

3 CHEMICAL DESIGNATIONS

3 Synonyms: [illegible]
3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures
3.3 Chemical Formula: [illegible]
3.4 IMCO United Nations Numerical Designation: [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): [illegible]
4.2 Color: [illegible]
4.3 Odor: [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]
5.2 Symptoms Following Exposure: [illegible]
5.3 Treatment for Exposure: [illegible]
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: 2500 mg/m^3 for 60 min
5.6 Toxicity by Ingestion: [illegible]
5.7 Late Toxicity: [illegible]
5.8 Vapor (Gas) Irritant Characteristics: [illegible]
5.9 Liquid or Solid Irritant Characteristics: [illegible]
5.10 Odor Threshold: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: [illegible]
6.2 Flammable Limits in Air: [illegible]
6.3 Fire Extinguishing Agents: [illegible]
6.4 Fire Extinguishing Agents Not to be Used: [illegible]
6.5 Special Hazards of Combustion Products: [illegible]
6.6 Behavior in Fire: [illegible]
6.7 Ignition Temperature: [illegible]
6.8 Electrical Hazard: [illegible]
6.9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: [illegible]
7.2 Reactivity with Common Materials: [illegible]
7.3 Stability During Transport: [illegible]
7.4 Neutralizing Agents for Acids and Caustics: [illegible]
7.5 Polymerization: [illegible]
7.6 Inhibitor of Polymerization: [illegible]

8 WATER POLLUTION

8.1 Aquatic Toxicity: [illegible]
8.2 Waterfowl Toxicity: [illegible]
8.3 Biological Oxygen Demand (BOD): [illegible]
8.4 Food Chain Concentration Potential: [illegible]

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 Grades of Purity: [illegible]
10.2 Storage Temperature: [illegible]
10.3 Inert Atmosphere: [illegible]
10.4 Venting: [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-4

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Flammable liquid
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
[illegible]	[illegible]

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard Blue	[illegible]
Flammability Red	[illegible]
Reactivity Yellow	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: [illegible]
13.2 Molecular Weight: [illegible]
13.3 Boiling Point at 1 atm: [illegible]
13.4 Freezing Point: [illegible]
13.5 Critical Temperature: [illegible]
13.6 Critical Pressure: [illegible]
13.7 Specific Gravity: [illegible]
13.8 Liquid Surface Tension: [illegible]
13.9 Liquid-Water Interfacial Tension: [illegible]
13.10 Vapor (Gas) Specific Gravity: [illegible]
13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]
13.12 Latent Heat of Vaporization: [illegible]
13.13 Heat of Combustion: [illegible]
13.14 Heat of Decomposition: [illegible]
13.15 Heat of Solution: [illegible]
13.16 Heat of Polymerization: [illegible]

[illegible]

NOTES

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JPV	JET FUELS: JP-5

Common Synonyms

Liquid Colorless Fuel odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritation to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
Floating to shoreline
May be dangerous if enters water intakes

1 RESPONSE TO DISCHARGE

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures
3.3 Chemical Formula: Not pertinent
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: INGESTION: DO NOT
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits: 2500 mg/m³ for 60 min
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents
6.4 Fire Extinguishing Agents Not to be Used.
6.5 Special Hazards of Combustion Products.
6.6 Behavior in Fire
6.7 Ignition Temperature
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization.

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades of Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations.
Combustible liquid

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Health	
Vapor Toxicity	
Liquid Toxicity	
Fire	
Water Pollution	
Hazard Level	
Water	
Reactivity	
Chemical Reactivity	
Water	
Reactivity	

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard	
Flammability	
Reactivity	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm.
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization.
13.13 Heat of Combustion.
13.14 Heat of Decomposition:
13.15 Heat of Solution.
13.16 Heat of Polymerization.

NOTES

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KRS	KEROSENE

Common Synonyms Illuminating oil Kerosene Range oil Fuel oil No. 1 Jet Fuel JP 1	Watery liquid Colorless Fuel oil odor Floats on water

[illegible]

Fire	Combustible [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes Harmful if swallowed [illegible] [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook [illegible]

[illegible]

2 LABELS

[illegible]

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible]

3.2 Coast Guard Compatibility Classification. Miscellaneous hydrocarbon mixtures

3.3 Chemical Formula: [illegible]

3.4 IMCO United Nations Numerical Designation: [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): [illegible]

4.2 Color: [illegible]

4.3 Odor: [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]

5.2 Symptoms Following Exposure: [illegible]

5.3 Treatment for Exposure: ASPIRATION [illegible] INGESTION [illegible] SKIN [illegible]

5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]

5.5 Short-Term Inhalation Limits: 2500 mg/m³ for 60 min

5.6 Toxicity by Ingestion: [illegible]

5.7 Late Toxicity: [illegible]

5.8 Vapor (Gas) Irritant Characteristics: [illegible]

5.9 Liquid or Solid Irritant Characteristics: [illegible]

5.10 Odor Threshold: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: [illegible]

6.2 Flammable Limits in Air: [illegible]

6.3 Fire Extinguishing Agents: [illegible]

6.4 Fire Extinguishing Agents Not to be Used: [illegible]

6.5 Special Hazards of Combustion Products: [illegible]

6.6 Behavior in Fire: [illegible]

6.7 Ignition Temperature: 444 F

6.8 Electrical Hazard: [illegible]

6.9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: [illegible]

7.2 Reactivity with Common Materials: [illegible]

7.3 Stability During Transport: [illegible]

7.4 Neutralizing Agents for Acids and Caustics: [illegible]

7.5 Polymerization: [illegible]

7.6 Inhibitor of Polymerization: [illegible]

8 WATER POLLUTION

8.1 Aquatic Toxicity: [illegible]

8.2 Waterfowl Toxicity: [illegible]

8.3 Biological Oxygen Demand (BOD): [illegible]

8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 Grades or Purity: [illegible]

10.2 Storage Temperature: [illegible]

10.3 Inert Atmosphere: [illegible]

10.4 Venting: [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook [illegible]

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Combust Ne Liquid

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
[illegible]	[illegible]

12.3 NFPA Hazard Classifications:

Category	Classification
[illegible]	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid

13.2 Molecular Weight: [illegible]

13.3 Boiling Point at 1 atm: [illegible]

13.4 Freezing Point: [illegible]

13.5 Critical Temperature: [illegible]

13.6 Critical Pressure: [illegible]

13.7 Specific Gravity: [illegible]

13.8 Liquid Surface Tension: [illegible]

13.9 Liquid-Water Interfacial Tension: [illegible]

13.10 Vapor (Gas) Specific Gravity: [illegible]

13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]

13.12 Latent Heat of Vaporization: [illegible]

13.13 Heat of Combustion: [illegible]

13.14 Heat of Decomposition: [illegible]

13.15 Heat of Solution: [illegible]

13.16 Heat of Polymerization: [illegible]

[illegible]

NOTES

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LTA	LACTIC ACID

Common Synonyms
2-Hydroxypropanoic acid
Racemic lactic acid
Milk acid
Alpha Hydroxypropionic acid

Thick Liquid Colorless to Yellow Weak Unpleasant Odor

Syrups and Mixes with water

Avoid contact with liquid and vapor. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control officials.

Fire

Combustible

Extinguish with water, dry chemicals, carbon dioxide, foam.

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

If in eyes hold lids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
LIQUID
Will burn skin and eyes
If swallowed will cause nausea

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold lids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water, milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Hydroxypropanoic acid, alpha Hydroxypropionic acid, Milk acid, Racemic lactic acid

3.2 **Coast Guard Compatibility Classification** Not listed

3.3 **Chemical Formula** $CH_3CHOHCOOH \cdot H_2O$

3.4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Syrupy liquid

4.2 **Color** Yellow to colorless

4.3 **Odor:** None or weak acidic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles, self contained breathing apparatus where high concentrations of mist are present

5.2 **Symptoms Following Exposure:** Inhalation of mist causes coughing and irritation of mucous membranes. Ingestion, even of diluted preparations, has corrosive effect on the esophagus and stomach. Contact with the concentrated solutions can cause severe burns of skin or eye.

5.3 **Treatment for Exposure** INHALATION: move to fresh air. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min. SKIN: flush with water, wash well with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 1,810 mg/kg (rats, pigs)

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics** Data not available

5.10 **Odor Threshold:** 4.0×10^{-1} ppm

6 FIRE HAZARDS

6.1 **Flash Point.** Not pertinent (not flammable or burns with difficulty)

6.2 **Flammable Limits in Air.** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire**

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Slowly corrodes most metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Dilute with water, rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
580 ppm/>100 hr/goldfish, no effect, fresh water
684 ppm/6 hr/fish killed, fresh water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD):** 72% 5 days

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Clinton Corn Processing Co
   P.O. Box 349
   Clinton, Iowa 52732
2. Mallinckrodt Chemical Works
   223 Westside Avenue
   P.O. Box 394
   Jersey City, N.J. 07304
3. Monsanto Company
   800 North Lindbergh Blvd
   St. Louis, Mo. 63166

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** USP Reagent, Technical 88%, Food processing 50%, 80%. The balance is water in all cases.

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classification** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight** 90

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** 1.2 at 20° (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion** −6,520 Btu/lb = −3,620 cal/g = -152×10^3 J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

.LS	LATEX, LIQUID SYNTHETIC

Common Synonyms	
Plastic latex Synthetic rubber latex	Liquid White Mixes with water

[illegible] if possible
Be careful to avoid [illegible] material
[illegible]

Fire	Not flammable Combustible solid is produced when heated
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to eyes IF IN EYES [illegible] with plenty of water
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush (if not coagulated)
Should be removed (if coagulated)
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Plastic latex
Synthetic rubber latex

3.2 **Coast Guard Compatibility Classification**
Miscellaneous water solutions

3.3 **Chemical Formula:** Not pertinent

3.4 **IMCO-United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Milky

4.3 **Odor:** Each type has a characteristic odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Chemical goggles or face shield

5.2 **Symptoms Following Exposure:** Irritation of eyes

5.3 **Treatment for Exposure:** Flush eyes with water for at least 15 min

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** None

5.9 **Liquid or Solid Irritant Characteristics:** Contact with eyes may cause irritation

5.10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable unless coagulated

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products** If the latex dries out and then burns hydrochloric acid, hydrogen cyanide, and styrene gases may be evolved. All are irritating and poisonous

6.6 **Behavior in Fire:** Heat may coagulate the latex and form sticky plastic lumps which may burn

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard** Data not available

6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport** Coagulated by heat and acids to gummy flammable material

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
Data not available

8.2 **Waterfowl Toxicity**
Data not available

8.3 **Biological Oxygen Demand (BOD)**
Low dose

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. Borg Warner Corp
Marbon Division
Washington, W. Va. 26181

2. W. R. Grace & Co
Dewey and Almy Chemical Division
Cambridge, Mass. 02140

Rohm and Haas Co
Independence Mall West
Philadelphia, Pa. 19105

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** All commercial latexes are shipped in a variety of concentrations in water depending on the particular polymer involved and the intended use of the latex. None are particularly hazardous except that they will coagulate to gummy flammable material

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-1

A P

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm** [illegible]

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity** 1.057 at 25°C (liquid)
(liquid)

13.8 **Liquid Surface Tension.** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued in pages 2 and 3

NOTES

REVISED 1973

LPO — LAUROYL PEROXIDE

Common Synonyms
Dilauroyl peroxide
Dodecanoyl peroxide

Solid — White — Faint soapy odor

Floats on water

Call fire department
Keep people away
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
May cause fire on contact with combustibles
Containers may explode in fire
May explode if exposed to heat or flames

Cool fire from behind barrier
Flood discharge area with water
Cool exposed containers with water

Exposure

Call for medical aid

SOLID

Irritating to skin and eyes.
Harmful if swallowed

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not induce except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — oxidizing material
water contaminant
Mechanical containment
Should be removed
Chemical and physical treatment

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dilauroyl peroxide
Dodecanoyl peroxide

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula** $[CH_3(CH_2)_{10}COO]_2$

3.4 **IMCO/United Nations Numerical Designation:** NA 1450

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid

4.2 **Color:** White

4.3 **Odor:** Faint pungent bland soapy

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles

5.2 **Symptoms Following Exposure:** Contact with liquid irritates eyes and skin. Ingestion causes irritation of mouth and stomach

5.3 **Treatment for Exposure:** EYES wash with plenty of water for 15 min and get medical attention. SKIN wash with plenty of soap and water. INGESTION administer emetic to induce vomiting and call a physician

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Weak carcinogen in mice

5.8 **Vapor (Gas) Irritant Characteristics** Data not available

5.9 **Liquid or Solid Irritant Characteristics** Data not available

5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 **Flash Point:** Not pertinent
(oxidizing combustible solid)

6.2 **Flammable Limits in Air** Not pertinent

6.3 **Fire Extinguishing Agents** Water, dry chemical, foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire** Can increase the severity of a fire. Becomes sensitive to shock when hot. Containers may explode in a fire. May ignite or explode spontaneously if mixed with flammable materials

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** May ignite or explode spontaneously when mixed with combustible materials

7.3 **Stability During Transport** Stable if not overheated

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Pennwalt Corporation
Lucidol Division
1740 Military Road
Buffalo, N.Y. 14240
2. Witco Chemical Corporation
U.S. Peroxygen Division
850 Morton Avenue
Richmond, Calif. 94804
3. Argus Chemicals Division
Dart Industries, Inc.
888 Garden Street
Elyria, Ohio 44035

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 97–98% dry or wetted with water

10.2 **Storage Temperature:** <80°F

10.3 **Inert Atmosphere.** No requirements

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II/

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Organic Peroxide

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications:**

	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	3
	OX

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid

13.2 **Molecular Weight** 399

13.3 **Boiling Point at 1 atm** Decomposes

13.4 **Freezing Point** 129.4°F = 54°C = 327°K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 0.91 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** (est.) −16,500 Btu/lb = −9,100 cal/g = −3.40 × 10⁷ J/kg

13.14 **Heat of Decomposition** Data not available

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 4 and 5

NOTES

LRM	# LAURYL MERCAPTAN

Common Synonyms	
1-Dodecanethiol Dodecyl mercaptan	Oily liquid Colorless Mild skunk odor Floats on water. Freezing point is 19°F

[illegible]

Fire

Combusti[illegible]
POISONOUS GASES ARE PRODUCED IN FIRE
[illegible]

Exposure

CALL FOR MEDICAL AID
LIQUID OR SOLID
Irritating to skin and eyes
If swallowed, will cause nausea
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES: hold eyelids open and flush with plenty of water
IF SWALLOWED: [illegible] UNCONSCIOUS [illegible] drink water
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** Dodecanethiol
Dodecyl mercaptan

3.2 **Coast Guard Compatibility Classification**
Not applicable

3.3 **Chemical Formula:** $CH_3(CH_2)_{11}SH$

3.4 **IMCO United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color** Colorless

4.3 **Odor.** Mild skunk

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Respirator when mist is present, rubber or vinyl gloves, chemical goggles, rubber shoes and apron

5.2 **Symptoms Following Exposure:** Liquid is irritating to skin, eyes and mucous membranes. Ingestion may cause nausea. Repeated [illegible] exposure [illegible] dermatitis and may produce a sensitizing effect

5.3 **Treatment for Exposure.** Get medical attention for all eye exposures and [illegible] exposures. INHALATION: rinse mouth repeatedly with cold water, treatment [illegible] symptomatic. INGESTION: dilute by drinking water, if vomiting occurs, drink more water, administer [illegible]. EYES: flush thoroughly with water, ventilation by electric [illegible] helpful in removing fast acting [illegible] especially around eyes and eyelids. SKIN: remove contaminated clothing, flush skin with water, wash exposed area with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Causes decline in kidney and liver function in rats

5.8 **Vapor (Gas) Irritant Characteristics.** Irritating concentration of vapor unlikely, but mist can cause irritation of eyes and upper respiratory tract

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause scarring and reddening of the skin

5.10 **Odor Threshold:** 4 mg/m³

6. FIRE HAZARDS

6.1 **Flash Point** 262°F O.C.

6.2 **Flammable Limits in Air**
Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used**
Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products.**
Poisonous and irritating gases (e.g. sulfur dioxide) are generated in fires

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:**
Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
Data not available

8.2 **Waterfowl Toxicity:**
Data not available

8.3 **Biological Oxygen Demand (BOD):**
Data not available

8.4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1. Occidental Petroleum Corp
Hooker Chemical Corp
Stamford, Conn. 06600
2. Phillips Petroleum Co
Bartlesville, Okla. 74004
3. Uniroyal Inc
Uniroyal Chemical Co. Division
Naugatuck, Conn. 06770

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
95% minimum

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-1-1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 202

13.3 **Boiling Point at 1 atm** Very high

13.4 **Freezing Point** 19.4°F = −7.0°C = 266.2°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.85 at 15°C (liquid)

13.8 **Liquid Surface Tension**
(est.) 30 dynes/cm = 0.03 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
(est.) 30 dynes/cm = 0.03 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization**
(est.) 110 Btu/lb = 60 cal/g = 2.5 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) −18,200 Btu/lb = −10,100 cal/g = −422 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 4 and 5

NOTES

LAC	LEAD ACETATE

Common Synonyms Lead acetate trihydrate Neutral Lead acetate Normal lead acetate	Solid White Odorless Sinks and mixes with water
[illegible]	
Fire	NOT FLAMMABLE
Exposure	CALL FOR MEDICAL AID **DUST** **POISONOUS IF INHALED** *If inhaled will cause dizziness or loss of consciousness* [illegible] plenty of water If breathing [illegible] artificial respiration If breathing difficult give oxygen **SOLID** **Irritating to skin and eyes** **If swallowed will cause nausea vomiting or loss of consciousness** Remove contaminated clothing shoes Flush eyes with plenty of water IF IN EYES [illegible] plenty of water IF SWALLOWED [illegible] CONSCIOUS [illegible] water [illegible] IF SWALLOWED [illegible] NO ANTIDOTES OR HAVING CONVULSIONS [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning water contaminant
Restrict access
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Lead acetate trihydrate Neutral lead acetate Normal lead acetate Salt of Saturn Sugar of lead

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula:** $Pb(C_2H_3O_2)_2 \cdot 3H_2O$

3 4 **IMCO/United Nations Numerical Designation:** 9 1616

4 OBSERVABLE CHARACTERISTIC

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White (commercial grades are frequently brown or grey lumps)

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Dust mask and protective gloves

5 2 **Symptoms Following Exposure** Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders colic constipation etc weakness which may go on to paralysis chiefly of the extensor muscles of the wrists and less often of the ankles sometimes with most serious cases Ingestion of a large amount causes fatal irritation of the alimentary tract pain leg cramps muscle weakness paresthesias depression coma and death may follow in 1 or 2 days Contact with eyes causes irritation

5 3 **Treatment for Exposure.** Remove at once all cases of lead intoxication from further exposure until the blood level is reduced to a safe value immediately place the individual under medical care INGESTION give gastric lavage using 1% solution of sodium or magnesium sulfate leave 15 30 gm magnesium sulfate in 8 oz of water in the stomach as antidote and cathartic egg white milk and tannin are useful demulcents atropine sulfate and other antispasmodics may relieve abdominal pain but morphine may be necessary EYE Not SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 [illegible] mg m (as Pb)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] mg kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Irritating acid fumes may be formed in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
50 ppm 16 168 days catfish bloodcell injury tapwater
7 48 mg (as Pb) 4 days minnow 11 [illegible] soft water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential** Fish and terrestrial animals are capable of concentrating lead

9 SELECTED MANUFACTURERS

1 Frito Color and Chemical Corp
347 Madison Ave
New York N Y 10017

2 Mallinckrodt Chemical Works
222 Westside Ave
P O Box 384
Jersey City N J 07303

3 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown N J 07960

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** NF Reagent Technical 97%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight:** 379 3

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2 55 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

LAR	LEAD ARSENATE

Common Synonyms			
Lead arsenate acid Plumbous arsenate	Solid Sinks in water	White	Odorless

AVOID CONTACT WITH SOLID. Keep people away.
Not flammable if possible.
Isolate and remove discharged material.
Notify authorities if public is endangered.

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
SOLID
POISONOUS IF SWALLOWED
IF SWALLOWED and conscious: Give water or milk and have victim vomit.
SWALLOWED and not conscious or having convulsions: Do not give anything by mouth.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if enters water intake.
Notify authorities if liquid enters sewers or waterways.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Isolate and remove poison when contaminated.
Should be removed.
Chemical and physical state.

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Lead arsenate acid
Plumbous arsenate

3.2 **Coast Guard Compatibility Classification**
Not applicable

3.3 **Chemical Formula:** $PbHAsO_4$

3.4 **IMCO United Nations Numerical Designation** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Dust respirator, protective clothing to prevent accidental inhalation or ingestion.

5.2 **Symptoms Following Exposure** Inhalation or ingestion causes dizziness, headache, pain in the chest, cramps and paralysis, collapse, coma. Subacute doses cause irritability, loss of weight, insomnia, constipation. Blood and urine concentrations of lead indicate exposure.

5.3 **Treatment for Exposure** Vapor: medical treatment is used for exposure to this chemical. Call a physician immediately. Give victim a tablespoon of salt in glass of warm water and induce vomiting. Then give two tablespoons of epsom salt in milk of magnesia in water and prepare emulsion and water. Have victim lie down and keep quiet.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion** Grade 4. LD50 [illegible] mg/kg rabbit [illegible]

5.7 **Late Toxicity** Lead poisoning

5.8 **Vapor (Gas) Irritant Characteristics.** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics.** None

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point.** Not flammable

6.2 **Flammable Limits in Air**
Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6.5 **Special Hazards of Combustion Products**
Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity**
[illegible] ppm 48h [illegible]

8.2 **Waterfowl Toxicity** [illegible]

8.3 **Biological Oxygen Demand (BOD)**
None

8.4 **Food Chain Concentration Potential**
Data not available

9. SELECTED MANUFACTURERS

1. Chemipa Chemical Co. Inc.
200 Madison Ave.
New York, N.Y. [illegible]
2. Chevron Chemical Co.
Ortho Division
940 Hensley St.
Richmond, Calif. 94804
3. FMC Corp.
Niagara Chemical Division
Middleport, N.Y. 14105

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 94%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight.** [illegible]

13.3 **Boiling Point at 1 atm:** Decomposes

13.4 **Freezing Point** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization:**
Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

LFB	# LEAD FLUOROBORATE

Common Synonyms			
Lead fluoborate Lead fluoroborate solution	Liquid	Colorless	Odorless
	Sinks and mixes with water		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP FLOOD AWAY.
Wear goggles and self contained [illegible]
Stop the stage of poisoning
[illegible]
[illegible]

Fire

Not flammable
Irritating gases may be produced when heated
[illegible]

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED
If inhaled will cause dizziness or loss of consciousness
[illegible]
LIQUID
Will burn skin and eyes
If swallowed will cause nausea vomiting or loss of consciousness
[illegible]
IF IN EYES [illegible] and rinse with plenty of water
IF SWALLOWED [illegible] CONSCIOUS [illegible] milk and have victim rinse [illegible]
IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4

Issue warning [illegible] water contaminant
Restrict access
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Lead fluoborate
Lead fluoroborate solution

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Pb(BF_4)_2 \cdot H_2O$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Faint

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves face shield rubber apron

5 2 **Symptoms Following Exposure.** Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders colic constipation [illegible] weakness which may lead to paralysis chiefly of the extensor muscles. If the wrists and less often of the ankles is noticeable [illegible] In severe cases. Ingestion of a large amount causes local irritation of the alimentary tract pain leg cramps muscle weakness paresthesias depression coma and death may follow in 1 or 2 days. Contact with eyes or skin may cause burns and irritation

5 3 **Treatment for Exposure:** Remove at once all cases. Lead intoxication from further exposure until the blood level is reduced to a safe [illegible] immediately place the individual under medical care. INGESTION give gastric lavage using [illegible] solution of sodium or magnesium sulfate leave [illegible] 30 gm magnesium sulfate in 6 oz of water in the stomach as antidote and [illegible] egg white milk and tannin are useful deterrents atropine sulfate and other anti spasmodics may relieve abdominal pain but morphine may be necessary. EYES [illegible] shower [illegible] quantities of water for 5 min. SKIN wash area with soap and water [illegible] and burn

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.2 mg/m³ (as Pb)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Grade 2 LD_{50} 0.5 [illegible] mg/kg

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products** Toxic and irritating hydrogen fluoride gas may form in fire

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** Solution is acid and will corrode most metals

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Flush with water rinse with dilute solution of sodium bicarbonate or soda ash

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** May be toxic

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential** Bioconcentrative

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
P O Box 1087R
Morristown N J 07960

2 The Harshaw Chem Co
1945 E 97th St
Cleveland Ohio 44106

3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 50 62% solutions in water

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

A P

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight.** Mixture

13 3 **Boiling Point at 1 atm** Not pertinent

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.75 at 20 C (liquid)

13 8 **Liquid Surface Tension** Data not available

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

LFR

LEAD FLUORIDE

Common Synonyms
Lead difluoride
Plumbous fluoride

Solid | White | Odorless

Sinks in water

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY

Fire

Not flammable

Exposure

CAUTION: VERY TOXIC
DUST
POISONOUS IF INHALED
If inhaled will cause dizziness or loss of consciousness

SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning; water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Lead difluoride
Plumbous fluoride

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula.** PbF

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

Dust and fumes of all but the most insoluble lead compounds are readily absorbed on inhalation and to a lesser degree after ingestion

5 1 **Personal Protective Equipment:** Respirator for heavy dust exposure, safety goggles

5 2 **Symptoms Following Exposure.** Not irritating to skin or mucous membranes. Protect against chronic poisoning. Early signs of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders, colic, constipation, etc., weakness, which may go on to paralysis of the extensor muscles of the wrists and less often the ankles, is noticeable in the most serious cases. Ingestion of a large amount causes local irritation of the alimentary tract, pain, leg cramps, muscle weakness, paresthesias, depression, coma, and death may follow in one 2 days. Contact with eyes causes irritation

5 3 **Treatment for Exposure:** Remove at once all cases of lead intoxication from further exposure until the blood level is reduced to a safe value, immediately place the individual under medical care. INGESTION: give gastric lavage using 1% solution of sodium or magnesium sulfate, leave 15–30 gm magnesium sulfate in 6–8 oz. of water in the stomach as a purgative and cathartic, egg white, milk and tannic are used. Edemulcents, atropine sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. EYES or SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.15 mg/m³ as lead

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion.** Grade 5 LD50 5–50 g/kg

5 7 **Late Toxicity:** Data not available

Continued on page 4

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products.**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
[illegible] mg/l as Pb) 4 days minnow, [illegible] soft water

8 2 **Waterfowl Toxicity:** May be toxic

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential**
Bioconcentrative

9. SELECTED MANUFACTURERS

1 Ozark Mahoning Co
1870 South Boulder
Tulsa, Okla 74119

2 American Hoechst Corp
Chemicals and Plastics Div
Rt 202 206 North
Somerville, N J 08876

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical C P
Optical grade

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.**
Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Solid

13 2 **Molecular Weight:** 245.19

13 3 **Boiling Point at 1 atm** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 8.24 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5

5 HEALTH HAZARDS (Cont'd)

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold** Data not available

LID	LEAD IODIDE

Common Synonyms	Solid	Bright Yellow	Odorless
	Sinks in water		

AVOID CONTACT WITH SOLUTIONS THAT REDUCE PH [illegible]
Water [illegible]
Not [illegible]
Incompatible with [illegible]
Not [illegible]

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED
If inhaled will cause dizziness or loss of consciousness
[illegible]
SOLID
Irritating to skin and eyes
If swallowed will cause nausea vomiting or loss of consciousness
[illegible]
IN EYES [illegible]
IF SWALLOWED [illegible] DO NOT GIVE ANYTHING BY MOUTH [illegible] milk and raisins [illegible]
IF SWALLOWED [illegible] DO NOT INDUCE VOMITING OR HAVING VOMITING [illegible]

Water Pollution

Dangerous to aquatic life at high concentrations
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula** PbI
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color:** Bright yellow
4.3 **Odor** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask and protective gloves
5.2 **Symptoms Following Exposure:** Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders colic constipation etc weakness which may give on to paralysis chiefly of the extensor muscles of the wrists and less often the ankles is most cable in the most serious cases Ingestion of a large amount causes local irritation of the alimentary tract Pain leg cramps muscle weakness paresthesias depression coma and death may follow in 1 or 2 days Contact with eyes causes irritation
5.3 **Treatment for Exposure:** Remove at once all cases of lead intoxication from further exposure [illegible] the blood level is reduced to a safe value immediately place the individual under medical care INGESTION give gastric lavage using 1% solution of sodium or magnesium sulfate leave 15 30 mg magnesium sulfate in [illegible] Use of water in the stomach as antidote and activated charcoal white milk and tannin are useful demulcents atropine sulfate and other antispasmodics may relieve abdominal pain but morphine may be necessary EYES or SKIN flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.15 mg/m³ (as lead)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air** Not pertinent
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products**
6.6 **Behavior in Fire.**
6.7 **Ignition Temperature.** Not pertinent
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials**
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** Bioconcentrative

9 SELECTED MANUFACTURERS

1. RSA Corporation
600 Sawmill River Road
Ardsley N.Y. 10502
2. Ventron Corp
P.O. Box 150
Beverly Mass 01915
3. Mallinckrodt Chemical Works
St. Louis Mo 63160

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible] NF
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 461.01
13.3 **Boiling Point at 1 atm.** Not pertinent
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 6.16 at 20°C (solid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on page [illegible]

NOTES

LNT	# LEAD NITRATE

Common Synonyms			
Nitric acid lead (II) salt	Solid	White	Odorless
	Sinks and mixes with water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

DUST
POISONOUS IF INHALED
If inhaled will cause dizziness or loss of consciousness

SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**
3.2 **Coast Guard Compatibility Classification:** Not Listed
3.3 **Chemical Formula:** $Pb(NO_3)_2$
3.4 **IMCO/United Nations Numerical Designation:**

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).**
4.2 **Color:** White
4.3 **Odor:**

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask and protective gloves
5.2 **Symptoms Following Exposure:** Early symptoms of lead intoxication are inhalation of metallic fumes, commonly gastrointestinal upset, constipation, etc., weakness which may go [illegible] the extensor muscle of the wrists and less often the ankles, muscle [illegible] Pressure in the large arteries causes visual [illegible] the alimentary [illegible] weakness, paresthesias, depression, coma and death may follow [illegible] irritation
5.3 **Treatment for Exposure:** Remove at once all causes of lead intoxication from further exposure until [illegible] reduced to a safe level. Immediately place the individual under medical care. INGESTION: [illegible] gastric lavage using 1% solution of sodium or magnesium sulfate leave [illegible] magnesium sulfate in [illegible] of water in the stomach as antidote and cathartic. Egg white, milk and tannic are useful demulcents, atropine sulfate and other antispasmodics may [illegible] but morphine is to be avoided. EYES/SKIN: flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³ (as lead)
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** [illegible]
6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]
6.5 **Special Hazards of Combustion Products:** [illegible]
6.6 **Behavior in Fire:** [illegible]
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** [illegible]
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]
7.2 **Reactivity with Common Materials.** [illegible]
7.3 **Stability During Transport.** [illegible]
7.4 **Neutralizing Agents for Acids and Caustics.** [illegible]
7.5 **Polymerization:** [illegible]
7.6 **Inhibitor of Polymerization.** [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity** [illegible]
8.2 **Waterfowl Toxicity** [illegible]
8.3 **Biological Oxygen Demand (BOD)** [illegible]
8.4 **Food Chain Concentration Potential** [illegible]

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

*10.1 **Grades or Purity:** Reagent, Technical [illegible]
*10.2 **Storage Temperature:** [illegible]
*10.3 **Inert Atmosphere:** [illegible]
*10.4 **Venting:** [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

[illegible]

12 HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not Listed
12.3 **NFPA Hazard Classifications**

Category	Classification*
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]
Special	[illegible]

*[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Solid
*13.2 **Molecular Weight:** [illegible]
*13.3 **Boiling Point at 1 atm:** [illegible] decomposes
*13.4 **Freezing Point:** [illegible]
*13.5 **Critical Temperature:** [illegible]
*13.6 **Critical Pressure:** [illegible]
*13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** [illegible]
*13.9 **Liquid-Water Interfacial Tension.** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
*13.11 **Ratio of Specific Heats of Vapor (Gas)** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** [illegible]
13.15 **Heat of Solution.** [illegible]
13.16 **Heat of Polymerization:** [illegible]

Continued on page [illegible]

NOTES

LTT	# LEAD TETRAACETATE

Common Synonyms			
Lead Tetraacetate	Wet Crystals	Lavender Pink	Vinegar-like Odor
	Reacts with water		

AVOID CONTACT WITH SOLID. KEEP DRY. [illegible]
Wear [illegible] respirator
[illegible]

Fire

Not flammable
Will increase the intensity of a fire

Exposure

CAUTION MODERATE
LIQUID SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness
[illegible]
IF ON SKIN [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

[illegible]
Restrict access
Disperse and flush

2 LABEL

OXIDIZER

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Lead Diacetate
3.2 **Coast Guard Compatibility Classification** Not listed
3.3 **Chemical Formula:** $Pb(C_2H_3O_2)_4$ CH_3COOH
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Crystals and wet crystals solid
4.2 **Color:** Lavender pink
4.3 **Odor:** Lavender, acid, vinegar

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles, face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Early symptoms of lead poisoning are [illegible] gastrointestinal disorders, [illegible] weakness which may [illegible] paralysis chiefly of the extensor muscles of the wrists and less often of the ankles in moderate to the most serious cases. Ingestion of a large amount causes local irritation to the mucous membranes, [illegible] muscle weakness, paralysis, depression, coma and death may follow in one 2 days. Contact causes [illegible] and can be [illegible]
5.3 **Treatment for Exposure:** Remove at once all cases. Lead poisoning from other exposure [illegible] blood level is reduced [illegible] immediately place the patient under medical care. INGESTION: give gastric lavage using [illegible] solution of magnesium sulfate, leave [illegible] magnesium citrate [illegible] water. [illegible] and cathartics, give white milk and tannic acid demulcents, also give sulfate and other antiemetics, may relieve abdominal pain but morphine may be necessary. EYES: flush with water for at least [illegible] min. SKIN: wash [illegible] skin with large amounts of water for 15 min.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.15 mg/m³ (as lead)
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible]
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not applicable
6.2 **Flammable Limits in Air** Not applicable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire** [illegible] water
6.7 **Ignition Temperature.** Not pertinent
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** [illegible] dioxide [illegible]
7.2 **Reactivity with Common Materials** May [illegible]
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Dilute [illegible] bicarbonate [illegible]
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data [illegible]
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential:** Bioaccumulative

9 SELECTED MANUFACTURERS

Mallinckrodt Chemical Works
[illegible]
Inside Cover [illegible]
[illegible] Chemicals
[illegible]
Boston, Mass. 01915
Gallard-Schlesinger Chemical Mfg. Co.
[illegible]
Carle Place, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades of Purity** Commercial [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Not required
10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

RP

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid
13.2 **Molecular Weight.** [illegible]
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** [illegible] K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

LTC	LEAD THIOCYANATE

Common Synonyms			
Lead sulfocyanate	Solid	White	Odorless
	Sinks and mixes with water		

	[illegible]
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	[illegible] DUST POISONOUS IF INHALED If inhaled will cause dizziness or loss of consciousness [illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Lead sulfocyanate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $Pb(SCN)_2$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Early symptoms of lead poisoning [illegible] are most commonly gastrointestinal disorders, colic, constipation, etc., weakness, which may [illegible] signs of the extreme muscles. The wrists and less office of the arms is noted. Near them in serious cases. Ingestion of a large amount can [illegible] local irritation of the alimentary tract, pain, [illegible], muscle weakness, paresthesias, depression, coma and death may follow [illegible] day. Contact causes [illegible] and mild irritation of skin
5 3 **Treatment for Exposure:** Remove [illegible] Head [illegible] from [illegible] exposure [illegible] the blood [illegible] value immediately [illegible] place the individual under medical care. INGESTION [illegible] gastric lavage using [illegible] solution of sodium or magnesium sulfate [illegible] magnesium sulfate [illegible] water [illegible] has a [illegible] and cathartic, [illegible] and tannic acid [illegible] antispasmodics may relieve abdominal pain but morphine may be necessary. EYES flush with water [illegible] min. SKIN wash well with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³ as Pb
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion.** Grade 2 LD [illegible] mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Irritating sulfur dioxide gas may form in fire
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** May be toxic
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** Bioconcentrative

9. SELECTED MANUFACTURERS

1 Fielding Chemicals Co
P O Box [illegible]
Jersey City, N J 07303

2 Gallard-Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

3 Eastman Organic Chemicals
Rochester, N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Practical, Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Nonrequirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poison Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight:** 323.4
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 3.82 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

LAL	LINEAR ALCOHOLS

Common Synonyms			
Dodecanol Tridecanol Tetradecanol Pentadecanol	Liquid	Colorless	Mild alcohol odor
	Floats on water		

[illegible]

Fire	Combustible [illegible]
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin Will burn eyes [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dodecanol Tetradecanol Tridecanol Pentadecanol (Could be any of the above or mixtures thereof)

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $CH_3(CH_2)_{10}CH_2OH$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Eye protection

5.2 **Symptoms Following Exposure:** Direct contact can produce eye irritation. Low general toxicity

5.3 **Treatment for Exposure:** Wash eyes with water for at least 15 min

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 1 [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents.** [illegible] foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** [illegible]

7.2 **Reactivity with Common Materials.** [illegible]

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** [illegible] days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** Open flame [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A T U

12 HAZARD CLASSIFICATIONS

12 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid [illegible]

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** [illegible]

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** [illegible]

[illegible]

NOTES

LNG	LIQUEFIED NATURAL GAS

Common Synonyms LNG	Liquefied gas — Colorless — Odorless or weak skunk odor Floats and boils on water. Flammable visible vapor cloud is produced
Fire	FLAMMABLE Flashback of the vapor trail may occur May explode if ignited in a confined area
Exposure	VAPOR Not irritating to eyes, nose or throat If inhaled, will cause dizziness, difficult breathing, or loss of consciousness LIQUID Will cause frostbite
Water Pollution	Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

See Response Methods Handbook

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 Synonyms, LNG
3.2 Coast Guard Compatibility Classification Paraffin
3.3 Chemical Formula, CH_4
3.4 IMCO United Nations Numerical Designation

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped)
4.2 Color
4.3 Odor

5 HEALTH HAZARDS

5.1 Personal Protective Equipment
5.2 Symptoms Following Exposure
5.3 Treatment for Exposure
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits
5.6 Toxicity by Ingestion
5.7 Late Toxicity
5.8 Vapor (Gas) Irritant Characteristics
5.9 Liquid or Solid Irritant Characteristics
5.10 Odor Threshold

6 FIRE HAZARDS

6.1 Flash Point. Flammable gas
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents
6.4 Fire Extinguishing Agents Not to be Used
6.5 Special Hazards of Combustion Products
6.6 Behavior in Fire
6.7 Ignition Temperature
6.8 Electrical Hazard
6.9 Burning Rate

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water
7.2 Reactivity with Common Materials
7.3 Stability During Transport
7.4 Neutralizing Agents for Acids and Caustics
7.5 Polymerization
7.6 Inhibitor of Polymerization

8 WATER POLLUTION

8.1 Aquatic Toxicity
8.2 Waterfowl Toxicity
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity
10.2 Storage Temperature
10.3 Inert Atmosphere
10.4 Venting

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations
12.2 NAS Hazard Rating for Bulk Water Transportation

Category	Rating

12.3 NFPA Hazard Classifications

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm.
13.2 Molecular Weight
13.3 Boiling Point at 1 atm
13.4 Freezing Point
13.5 Critical Temperature
13.6 Critical Pressure
13.7 Specific Gravity
13.8 Liquid Surface Tension
13.9 Liquid-Water Interfacial Tension
13.10 Vapor (Gas) Specific Gravity
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization
13.13 Heat of Combustion
13.14 Heat of Decomposition
13.15 Heat of Solution
13.16 Heat of Polymerization

NOTES

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LPG — LIQUEFIED PETROLEUM GAS

Common Synonyms
Propane butane propylene
Propylene
LPG

Liquefied compressed gas. Colorless. Weak odor may have skunk odor added.

Floats and boils on water. Flammable vapor cloud is produced.

Stop discharge if possible. Keep people away.
Stay upwind and avoid water spills. Keep
Avoid contact with liquid.
Notify local health and pollution control officials.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Containers may explode in fire.
May explode if ignited in an enclosed area.

Stop discharge if possible.
Let fire burn.

Exposure

VAPOR
Not irritating to eyes, nose and throat.
If inhaled will cause dizziness, difficult breathing or loss of consciousness.

CAUTION MED. ALERT

LIQUID
Will cause frostbite.

May cause cold
If breathing has stopped, give artificial respiration.
If breathing difficult, give oxygen.

Flush frozen areas with plenty of water.
DO NOT RUB AFFECTED AREAS.

Water Pollution

Not harmful to aquatic life.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, Cg 446-4

Eliminate all ignition sources.
Reduce vapors.
Evacuate area.

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Butane, Propane, Propylene, Butylene, LPG, LP-Gas

3.2 **Coast Guard Compatibility Classification** Paraffin or olefin

3.3 **Chemical Formula** C_3H_8, C_4H_{10}, C_3H_6, C_4H_8

3.4 **IMCO United Nations Numerical Designation** None

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquefied compressed gas

4.2 **Color** Colorless

4.3 **Odor** Mild petroleum odor. LPG's are odorless and have added odorant

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Not required under normal conditions. Use gloves when handling liquid.

5.2 **Symptoms Following Exposure** Contact with liquid causes frostbite. Inhalation causes dizziness, difficulty breathing, loss of consciousness.

5.3 **Treatment for Exposure** Remove victim to fresh air. If breathing has stopped, give artificial respiration. If breathing difficult, give oxygen. Treat for frostbite.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 1000 ppm

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion** Not applicable

5.7 **Late Toxicity** None

5.8 **Vapor (Gas) Irritant Characteristics** Vapor causes frostbite when confined in eyes.

5.9 **Liquid or Solid Irritant Characteristics** Not applicable. Liquid causes frostbite. May cause cold burns.

5.10 **Odor Threshold** 1000 ppm

6 FIRE HAZARDS

6.1 **Flash Point** Propane -156°F (CC), -104°F (OC); Butane -76°F (CC), -60°F (OC)

6.2 **Flammable Limits in Air.** Propane 2.2% - 9.5%; Butane 1.8% - 8.4%

6.3 **Fire Extinguishing Agents** Water spray, fog, foam, dry chemical, carbon dioxide, halon. Extinguish fire by stopping the flow of gas. Shut flow if possible.

6.4 **Fire Extinguishing Agents Not to be Used** Water direct in bulk

6.5 **Special Hazards of Combustion Products** Not applicable

6.6 **Behavior in Fire** Containers may explode in fire. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers should be cooled with water from maximum distance.

Continued on page 4

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Negligible

7.2 **Reactivity with Common Materials** Negligible

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not applicable

7.5 **Polymerization** Not applicable

7.6 **Inhibitor of Polymerization** Not applicable

8 WATER POLLUTION

8.1 **Aquatic Toxicity** None

8.2 **Waterfowl Toxicity.** None

8.3 **Biological Oxygen Demand (BOD)** None

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Exxon Co.
Houston, Tex. 77001

Phillips Petroleum Co.
Bartlesville, Okla. 74004

Sun Oil Co.
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Various grades mostly propane. Commercial propane may be included. The proportion is [illegible]

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, Cg 446-2

A B C D E F

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	4
Health	
Acute Toxicity	0
Long-Term Toxicity	0
Poison	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	0
Water	0
Self Reactivity	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES*

13.1 **Physical State at 15°C and 1 atm** Gas

13.2 **Molecular Weight** >44

13.3 **Boiling Point at 1 atm** >-44°F = >-42°C = >231°K

13.4 **Freezing Point** Not applicable

13.5 **Critical Temperature** -142°F = -97°C = 176°K

13.6 **Critical Pressure.** 616.5 psia = 41.9 atm = 4.249 MN/m²

13.7 **Specific Gravity** 0.5 - 0.6 (Liquid)

13.8 **Liquid Surface Tension** 0.0 dyne/cm = 0.00 N/m at -47°C

13.9 **Liquid-Water Interfacial Tension*** 50 dyne/cm = 0.05 N/m at -50°C

13.10 **Vapor (Gas) Specific Gravity** 1.5

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.1

13.12 **Latent Heat of Vaporization** 185 Btu/lb = 101 cal/g = 4.26 × 10⁵ J/kg

13.13 **Heat of Combustion** -19,752 Btu/lb = -10,980 cal/g = -460 × 10⁵ J/kg

13.14 **Heat of Decomposition** Not applicable

13.15 **Heat of Solution** Not applicable

13.16 **Heat of Polymerization*** Not applicable

*Physical properties are those of propane. Properties of other LPG's may vary.

Continued on page 3

6 FIRE HAZARDS (Cont'd.)

6.7 **Ignition Temperature** Propane 842°F, Butane 761°F

6.8 **Electrical Hazard** Class I, Group D

6.9 **Burning Rate** 3.2 mm/min

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LTH	LITHARGE

Common Synonyms			
Lead monoxide Lead oxide yellow Plumbous oxide Lead Protoxide	Solid Sinks in water	Gray or yellow green or red brown	Odorless

Keep people away
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	Not flammable
Exposure	Solid or dust cloud and gas SOLID OR DUST Irritating to eyes Harmful if inhaled Move victim to fresh air Protect eyes, mouth, nostrils, ears and clothes with a paste of water SWALLOWED and victim CONSCIOUS: Give victim drink water or milk and have victim induce vomiting. SWALLOWED and victim UNCONSCIOUS OR HAVING CONVULSIONS: Do nothing except keep victim warm
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2 LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Lead monoxide, Lead oxide yellow, Lead protoxide, Massicot, Plumbous oxide

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula** PbO

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color** Yellow to red, low-metal content oxides yellow to green to brown, high metal content oxides gray to brown

4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** [illegible] or metal fume respirator, gloves, goggles

5 2 **Symptoms Following Exposure.** Generalized symptoms of lead poisoning (delayed): inhalation or ingestion causes abdominal pain (lead colic), metallic taste in mouth, loss of weight, pain in muscles and muscular weakness. Dust may irritate eyes

5 3 **Treatment for Exposure** Consult physician after ingestion or exposure to high concentrations of dust. INGESTION: Call physician at once; induce vomiting and give milk and magnesium sulfate (Epsom salt)

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.15 mg/m³

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity** Impairs development of human fetal connective tissue cell

5 8 **Vapor (Gas) Irritant Characteristics** Not pertinent

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity** >56,000 ppm/96 hr mosquito fish TL_m turbid water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential.** Data not available

9 SELECTED MANUFACTURERS

1 NL Industries Inc
Pigment and Chemicals Division
425 University Avenue
Westwood, Mass 02090

2 J T Baker Chemical Co
Phillipsburg, N J 08865

3 Eagle Picher Industries Inc
Chemicals and Ether Division
American Building
Cincinnati, Ohio 45202

10. SHIPPING INFORMATION

10 1 **Grades or Purity** Low metal-content oxides contain 98 to 99 8% High metal or battery grades contain 90 to 95% Reagent purified Most grades available in several particle sizes

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight.** 223.2

13 3 **Boiling Point at 1 atm.** Not pertinent (Decomposes)

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 9.5 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

LAH	# LITHIUM ALUMINUM HYDRIDE

Common Synonyms
LAH

Solid powder — White to gray — Odorless

Reacts violently with water. Flammable gas is produced.

Avoid contact with solid and dust
Wear rubber gloves, goggles, and fireproof clothing
Stop leak if possible. Keep people away
Shut off ignition sources and call fire department
Evacuate area and dissipate flammable gas
Notify local health and pollution control agencies

Fire

FLAMMABLE
Flammable gas is released on contact with water, metals, or acids
Wear rubber gloves, goggles, and fireproof clothing
DO NOT USE WATER, DRY CHEMICAL, CARBON DIOXIDE OR FOAM
Extinguish with powdered limestone or powdered graphite

Exposure

CALL FOR MEDICAL AID
SOLID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES: Lift lids and eyes. Flush with pieces of water
IF SWALLOWED and victim is CONSCIOUS: Have victim drink plenty of water

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4.

Isolation: high toxicity, corrosive
Restriction: [illegible]
Disposal: Bury in the ground

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** [illegible]
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula.** $LiAlH_4$
3.4 **IMCO United Nations Numerical Designation** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color** White to gray
4.3 **Odor** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Rubber gloves, full face shield
5.2 **Symptoms Following Exposure** Contact burns with severe irritation of the eyes, skin, and mucous membranes; caustic soda
5.3 **Treatment for Exposure:** [illegible]
5.4 **Toxicity by Inhalation (Threshold Limit Value).** Not [illegible]
5.5 **Short-Term Inhalation Limits** Not [illegible]
5.6 **Toxicity by Ingestion** Data not available
5.7 **Late Toxicity** Data [illegible]
5.8 **Vapor (Gas) Irritant Characteristics** Not [illegible]
5.9 **Liquid or Solid Irritant Characteristics** Moistened [illegible]
5.10 **Odor Threshold** Not [illegible]

6. FIRE HAZARDS

6.1 **Flash Point** Solid
6.2 **Flammable Limits in Air** Not pertinent
6.3 **Fire Extinguishing Agents.** Powdered graphite, powdered salt, or powdered limestone
6.4 **Fire Extinguishing Agents Not to be Used** Do NOT use water, solid carbon dioxide or dry chemical
6.5 **Special Hazards of Combustion Products** Data not available
6.6 **Behavior in Fire.** Decomposes at 250°F to form hydrogen. The heat generated may ignite the hydrogen and cause explosion
6.7 **Ignition Temperature** Data [illegible]
6.8 **Electrical Hazard** Class I, Group B
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** Reacts violently with water as a dry solid or when dissolved in ether. The hydrogen released by the reaction with water is a major hazard and necessitates adequate ventilation
7.2 **Reactivity with Common Materials:** Can burn in the presence of moisture
7.3 **Stability During Transport** Normally stable, unstable at high temperatures
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Belmont Smelting & Refining Works, Inc.
   [illegible] Belmont Ave
   Brooklyn, N.Y. 11220
2. Foote Mineral Co.
   Route 100
   Exton, Pa. 19341
3. Vertron Corp.
   Chemical Division
   Beverly, Mass. 01915

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 95-98
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** Dry air
10.4 **Venting** Store in container in well ventilated area

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

RRC

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Flammable solid
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	2
	W

12 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid
13.2 **Molecular Weight** [illegible]
13.3 **Boiling Point at 1 atm** Decomposes
13.4 **Freezing Point** Not [illegible]
13.5 **Critical Temperature** Not [illegible]
13.6 **Critical Pressure** Not [illegible]
13.7 **Specific Gravity.** [illegible] at 15°C solid
13.8 **Liquid Surface Tension.** Not [illegible]
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion** Not [illegible]
13.14 **Heat of Decomposition** Not [illegible]
13.15 **Heat of Solution** Not [illegible]
13.16 **Heat of Polymerization** Not pertinent

[illegible]

NOTES

REVISED 1978

LHD	LITHIUM HYDRIDE

Common Synonyms

Solid Crystals are gray or blue powder is white Odorless

Reacts violently with water
Flammable gas is produced

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
May cause irritation of the eyes, skin, and respiratory tract
Not a hazardous waste
Is not a hazardous substance
Not a hazardous pollutant

Fire

Combustible
Irritating flammable gas may be produced when heated
Extinguish with dry graphite or sodium chloride powder
DO NOT USE WATER, FOAM, CARBON DIOXIDE OR DRY CHEMICALS ON FIRE OR ADJACENT FIRES

Exposure

ALL FORMS MEDICAL AID

DUST
POISONOUS IF INHALED
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
Will burn skin and eyes
If swallowed will cause nausea or loss of consciousness
Remove contaminated clothing [illegible]
Flush eyes or skin with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED [illegible] UNCONSCIOUS [illegible]
IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS [illegible]

Water Pollution

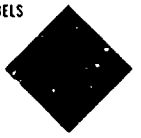
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Not a hazardous substance
Not a pollutant [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning, keep flammables away
Keep off fumes
Dike and flush with care

2 LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** No common synonyms
3.2 **Coast Guard Compatibility Classification** Not listed
3.3 **Chemical Formula** LiH
3.4 **IMCO/United Nations Numerical Designation** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color** Gray blue crystalline material ground material ranges in color from white to gray
4.3 **Odor** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Gloves or other solid impervious [illegible] boots or shoes
5.2 **Symptoms Following Exposure** [illegible]
5.3 **Treatment for Exposure** *Lithium hydride burns the eyes, skin, [illegible] INHALATION* [illegible] **INGESTION** [illegible] **SKIN** [illegible]
5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]
5.5 **Short-Term Inhalation Limits** [illegible]
5.6 **Toxicity by Ingestion** [illegible]
5.7 **Late Toxicity** [illegible]
5.8 **Vapor (Gas) Irritant Characteristics** [illegible]
5.9 **Liquid or Solid Irritant Characteristics** [illegible]
5.10 **Odor Threshold** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point** Not applicable [illegible] combustible solid
6.2 **Flammable Limits in Air** Not applicable
6.3 **Fire Extinguishing Agents** Dry graphite or lithium chloride
6.4 **Fire Extinguishing Agents Not to be Used** Never use water, foam, carbon dioxide, halogenated hydrocarbons, [illegible] carbon dioxide
6.5 **Special Hazards of Combustion Products** Irritating flammable fumes may [illegible]
6.6 **Behavior in Fire** Melts [illegible] flammable hydrogen gas. Reacts violently with water to produce [illegible] which is explosive [illegible]
6.7 **Ignition Temperature** [illegible]
6.8 **Electrical Hazard** Not applicable
6.9 **Burning Rate** Not applicable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Reacts violently with water to form flammable hydrogen gas and strong caustic solution and can [illegible] occur especially with powder
7.2 **Reactivity with Common Materials** May [illegible] if the material [illegible] damp
7.3 **Stability During Transport** Stable if dry and moisture is excluded
7.4 **Neutralizing Agents for Acids and Caustics** Residues should be washed with water, then rinsed with dilute acetic acid
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** [illegible]
8.2 **Waterfowl Toxicity** [illegible]
8.3 **Biological Oxygen Demand (BOD)** [illegible]
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

[illegible]
P.O. Box [illegible]
[illegible] NC 28[illegible]

[illegible]
P.O. Box [illegible]
Beverly, Mass. [illegible]

Pfizer Chemical Inc.
[illegible] Avenue
Stamford, Conn. 06902

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Commercial [illegible]
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** Required
10.4 **Venting** Not required

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

RF

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Flammable solid

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid
13.2 **Molecular Weight** [illegible]
13.3 **Boiling Point at 1 atm** Not applicable (decomposes)
13.4 **Freezing Point** Not pertinent
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity** [illegible]
13.8 **Liquid Surface Tension** [illegible]
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion** [illegible]
13.14 **Heat of Decomposition** Data not available
13.15 **Heat of Solution** [illegible]
13.16 **Heat of Polymerization** Not pertinent

[illegible]

NOTES

LTM	# LITHIUM, METALLIC

Common Synonyms

Soft solid — Weak to light silver — Odorless

Reacts violently with water
Flammable gas is produced

AVOID CONTACT WITH SOLID. KEEP PEOPLE AWAY
Wear protective clothing including eyes
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Irritating gases may be produced when heated

Wear goggles and self-contained breathing apparatus
Extinguish with dry graphite, sodium chloride powder
DO NOT USE WATER, FOAM, DRY CHEMICALS OR CARBON DIOXIDE ON FIRE
DO NOT USE WATER OR FOAM ON ADJACENT FIRES

Exposure

CALL FOR MEDICAL AID
SOLID
Will burn skin and eyes
Harmful if swallowed

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES: Lift eyelids, gently wash and flush with plenty of water
IF SWALLOWED: Induce vomiting if CONSCIOUS. Give plenty of water or milk
IF SWALLOWED: Do not induce vomiting if UNCONSCIOUS OR HAVING CONVULSIONS
Keep warm and quiet. Get medical attention

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

Notify [illegible]
Notify [illegible]

1 RESPONSE TO DISCHARGE

[illegible]

2 LABELS

3 CHEMICAL DESIGNATIONS

- Synonyms: N
- Coast Guard Compatibility Classification: N
- Chemical Formula
- IMCO/United Nations Numerical Designation

4 OBSERVABLE CHARACTERISTICS

- Physical State (as shipped)
- Color: N
- Odor: N

5 HEALTH HAZARDS

Personal Protective Equipment

Symptoms Following Exposure

Treatment for Exposure

Toxicity by Inhalation (Threshold Limit Value)

Short Term Inhalation Limits

Toxicity by Ingestion

Late Toxicity

Vapor (Gas) Irritant Characteristics

Liquid or Solid Irritant Characteristics

Odor Threshold

6 FIRE HAZARDS

6.1 **Flash Point** Not pertinent (Combustible solid)

6.2 **Flammable Limits in Air** Not pertinent

6.3 **Fire Extinguishing Agents.** Graphite, lithium chloride

6.4 **Fire Extinguishing Agents Not to be Used** Water, sand, halogenated hydrocarbons, carbon dioxide, soda acid or dry chemical

6.5 **Special Hazards of Combustion Products** Strong alkali fumes in fire and during fire

6.6 **Behavior in Fire** Molten lithium is quite easily ignited and is then difficult to extinguish. Hot or burning lithium will react with all gases except those of the helium family group. It also reacts violently with nitrogen, wood, asphalt, sand, [illegible] in fact, [illegible] except that it does approach [illegible] adjacent [illegible]. Hydrogen approaches [illegible]

Continued on page 4

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** Reacts violently to form flammable hydrogen gas and strong caustic solution. Ignition usually occurs

7.2 **Reactivity with Common Materials.** May ignite combustible materials if they are dry

7.3 **Stability During Transport** Stable. Fire and moisture are excluded

7.4 **Neutralizing Agents for Acids and Caustics** Residues should be flushed with water, neutralized with dilute acetic acid

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** None

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Foote Mineral Co
   Route 100
   Exton, Pa 19341
2. Lithium Corporation of America
   Box 795
   Bessemer City, N.C. 28016
3. Venus Corp
   P.O. Box 59
   Beverly, Mass 01915

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure 99.9%
Powder, shot, wire, ribbon, rod

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** Required

10.4 **Venting** Safety valve

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

RR

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Flammable solid

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	3
Special	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm**
Solid

13.2 **Molecular Weight.** 6.939

13.3 **Boiling Point at 1 atm** Not pertinent

13.4 **Freezing Point** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity** 0.53 at 20°C (solid)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization**
Not pertinent

13.13 **Heat of Combustion** 18,470 Btu/lb
= 10,260 cal/g = 429.3 × 10⁶ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** 31,500 Btu/lb
= 17,500 cal/g = 733 × 10⁶ J/kg

13.16 **Heat of Polymerization** Not pertinent

6 FIRE HAZARDS (Cont'd)

6.7 **Ignition Temperature** 180°C

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not pertinent

MGX	MAGNESIUM

Common Synonyms	Solid	Silvery	Odorless
	Sinks in water		

Call fire department
Stop discharge if possible. Keep people away
Isolate and [illegible] hazard area
Notify local health and pollution control agencies

Fire

FLAMMABLE
Extinguish with dry graphite sand salt or other inert powder
DO NOT USE WATER FOAM CARBON DIOXIDE DRY CHEMICALS OR VAPORIZING LIQUID ON FIRE

Exposure

Call [illegible] medical aid
SOLID
Irritating to eyes
Harmful if swallowed
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED if victim is CONSCIOUS give more fresh water or milk

Water Pollution

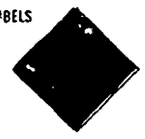
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Should not be moved
Chemical and physical treatment

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** No common synonyms
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula** Mg
3.4 **IMCO/United Nations Numerical Designation:**
Pellet [illegible] 4.1 1869
Powder non pyrophoric 4.3 1418

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid
4.2 **Color** Silvery looks like aluminum
4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Eye protection
5.2 **Symptoms Following Exposure.** Dust irritates eyes in same way as any foreign material
Penetration of skin by fragments of metal is likely to produce local irritation blisters and ulcers which may become infected
5.3 **Treatment for Exposure:** EYES flush with water to remove dust SKIN treat as any puncture
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits** Not pertinent
5.6 **Toxicity by Ingestion** Oral LD[illegible] (lowest lethal dose) [illegible] 230 mg/kg [illegible]
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** Not pertinent (solid)
Flammable when in the form of turnings or powder
6.2 **Flammable Limits in Air** Not pertinent
6.3 **Fire Extinguishing Agents** Inert dry powders (e.g. graphite limestone salt)
6.4 **Fire Extinguishing Agents Not to be Used.** Water foam halogenated agents carbon dioxide
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire** Turns dense white smoke Flame covers bright
6.7 **Ignition Temperature.** 883°F
6.8 **Electrical Hazard.** Class I Group B
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** In finely divided form reacts with water and acids to release flammable hydrogen gas
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** None
8.2 **Waterfowl Toxicity** None
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. NL Industries Inc
Magnesium Division
238 North 2200 West
Salt Lake City Utah 84116
2. Dow Chemical Co
Midland Mich 48640
3. Belmont Smelting and Refining Works Inc
330 Belmont Ave
Brooklyn N Y 11226

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Pigs ingots turnings sticks all high purity
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Open flame arresters

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable solid
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid
13.2 **Molecular Weight** 24.3
13.3 **Boiling Point at 1 atm** 2012°F = 1100°C = 1373°K
13.4 **Freezing Point** 1202°F = 650°C = 923°K
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity** 1.74 at 20°C (solid)
13.8 **Liquid Surface Tension** Not pertinent
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion** 11,980 Btu/lb = 6,650 cal/g = 27,8[illegible] x 10[illegible] J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on page [illegible]

NOTES

MPC	MAGNESIUM PERCHLORATE

Common Synonyms			
Anhydrone Dehydrite Magnesium perchlorate anhydrous Magnesium perchlorate hexahydrate	Solid	White	Odorless
	Sinks and mixes with water		

[illegible]
Stop discharge if possible
Isolate and remove spilled material
[illegible]

Fire

Not flammable
May cause fire on contact with combustibles
Will increase the intensity of a fire
[illegible]

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing
[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning: oxidizing material
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Anhydrone, Dehydrite, Magnesium perchlorate anhydrous, Magnesium perchlorate hexahydrate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula.** $Mg(ClO_4)_2$
3.4 **IMCO/United Nations Numerical Designation:** 5.1 1475

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color** White
4.3 **Odor** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** U.S. Bureau of Mines approved respirator, chemical safety goggles, face shield
5.2 **Symptoms Following Exposure:** Inhalation of dust irritates mucous membranes. Ingestion of large amounts may be fatal. Immediate symptoms include abdominal pain, nausea and vomiting, diarrhea, pallor, blueness, shortness of breath, unconsciousness. Contact with eyes or skin causes irritation.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, get medical attention if irritation persists. INGESTION: give large amounts of water, induce vomiting, call a physician. EYES: flush with copious quantities of water for at least 15 min., call physician. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion** Data not available
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable but may cause or increase the intensity of a fire
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents.** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products.**
6.6 **Behavior in Fire:** Can form explosive mixture with combustible material of finely powdered metals. Increases the intensity of fires
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves with liberation of heat. May cause spattering
7.2 **Reactivity with Common Materials:** Contact with wood, paper, oils, grease or finely divided metals may cause fires and explosions
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Hooker Chemical Corporation
Industrial Chemicals Division
Niagara Falls, N.Y. 14302
2. Kerr McGee Chemical Corp.
Kerr McGee Center
Oklahoma City, Okla. 73102
3. D.L. Goldsmith Chemical & Metal Corp.
900 Pitner Ave.
Evanston, Ill. 60202

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure anhydrous, 65-66% solution of hexahydrate in water
10.2 **Storage Temperature.** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0
	OX

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 223.2
13.3 **Boiling Point at 1 atm:** Decomposes above 250°C
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.21 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Data not available
13.15 **Heat of Solution:** 260 Btu/lb = 140 cal/g = 6.0×10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

MLT	# MALATHION

Common Synonyms	Liquid	Yellow to dark brown	Skunk-like odor
Cythion Insecticide	Sinks in water Freezing point is 37° F		

[illegible]

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED
Containers may explode in fire
[illegible]

Exposure

CALL FOR MEDICAL AID
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** CYTHION Insecticide
S (1,2 Bis (ethoxycarbonyl) ethyl) O,O dimethyl phosphorodithioate

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C_{10}H_{19}O_6PS_2$

3.4 **IMCO/United Nations Numerical Designation:** 6.1/1893

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Yellow to dark brown

4.3 **Odor:** Characteristic skunk like mercaptan

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wear self-contained breathing apparatus (or respirator for organophosphate pesticides) and rubber clothing while fighting fires of malathion with chlorine bleach solution. All clothing contaminated by fumes and vapors must be decontaminated.

5.2 **Symptoms Following Exposure:** Exposure to fumes from a fire or to liquid causes headache, blurred vision, constricted pupils of the eyes, weakness, nausea, cramps, diarrhea, and tightness in the chest. Muscles twitch and convulsions may follow. The symptoms may develop over a period of 8 hours.

5.3 **Treatment for Exposure:** *Speed is essential.* INHALATION: in the nonbreathing victim *immediately* institute artificial respiration using the mouth to mouth, the mouth to nose or the mouth-to-oropharyngeal method. *Call physician.* INGESTION: administer milk, water or salt water and induce vomiting repeatedly. SKIN OR EYE CONTACT: flood and wash exposed skin areas *thoroughly* with water. Remove contaminated clothing under a shower. Administer atropine, 2 mg (1/30 gr) intramuscularly or intravenously as soon as any local or systemic signs or symptoms of an intoxication are noted; repeat the administration of atropine every 3-8 min until signs of atropinization (mydriasis, dry mouth, rapid pulse, hot and dry skin) occur. Initiate treatment in children with 1 mg of atropine. Watch respiration and remove bronchial secretions if they appear to be obstructing the airway, intubate if necessary. Give 2 PAM (Pralidoxime, *Protopam*) 2.5 gm in 100 ml of sterile water or in 5% dextrose and water intravenously slowly in 15-30 min; if sufficient fluid is not available give 1 gm of 2 PAM in 3 ml of distilled water by deep intramuscular injection; repeat this every half hour if respiration weakens or if muscle fasciculation or convulsions recur.

6. FIRE HAZARDS

6.1 **Flash Point:** > 325°F

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, water spray, foam

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Vapors and fumes from fires are hazardous. They include sulfur dioxide and phosphoric acid.

6.6 **Behavior in Fire:** Gives off hazardous fumes. Area surrounding fire should be diked to prevent water runoff.

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** None

7.2 **Reactivity with Common Materials:** No hazardous reaction

7.3 **Stability During Transport:** Not pertinent

7.4 **Neutralizing Agents for Acids and Caustics.** Liquid bleach solution for decontamination

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.09 ppm/96 hr/bluegill/TL_m/fresh water
0.033-0.083 ppm/96 hr/marine crustaceae/LC_{50}

8.2 **Waterfowl Toxicity:** LD_{50}=1485 mg/kg

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

American Cyanamid Co
Agricultural Division
P.O. Box 400
Princeton, N.J. 08540

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** CYTHION Insecticide, Malathion ULV Concentrate Insecticide. Many powders, dusts, and spray solutions are sold under a variety of trade names.

10.2 **Storage Temperature:** Below 120°F. Decomposition (non hazardous) occurs at higher temperatures.

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 330.36

13.3 **Boiling Point at 1 atm.** Very high

13.4 **Freezing Point.** 37°F = 2.9°C = 276°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.234 at 25°C (liquid)

13.8 **Liquid Surface Tension.** 37.1 dynes/cm = 0.0371 N/m at 24°C

13.9 **Liquid-Water Interfacial Tension:** 19 dynes/cm = 0.019 N/m at 24°C

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

5. HEALTH HAZARDS (Cont'd.)

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m³

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** None likely

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

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MLI	# MALEIC ACID

Common Synonyms	Solid	White	Odorless
cis Butenedioic acid cis 1,2 Ethylenedicarboxylic acid Maleic acid Maleic acid Toxilic acid	Sinks and mixes with water		

[illegible]

Fire

Combustible

[illegible]

Exposure

[illegible]

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

[illegible]

SOLID
Irritating to skin and eyes
Harmful if swallowed

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4)

Dilute and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** cis Butenedioic acid, cis 1,2 Ethylenedicarboxylic acid, Maleic acid, Maleic acid, Toxilic acid

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** HOOC—CH=CH—COOH

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with eyes causes irritation

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air. EYES: immediately flush with plenty of water for 15 min, get medical attention if irritation persists. SKIN: wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1, Oral LD_{50} = [illegible] mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.**

6.5 **Special Hazards of Combustion Products.** Irritating smoke containing maleic anhydride may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** Not reactive

7.2 **Reactivity with Common Materials.** May corrode metals when wet

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 240 ppm/24–48 hr minnow (Fish) TL_m, fresh water
[illegible] ppm/96 hr fathead minnow TL_m, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 18% 5 days

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1. Allied Chemical Co
Specialty Chemical Div
P O Box 1087R
Morristown, N J 07960

2. Mallinckrodt Chemical Works
222 Westside Ave
P O Box 164
Jersey City, N J 07303

3. Eastman Organic Chemicals
Rochester, N Y 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 2

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** 116.1

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** 260°F = 130°C = 403°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.59 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** −5,000 Btu/lb = −2,500 cal/g = −11.7 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 7 and 8

NOTES

MLA	# MALEIC ANHYDRIDE

Common Synonyms Toxilic anhydride cis-Butenedioic anhydride	Molten, or solid crystals or tablets Colorless Choking odor Sinks and mixes slowly with water

Avoid contact with solid and liquid. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber coveralls including gloves.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire	Combustible Dust cloud may be ignited by spark or flame. Wear goggles, self-contained breathing apparatus, and rubber coveralls including gloves. Extinguish with dry chemical, alcohol foam, carbon dioxide. Water may be ineffective.
Exposure	CALL FOR MEDICAL AID. LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED and conscious, GIVE TWO GLASSES fresh water.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Disperse and flush.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** cis-Butenedioic anhydride
2,5-Furanedione
Toxilic anhydride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $(CO)_2CH_2CH_2O$

3.4 **IMCO United Nations Numerical Designation.** 9.0

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid or liquid

4.2 **Color:** Colorless

4.3 **Odor:** Acrid, choking

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved organic vapor and gas canister, chemical goggles and face shield, rubber gloves and boots, coveralls or rubber apron.

5.2 **Symptoms Following Exposure:** Inhalation causes coughing, sneezing, throat irritation. Skin contact causes irritation and redness. Vapors cause severe eye irritation, photophobia and double vision may occur.

5.3 **Treatment for Exposure:** INHALATION: give oxygen. EYE OR SKIN CONTACT: flush with large amounts of water for at least 15 min; for eyes, call a physician. For toxilic acid burns, remove crust and treat as chemical and thermal burn.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.25 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, LD50 0.35 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure.

5.10 **Odor Threshold:** 1.3 - 2.9 mg/m^3

6. FIRE HAZARDS

6.1 **Flash Point:** (Liquid) 215°F (C.C.) 240°F (O.C.)

6.2 **Flammable Limits in Air:** 1.4% - 7.1%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** When heated above 480°F in the presence of various materials, may generate heat and carbon dioxide. Will explode if confined.

6.7 **Ignition Temperature:** 970°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 1.4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Hot water may cause frothing. Reaction with cold water is slow and non-hazardous.

7.2 **Reactivity with Common Materials.** Not a factor

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Solid spills, if usable here, covered before any significant reaction with water occurs. Flush area of spill with water.

7.5 **Polymerization:** Very unlikely at ordinary temperatures, even in the molten state.

7.6 **Inhibitor of Polymerization.** None

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 150 ppm/24 hr, sunfish, TL_{50}, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 905 mg/g

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Monsanto Co.
Monsanto Industrial Chemicals Co.
730 North Lindbergh Blvd.
St. Louis, Mo. 63166

2. Petro-Tex Chemical Corp.
5000 Park Place
Houston, Tex. 77017

3. United States Steel Corp.
USS Chemicals Division
Neville Island, Pa. 15225

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 99%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

RR

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	2
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 98.06

13.3 **Boiling Point at 1 atm:** 390°F = 200°C = 473°K

13.4 **Freezing Point:** 127°F = 53°C = 326°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.48 at 15°C (solid)

13.8 **Liquid-Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** −3,000 Btu/lb = −1,750 cal/g = −7.3 × 10^6 J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** −153 Btu/lb = −85 cal/g = −3.6 × 10^5 J/kg

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

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MLH — MALEIC HYDRAZIDE

Common Synonyms

1,2 Dihydro
3,6-pyridazinedione
Maleic acid hydrazide
MH
Malazide
Regulox

Solid — White — Odorless

Sinks in water

[illegible] fire department
Keep people away
Isolate and remove discharge material
Not [illegible] health and public [illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Extinguish with water [illegible]

Exposure

Cold [illegible] air
DUST
Irritating to eyes, nose and throat
[illegible]
SOLID
Irritating to skin and eyes.
Harmful if swallowed
[illegible]
Flush affected areas with [illegible] water
IF IN EYES: Blepharospasm [illegible] plenty of water
IF SWALLOWED [illegible] CONSCIOUS [illegible] drink water milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2 Dihydro-3,6-pyridazinedione 6-Hydroxy-3(2H)-pyridazinone, Maleic acid hydrazide, Malazide, MH, Regulox

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula:** $C_4H_4N_2O_2$

3.4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Goggles or face shield, dust mask

5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Contact with eyes or skin causes irritation. Ingestion has been observed to cause [illegible] and muscle spasms in test animals

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. EYES: flush with water for at least [illegible] min. SKIN: flush with water, wash with soap and water. INGESTION: get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Oral LD_{50} [illegible] mg/kg

5.7 **Late Toxicity:** Causes [illegible]

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Water, dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic nitrogen oxides are produced

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. The Amsul Company
   Chemical Division
   1 Stanton Street
   Marinette, Wis. 54143
2. Uniroyal Chemical Co
   Spencer Street
   Naugatuck, Conn 06770
3. Chemical Formulators Inc
   Box 26
   Nitro, W. Va. 25143

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 97+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere.** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight.** 112.1

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point.** [illegible]°F = [illegible]°C = [illegible]°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.60 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion** (est.) [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10[illegible] J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages [illegible]

NOTES

MAT	MERCURIC ACETATE

Common Synonyms	Solid	White	Mild vinegar like odor
	Sinks and mixes with water		

AVOID CONTACT WITH SOLID AND FUMES. KEEP PEOPLE AWAY

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED SOLID POISONOUS IF SWALLOWED
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant.
Restrict access.
Should be removed.
Chemical and physical treatment.

2 LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification.** Not applicable
3.3 **Chemical Formula:** $(CH_3CO_2)_2Hg$
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid
4.2 **Color:** White
4.3 **Odor:** Slight acetic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, dust mask, goggles
5.2 **Symptoms Following Exposure:** The general symptoms of mercuric poisoning develop rapidly after ingestion but more slowly after prolonged exposure. Contact with eyes causes irritation and ulceration; skin contact may cause dermatitis. Ingestion causes pain, vomiting, ulceration of mouth and stomach, bloody diarrhea, metallic taste, pain and rapid weak pulse.
5.3 **Treatment for Exposure:** Have physician treat. [illegible] EYES: SKIN: flush with water. INGESTION: call physician, poison should be removed [illegible] as soon as possible: give milk, white of eggs beaten with water, two tablespoons of salt in a glass of warm water, and repeat until vomit fluid is clear; repeat milk or white of eggs beaten with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³ (as mercury)
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Grade [illegible] LD_{50} [illegible] mg/kg rat
5.7 **Late Toxicity:** Internal bleeding and kidney damage may develop
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products.** Smoke may contain toxic mercury or mercury oxide fumes
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
[illegible] 0.05 ppm young salmon, lethal, fresh water
[illegible] 45 ppm stickleback, 11 ppm fresh water
*Time interval not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential:** [illegible]

9 SELECTED MANUFACTURERS

1. Vertex of Importance
Chemicals Division
Congress Street
Beverly, Mass. [illegible]
2. Nalco Chemical Chemical Works
1600 N. Second Street
St. Louis, Mo. 63160
3. Gallard Schlesinger Chemical Manufacturing Co. and Mineral Co.
Carle Place, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** C.P. [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Poisonous Class B
12.2 **IMAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classification.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point.** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

MCC	MERCURIC AMMONIUM CHLORIDE

Common Synonyms

Mercury chloride ammoniated
Mercury ammonium chloride
Mercury amide chloride
Ammoniated mercury

Solid — White — Odorless

Sinks in water

AVOID CONTACT WITH [illegible]
FLOATS AWAY
[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CAUTION [illegible]

DUST
POISONOUS IF INHALED
[illegible]

SOLID
POISONOUS IF SWALLOWED
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

See hazard assessment handbook (Section 4)

Issue warning [illegible] water
[illegible]
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** [illegible]
Chloride ammoniated mercury
Mercury chloride ammoniated
Mercury ammonium chloride
Mercury amide chloride
Mercury(II) chloride ammoniate

3.2 **Coast Guard Compatibility Classification**
Not applicable

3.3 **Chemical Formula:** $HgNH_4Cl$

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Gloves, goggles, respirator

5.2 **Symptoms Following Exposure:** The general symptoms [illegible] developing rapidly after ingestion [illegible] severe [illegible] and ascending. No [illegible] may be used. [illegible] Ingestion causes [illegible] metallic taste, [illegible] and [illegible] and [illegible] and [illegible]

5.3 **Treatment for Exposure:** Have [illegible] for [illegible] EYES or SKIN flush with water. INGESTION: call a physician [illegible] water. Egg whites with water, [illegible] milk. Call in [illegible] of water. Repeat [illegible] fluid [illegible] repeat with [illegible] egg whites. [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** [illegible] Bleeding and kidney [illegible] damage was observed

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Smoke may contain toxic mercury compounds
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
[illegible] ppm 24-hr minnow lethal fresh water
[illegible] ppm * brine larvae lethal salt water
*Time period not specified

8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Not pertinent
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

Ventron Corporation
Chemicals Division
Congress Street
Beverly, Mass. 01915

10. SHIPPING INFORMATION

10.1 **Grades of Purity:** U.S.P. [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See hazard assessment handbook (Section 5)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Poisonous Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**
Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 252.1
13.3 **Boiling Point at 1 atm:** Not pertinent (sublimes at red heat)
13.4 **Freezing Point:** Not pertinent (infusible)
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

MRC

MERCURIC CHLORIDE

Common Synonyms
Mercury bichloride
Corrosive mercury chloride
Mercury perchloride
Mercury (II) chloride
Calochlor

Solid White

Sinks and mixes slowly with water

[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

[illegible]

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing

[illegible]

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning: poison, water contaminant
Restrict access
Disperse and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Calochlor Corrosive mercury chloride Corrosive sublimate Mercury bichloride Mercury (II) chloride Mercury perchloride

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $HgCl_2$

3.4 **IMCO/United Nations Numerical Designation:** [illegible] 1624

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White [illegible]

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Be [illegible] approved airline respirator [illegible] appropriate eye protection

5.2 **Symptoms Following Exposure:** [illegible] exposure to this compound are [illegible] systemic [illegible] death by [illegible] poisoning is usually delayed [illegible] days. Acute poisoning has resulted from inhaling dust concentrations of [illegible] mg/m³ for [illegible] minutes. Initial complaints include tightness and pain in chest, coughing and difficulty in breathing. Ingestion causes nausea and vomiting and severe purging, colitis and [illegible]. Contact with eyes causes irritation of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis. Systemic poisoning can occur by absorption through skin.

5.3 **Treatment for Exposure:** [illegible] immediately. Immediately dilute poison if it was ingested and the first [illegible] minutes determine the prognosis. INHALATION remove victim to fresh air, get medical attention. INGESTION give egg white, milk or activated charcoal, induce vomiting, consult physician. EYES or SKIN wash with water for 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** [illegible] mg/kg rat

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

5 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Heat of fire may cause material to form fumes of mercuric chloride, which are toxic

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
[illegible] ppm 7 days (additive) [illegible] fresh water
[illegible] 24 hr pink shrimp [illegible] salt water
[illegible] ppm 48 hr oyster [illegible] sea water

8.2 **Wastewater Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Many organisms are capable of accumulating mercury from water. Bioconcentrating up to 10 (6)-fold

9 SELECTED MANUFACTURERS

1. Mallinckrodt Chemicals Works
   221 Westside Ave
   P O Box [illegible]
   Jersey City, N J [illegible]
2. J T Baker Chemical Co
   Phillipsburg, N J 08865
3. Gallard Schlesinger Chemical Mfg Co
   584 Mineola Ave
   Carle Place, N Y [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, Analytical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisons, solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classification:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

MCN	# MERCURIC CYANIDE

Common Synonyms	
Cianurina Mercury cyanide Mercury (II) cyanide	Solid (crystals or powder) White Sinks and mixes slowly with water

AVOID CONTACT WITH SOLID AND SOLUTION KEEP FOOD AWAY
[illegible]
Stop leak if possible
Isolate and remove discharged material
[illegible]

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

ALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
Remove contaminated clothing and shoes
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible]
IF SWALLOWED [illegible]
OVEREXPOSURE [illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cianurina, Mercury cyanide, Mercury (II) cyanide

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Hg(CN)_2$

3 4 **IMCO/United Nations Numerical Designation:** 6 1/1636

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Colorless or white

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Dust mask, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Symptoms of both cyanide and mercury intoxication can occur. Acute poisoning has resulted from inhaling dust concentrations of 1.2 - 3.5 mg/m³ of air. Symptoms include tightness and pain in chest, coughing and difficulty in breathing. Cyanide poisoning can cause anxiety, confusion, dizziness and shortness of breath with possible unconsciousness, convulsions and paralysis; breath may smell like bitter almonds. Ingestion causes necrosis, pain, vomiting, and severe purging plus the above symptoms. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin.

5 3 **Treatment for Exposure:** *Act quickly, call physician.* INHALATION: if victim has stopped breathing, start artificial respiration immediately. Using amyl nitrite pearls, administer amyl nitrite by inhalation for 15 - 30 seconds of every minute while sodium nitrite solution is being prepared; discontinue amyl nitrite and immediately inject intravenously 10 ml of a 3% solution of sodium nitrite (nonsterile if necessary); over a period of 2 - 4 min., without removing needle, infuse intravenously 50 ml of a 25% aqueous solution of sodium thiosulfate; injection should take about 10 min. (concentrations of 5 - 50% may be used, but keep total dose approx. 12 gm). Oxygen therapy may be helpful in combination with the above. INGESTION: *alimentary absorption is very rapid; action during first 10 - 15 min. determines prognosis.* Give egg whites, milk, or activated charcoal and induce vomiting; treat for cyanide poisoning as above. EYES or SKIN: wash with water for 15 min.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 mg/m³ (as mercury)

5 5 **Short-Term Inhalation Limits:** Data not available

(Continued on page 4)

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Fumes from fire may contain toxic mercury and hydrogen cyanide

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Contact with any acidic material will form poisonous hydrogen cyanide gas which may collect in enclosed spaces

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 0.02 ppm/48 hr/daphnia magna/TL_m/fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** Possible bioaccumulation problem. Many organisms can accumulate mercury from water. Bioconcentrative up to 10 000 fold

9. SELECTED MANUFACTURERS

1 J. T. Baker Chemical Co
Phillipsburg, N. J. 08865

2 Pfaltz and Bauer, Inc
375 Fairfield Ave
Stamford, Conn. 06902

3 Gallard-Schlesinger Chemical Mfg. Co
584 Mineola Ave
Carle Place, N. Y. 11514

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Poisonous solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 252.63

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 4.0 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

5 HEALTH HAZARDS (Cont'd.)

5 6 **Toxicity by Ingestion:** Grade 4 oral LD_{50} = 25 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Odorless

MID	MERCURIC IODIDE

Common Synonyms			
Mercuric iodide, red Mercury biniodide	Solid	Red	Odorless
	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear dust respirator and rubber overclothing (including gloves)
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing
If in eyes hold eyelids open and flush with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2 LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Mercuric iodide, red
Mercury biniodide

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** HgI_2

3 4 **IMCO/United Nations Numerical Designation:** 6 1/6115

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Red

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles or face shield protective gloves

5 2 **Symptoms Following Exposure:** *All forms of exposure to this compound are hazardous Acute systemic mercurialism may be fatal within a few minutes death by uremic poisoning is usually delayed 5 12 days* Acute poisoning has resulted from inhaling dust concentrations of 1 2 8 5 mg/m³ of air, symptoms include tightness and pain in chest coughing, and difficulty in breathing Ingestion causes necrosis pain vomiting, and severe purging Contact with eyes causes ulceration of conjunctiva and cornea Contact with skin causes irritation and possible dermatitis systemic poisoning can occur by absorption through skin

5 3 **Treatment for Exposure:** INHALATION remove to fresh air, get medical attention INGESTION *alimentary absorption is very rapid action during first 10 15 min determines prognosis* Give egg whites, milk or activated charcoal and induce vomiting, consult physician EYES flush with water for at least 15 min SKIN flush with water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 05 mg/m³ (as mercury)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 40 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Fumes from fire may contain toxic mercury vapor

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** Many organisms can accumulate mercury from water Bioconcentrative up to 10 000 fold

9. SELECTED MANUFACTURERS

1 Mallinckrodt Chemical Works
223 Westside Ave
P O Box 384
Jersey City N J 07303

2 J T Baker Chemical Co
Phillipsburg N J 08865

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 454 90

13 3 **Boiling Point at 1 atm:** 669°F = 354°C = 627°K

13 4 **Freezing Point:** 495°F = 257°C = 530°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 6 3 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

MNT	MERCURIC NITRATE

Common Synonyms			
Mercury pernitrate Mercury (II) nitrate Mercury nitrate monohydrate	Solid Sinks in water	White	Sharp odor

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear dust respirator and protective clothing
Stop production if possible
Isolate and remove the spilled material
Notify local health and pollution control agencies

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing
If exposed to dust or solution wash with plenty of water
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
Remove contaminated clothing and shoes
Flush affected area with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water milk and induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do not induce vomiting keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, water contaminant, oxidizing material
Restrict access
Disperse and flush

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Mercuric nitrate monohydrate, Mercury (II) nitrate, Mercury pernitrate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $Hg(NO_3)_2 \cdot H_2O$

3.4 **IMCO/United Nations Numerical Designation:** 6.1/1625

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White, colorless

4.3 **Odor:** Sharp odor of nitric acid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5.2 **Symptoms Following Exposure:** *Acute systemic poisoning may be fatal within a few minutes; death by uremic poisoning is usually delayed 5–12 days.* Acute poisoning has resulted from inhaling dust concentrations of 1.2–8.5 mg/m³ of air; symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Ingestion causes necrosis, pain, vomiting, and severe purging. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, get medical attention. INGESTION: *alimentary absorption is very rapid, action during first 10–15 min. determines prognosis.* Give egg whites, milk, or activated charcoal and induce vomiting, consult physician. EYES or SKIN: flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 mg/m³ (as mercury)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable, but may intensify fire

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Vapors from fire may contain toxic mercury and oxides of nitrogen

6.6 **Behavior in Fire:** May increase intensity of fire if in contact with burning material

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves, then forms cloudy acid solution. The reaction is not hazardous

7.2 **Reactivity with Common Materials:** Solution will corrode most metals. Solid in contact with wood or paper may cause fire

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush well with water, rinse with dilute solution of sodium bicarbonate or soda ash

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Possible bioaccumulation problem. Many organisms can accumulate mercury from water. Bioconcentrate up to 10,000 fold

9. SELECTED MANUFACTURERS

1. Mallinckrodt Chemical Works
   223 Westside Ave
   P. O. Box 384
   Jersey City, N. J. 07303
2. J. T. Baker Chemical Co.
   Phillipsburg, N. J. 08865
3. Pfaltz and Bauer, Inc.
   375 Fairfield Ave.
   Stamford, Conn. 06902

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent 99.0%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Poisonous solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 342.6

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 4.3 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

MOX	MERCURIC OXIDE

Common Synonyms		
Mercuric oxide, red Mercuric oxide, yellow Mercury oxide	Solid Sinks in water	Red, orange or yellow — Odorless

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear dust respirator and rubber overclothing including gloves
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing
If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen
SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
If swallowed will cause nausea or vomiting
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not [illegible] keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife [illegible]
Notify operators of nearby water [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Mercuric oxide, red (Red precipitate) Mercuric oxide (Yellow precipitate) Mercury oxide
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** HgO
3.4 **IMCO/United Nations Numerical Designation:** 6.1 1641

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Red, orange or yellow
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5.2 **Symptoms Following Exposure:** *Acute systemic poisoning may be fatal within a few minutes; death by uremic poisoning is usually delayed 5–12 days.* Acute poisoning has resulted from inhaling dust concentrations of 1.2–8.5 mg/m³ of air; symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Ingestion causes necrotic pain, vomiting, and severe purging. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, get medical attention. INGESTION: alimentary absorption is very rapid; action during first 10–15 min. determines prognosis. Give egg whites, milk, or activated charcoal and induce vomiting, consult physician. EYES: flush with water for at least 15 min. SKIN: wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 mg/m³ (as mercury)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Category 4, oral LD_{50} = 18 mg/kg (rat)
5.7 **Late Toxicity:** Carcinogenic in rats
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** [illegible]

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable, but may intensify fire
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Fumes from fire may contain poisonous mercury vapor
6.6 **Behavior in Fire:** Decomposes at 500°C into mercury and oxygen, which can increase intensity of fire. Solid changes color when hot
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 0.29 ppm/48 hr marine fish TL$_m$
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold

9. SELECTED MANUFACTURERS

1. Mallinckrodt Chemical Works
   223 Westside Ave
   P.O. Box 384
   Jersey City, N.J. 07303
2. J.T. Baker Chemical Co
   Phillipsburg, N.J. 08865
3. Gallard-Schlesinger Chemical Mfg. Co
   584 Mineola Ave
   Carle Place, N.Y. 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
Red: technical, reagent, purified
Yellow: technical, NF, reagent
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** Solid
13.2 **Molecular Weight:** 216.61
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 11.1 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

MSF	# MERCURIC SULFIDE

Common Synonyms			
Mercuric sulfide black Ethiops mineral Mercuric sulfide red Vermilion Artificial cinnabar Chinese red	Solid Sinks in water	Red or black	Odorless

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear dust respirator and rubber overclothing (including gloves)
Stop discharge if possible.
Call fire department
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and self-contained breathing apparatus
Extinguish with water. Foam or sand
Other extinguishing agents may be ineffective on fire

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing
If in eyes hold eyelids open and flush with plenty of water
If breathing has stopped artificial respiration
If breathing is difficult give oxygen

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes.
If swallowed will cause coughing, nausea and vomiting
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Mercuric sulfide black (Ethiops mineral) Mercuric sulfide, red (Vermilion, Artificial cinnabar, Chinese red)

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** HgS

3 4 **IMCO/United Nations Numerical Designation:** 6 1/2024

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Red or black

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles or face shield protective gloves

5 2 **Symptoms Following Exposure:** Acute poisoning can result from inhaling dust concentrations of 1 2 8 5 mg m³ in air symptoms include pain and tightness in chest coughing and difficulty in breathing If ingested toxicity depends on release of the Hg^{++} ion chronic mercury poisoning can cause kidney mental and nervous disturbances Dust irritates eyes and frequently causes allergic dermatitis absorption through skin can cause systemic poisoning

5 3 **Treatment for Exposure:** INHALATION remove to fresh air give artificial respiration if breathing has stopped INGESTION give egg whites milk or activated charcoal induce vomiting consult physician EYES flush with water SKIN wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0 05 mg m³ (as mercury)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity** Central nervous system effects tremors psychological disturbances in humans

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water foam sand

6 4 **Fire Extinguishing Agents Not to be Used** Other agents may be ineffective

6 5 **Special Hazards of Combustion Products:** Smoke from fire contains poisonous mercury vapor and irritating sulfur dioxide gas

6 6 **Behavior in Fire:** Changes color when hot Decomposes at burning temperature The black form may soften and molten sulfur may flow out and burn

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Many organisms can accumulate mercury from water Bioconcentrate up to 10 000 fold

9. SELECTED MANUFACTURERS

1 Ventron Corp
P O Box 159
Beverly, Mass 01915

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

3 Merck & Co
Merck Chemical Division
126 East Lincoln Ave
Rahway, N J 07065

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** The black form may contain up to 40% free sulfur

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

II

12. HAZARD CLASSIFICATION

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 232 7

13 3 **Boiling Point at 1 atm.** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 8 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** 1,500 Btu lb [illegible] J kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

MRR	# MERCUROUS CHLORIDE

Common Synonyms			
Calomel Mild mercury chloride Mercury monochloride Mercury protochloride Mercury subchloride	Solid	White	Odorless
	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear dust respirator
Stop discharge if possible
Isolate affected area, discharge [illegible]
Notify local health and pollution control agencies

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	CALL DOCTOR MEDICAL AID DUST POISONOUS IF INHALED If inhaled will cause coughing or difficult breathing If in eyes hold eyelids open and flush with plenty of water If breathing has stopped give artificial respiration If breathing is difficult give oxygen SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes If swallowed will cause nausea and vomiting Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Restrict access
Shoveled be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Calomel Mercury monochloride, Mercury protochloride Mercury subchloride, Mild mercurous chloride

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** HgCl or Hg_2Cl_2

3 4 **IMCO/United Nations Numerical Designation:** 6 1/2024

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield protective gloves

5 2 **Symptoms Following Exposure:** Acute poisoning can result from inhaling dust concentrations of 1 2 8 5 mg/m³ in air symptoms include pain and tightness in chest cough rg, and difficulty in breathing Compound is an irritant cathartic, or purgative agent "Calomel sickness" a benign reaction with fever and rash, appears after about 1 week seldom causes systemic poisoning but may be fatal if retained to 30 40 mg kg Contact with eyes causes mild irritation

5 3 **Treatment for Exposure:** INHALATION remove to fresh air give artificial respiration if breathing has stopped INGESTION give egg whites, milk or activated charcoal induce vomiting, consult physician EYES flush with water SKIN wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 05 mg m (as mercury)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 210 mg kg (rat)

5 7 **Late Toxicity:** Central nervous system effects tremors psychological disturbances in humans

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Fumes from fire may contain toxic vapors of substance

6 6 **Behavior in Fire:** Vaporizes and escapes as a sublimate

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Many organisms can accumulate mercury from water Bioconcentrative up to 10 000 fold

9 SELECTED MANUFACTURERS

1 Mallinckrodt Chemical Works
223 Westside Ave
P O Box 384
Jersey City N J 07303

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11 [illegible]

3 Pfaltz and Bauer, Inc
375 Fairfield Ave
Stamford Conn 06902

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** NF Technical 99 6% Reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

H

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 236 1

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 7 15 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 3 and 4

NOTES

MRN	MERCUROUS NITRATE

Common Synonyms			
Mercury protonitrate Mercurous nitrate monohydrate	Solid Sinks in water	White	Slight odor

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear dust respirator and rubber overclothing, including gloves
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
If inhaled will cause coughing or difficult breathing

If in eyes, hold eyelids open and flush with plenty of water
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk at 2 liters in an indoor vent bag
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: poison, water contaminant, oxidizing material
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Mercurous nitrate monohydrate, Mercury protonitrate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $HgNO_3 \cdot H_2O$
3.4 **IMCO/United Nations Numerical Designation:** 6.1, 1627

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** Slight odor of nitric acid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5.2 **Symptoms Following Exposure:** *Acute systemic poisoning may be fatal within a few minutes; death by uremic poisoning is usually delayed 5–12 days.* Acute poisoning has resulted from inhaling dust concentrations of 1.2–8.5 mg/m³ of air. Symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Ingestion causes nervous pain, vomiting, and severe purging. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, get medical attention. INGESTION: give egg whites, milk, or activated charcoal; induce vomiting; consult physician. EYES: flush with water for at least 15 min. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 mg/m³ (as mercury)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 297 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable, but may intensify fire
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Smoke from fire may contain toxic mercury vapor and oxides of nitrogen
6.6 **Behavior in Fire:** May increase intensity of fire
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves, then forms cloudy acid solution. The reaction is not hazardous
7.2 **Reactivity with Common Materials:** Solution may corrode most metals. Solid in contact with wood or paper may cause fire
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Possible bioaccumulation problem. Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold

9. SELECTED MANUFACTURERS

1. J. T. Baker Chemical Co, Phillipsburg, N. J. 08865
2. Gallard-Schlesinger Chemical Mfg. Co, 584 Mineola Ave, Carle Place, N. Y. 11514
3. Pfaltz and Bauer, Inc, 375 Fairfield Ave, Stamford, Conn. 06902

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, Purified
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizer
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 280.6
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 4.78 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

MCR	MERCURY

Common Synonyms			
Quicksilver	Liquid	Silver	Odorless
	Sinks in water		

Fire	Not flammable
Exposure	LIQUID Effects of exposure may be delayed
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Quicksilver
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** Hg
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Silvery
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Avoid contact of liquid with skin. For vapor use chemical cartridge (Hopcalite) respirator
5 2 **Symptoms Following Exposure:** No immediate symptoms. As poisoning becomes established slight muscular tremor, loss of appetite, nausea, and diarrhea are observed. Psyche, kidneys, and cardiovascular disturbances may occur
5 3 **Treatment for Exposure:** Consult a doctor
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 mg/m³
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** No immediate toxicity
5 7 **Late Toxicity:** Development of mercury poisoning
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics:** None
5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.5 - 1 ppm/48 hr/carassius auratus, TL_m/fresh water
0.29 ppm/48 hr/marine fish, TL_m salt water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** Mercury concentrates in liver and kidneys of ducks and geese to levels above FDA limit of 0.5 ppm. Muscle tissue usually well below the limit

9. SELECTED MANUFACTURERS

1 Belmont Smelting and Refining Works, Inc
330 Belmont Ave
Brooklyn, N.Y. 11207

2 Engelhard Minerals and Chemical Corp
Philipp Bros. Division
299 Park Ave
New York, N.Y. 10017

3 NL Industries
Goldsmith Division
900 W. 18th St
Chicago, Ill. 60608

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-X

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 200.59
13 3 **Boiling Point at 1 atm:** 675°F = 357°C = 630°K
13 4 **Freezing Point:** −38.0°F = −38.9°C = 234.3°K
13 5 **Critical Temperature:** 2664°F = 1462°C = 1735°K
13 6 **Critical Pressure:** 23,300 psia = 1587 atm = 160.8 MN/m²
13 7 **Specific Gravity:** 13.55 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 470 dynes/cm = 0.470 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** 375 dynes/cm = 0.375 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 3 and 4)

NOTES

REVISED 1978

MSO — MESITYL OXIDE

Common Synonyms

4 methyl 3 pent n 2 one
Isopropylidenacetone
Methylisobutenyl ketone

Liquid — Colorless to light yellow — Strong peppermint or honey odor

Floats and mixes with water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE.
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, dizziness or difficult breathing

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floating to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4.

Issue warning — water contaminant
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Isobutenyl methyl ketone, Isopropylidenacetone, Methyl isobutenyl ketone, 4 Methyl 3-pentene 2-one

3.2 **Coast Guard Compatibility Classification:** Ketone

3.3 **Chemical Formula:** $CH_3COCH{=}C(CH_3)_2$

3.4 **IMCO/United Nations Numerical Designation:** 1229

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to slightly yellow

4.3 **Odor:** Strong, peppermint, honey like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air pack or organic canister mask, rubber gloves, goggles

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat, headache, dizziness, difficult breathing. Contact with liquid or concentrated vapor causes severe eye irritation. Liquid irritates skin. Ingestion causes irritation of mouth and stomach.

5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air and restore breathing, call physician. EYES: immediately flush with plenty of water for at least 15 min. SKIN: wash with water. INGESTION: give large amount of water, call physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm

5.5 **Short-Term Inhalation Limits:** 1 000 ppm for 60 min

5.6 **Toxicity by Ingestion:** Female 2 oral LD_{50} = 1 120 mg/kg (rats)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.

5.10 **Odor Threshold:** 12 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 84°F O.C., 73°F C.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** 652°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
   Chemicals and Plastics Division
   270 Park Avenue
   New York, N.Y. 10017
2. Shell Chemical Company
   Industrial Chemicals Division
   P.O. Box 2463
   Houston, Texas 77001
3. Eastman Kodak Co.
   Eastman Organic Chemicals
   Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 97+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A P Q T U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 98.2

13.3 **Boiling Point at 1 atm:** 266°F = 130°C = 403°K

13.4 **Freezing Point:** −51°F = −46°C = 227°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.853 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 22.9 dynes/cm = 0.0229 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 3.4

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 157 Btu/lb = 87 cal/g = 3.7 × 10⁵ J/kg

13.13 **Heat of Combustion:** −14 400 Btu/lb = −8 000 cal/g = −330 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(continued on page 7 and 8)

NOTES

MCL	METHALLYL CHLORIDE

Common Synonyms

3-Chloro-2-methylpropene
gamma-Chloromethylene
beta-Methallyl chloride
beta-Methallyl chloride

Liquid — Colorless to yellow — Sharp penetrating odor

Floats on water. Flammable, irritating vapor is produced.

Fire

FLAMMABLE
Irritating gases may be produced when heated
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Harmful if inhaled

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floating to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning — high flammability
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** gamma-Chloromethylene, 3-Chloro-2-methylpropene, beta-Methallyl chloride, Beta-Methallyl chloride
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $CH_2=C(CH_3)CH_2Cl$
3.4 **IMCO/United Nations Numerical Designation:** 1.2 1991

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to straw
4.3 **Odor:** Pungent, penetrating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister mask, goggles, rubber gloves
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact of vapor or liquid with eyes causes irritation. Liquid irritates skin. Ingestion causes irritation of mouth and stomach.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. If breathing stops, give artificial respiration and oxygen; subsequent treatment is symptomatic and supportive. EYES: flush with water for at least 15 min., get medical attention if exposure has been to liquid. SKIN: flush with water, get medical attention if skin is burned. INGESTION: induce vomiting and follow with gastric lavage, demulcents, and saline cathartics, get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Lethe Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 14°F (-10°C)
6.2 **Flammable Limits in Air:** 2.1% - 9.1%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and phosgene vapors may be formed
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 4.4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. FMC Corporation
Industrial Chemical Division
633 Third Avenue
New York, N.Y. 10017
2. Progil, Inc
509 Madison Ave
New York, N.Y. 10022
3. Aldrich Chemical Co
940 West St. Paul Ave
Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 95+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

A-T-U-V-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 90.55
13.3 **Boiling Point at 1 atm:** 162.0°F = 72.2°C = 345.4°K
13.4 **Freezing Point:** <-112°F = <-80°C = <193°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.9128 at 20°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** (est.) 32 dynes/cm = 0.032 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 3.12
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0893
13.12 **Latent Heat of Vaporization:** 160 Btu/lb = 89 cal/g = 3.7 × 10⁵ J/kg
13.13 **Heat of Combustion:** (est.) -11,600 Btu/lb = -6,500 cal/g = -270 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 3 and 4)

NOTES

MTH	METHANE

Common Synonyms
Marsh gas
Natural gas

Liquid or gas — Colorless — Weak odor

Liquid floats and boils on water. Flammable visible vapor cloud is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
May explode if ignited in an enclosed area.

Exposure

VAPOR
Not irritating to eyes, nose or throat.
If inhaled, will cause dizziness, difficult breathing, and loss of consciousness.

LIQUID
Will cause frostbite.

Water Pollution

Not harmful to aquatic life.

1. RESPONSE TO DISCHARGE

See Response Methods manual, CG 446-4

Issue warning: high flammability
Evacuate area
Evacuate area

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Marsh gas
3.2 **Coast Guard Compatibility Classification:** Paraffin
3.3 **Chemical Formula:** CH_4
3.4 **IMCO United Nations Numerical Designation:** 2.0 (9)

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Compressed gas
4.2 **Color:** Colorless
4.3 **Odor:** Slight odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus for high concentration; protective clothing if exposed to liquid
5.2 **Symptoms Following Exposure:** High concentration causes asphyxiation. No toxic effects even at 5% concentration in air
5.3 **Treatment for Exposure:** Remove to fresh air. Support respiration
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent (methane is an asphyxiant, and limiting factor is available oxygen)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Not pertinent
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Prolonged contact with liquid or rapid evaporation may cause some frostbite
5.10 **Odor Threshold:** 200 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Flammable gas
6.2 **Flammable Limits in Air:** 5.0% – 15.0%
6.3 **Fire Extinguishing Agents:** Shut flow of gas
6.4 **Fire Extinguishing Agents Not to be Used:** Water
6.5 **Special Hazards of Combustion Products:** None
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 1004°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 12 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** None
8.2 **Waterfowl Toxicity:** None
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals, Inc.
Allentown, Pa. 18105
2. Phillips Petroleum Co.
Bartlesville, Okla. 74004
3. Union Carbide Corp.
Linde Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Research grade, pure grade
10.2 **Storage Temperature:** −260°F
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A B C D E F G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Toxicity	0
Liquid or Solid Toxicity	
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Not Acute Toxicity	0
Reactivity	
Other Chemicals	
Water	0
Self Reactivity	0

12.3 **NFPA Hazard Classifications:** None

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 16.04
13.3 **Boiling Point at 1 atm:** −258.7°F = −161.5°C = 111.7°K
13.4 **Freezing Point:** −296.4°F = −182.4°C = 90.7°K
13.5 **Critical Temperature:** −116.5°F = −82.5°C = 190.7°K
13.6 **Critical Pressure:** 668 psia = 45.44 atm = 4.60 MN/m²
13.7 **Specific Gravity:** 0.422 at −258.7°F (liquid)
13.8 **Liquid Surface Tension:** 14 dynes/cm = 0.014 N/m at −258.7°F
13.9 **Liquid-Water Interfacial Tension:** 50 dynes/cm = 0.050 N/m at −258.7°F
13.10 **Vapor (Gas) Specific Gravity:** 0.55
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.30
13.12 **Latent Heat of Vaporization:** 219.4 Btu/lb = 122.1 cal/g
13.13 **Heat of Combustion:** −23,875 Btu/lb = −13,264 cal/g = −55.5 kJ/g
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

NOTES

REVISED 1978

MSA	METHANEARSONIC ACID, SODIUM SALTS

Synonyms Disodium methane arsonate Monosodium methane arsonate MSMA DSMA	Solid or water solution. Colorless solid solution may be red or green. Odorless. Solid may float or sink in water; solid and solution mix with water.
	[illegible]
Fire	Not flammable POISONOUS GASES ARE PRODUCED WHEN HEATED [illegible]
Exposure	[illegible] SOLID OR SOLUTION Irritating to skin and eyes If swallowed, will cause nausea, vomiting, or loss of consciousness [illegible]
Water Pollution	Dangerous to aquatic life at high concentrations May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: persons, water contaminant

Should be removed

Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Disodium methanearsonate; Disodium methyl arsonate; DSMA; Monosodium methanearsonate; Monosodium methyl arsonate; MSMA

3.2 **Coast Guard Compatibility Classification:** Not applicable

Continued on page 4

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or water solution

4.2 **Color:** Colorless; solutions may contain red or green dyes

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective clothing to prevent contact with skin; chemical goggles

5.2 **Symptoms Following Exposure:** Subacute poisoning by arsenicals causes salty taste, burning in throat and stomach, and intestinal pain. Acute toxicity indicated by headache, vomiting, stupor, convulsions, paralysis. About 1 ounce to 1 pound must be taken to cause these symptoms.

5.3 **Treatment for Exposure:** INGESTION: cause vomiting; give water and repeat; give a saline cathartic such as sodium sulfate. SKIN: wash with soap and water. EYES: wash out with water; consult physician if irritation remains.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 2 (LD50 = 5 g/kg rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** Repeated contact may cause skin sensitization

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic gases may be generated in fires

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** None

7.2 **Reactivity with Common Materials:** None

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** >1000 ppm 48 hr bluegill (fresh water)

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. The Ansul Co.
   Chemical Division
   1 Stanton St.
   Marinette, Wis. 54143
2. Diamond Shamrock Corp.
   Bus. Chem. Div.
   300 Union Commerce Bldg.
   Cleveland, Ohio 44115
3. Vineland Chemical Co.
   P.O. Box 743
   Vineland, N.J. 08360

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** The solid disodium salt (DSMA) contains water of crystallization. Salts are often shipped as solutions in water with concentrations up to about 50% solids.

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid or water solution

13.2 **Molecular Weight:** 162 (MSMA); 292 (DSMA hexahydrate)

13.3 **Boiling Point at 1 atm:** Decomposes

13.4 **Freezing Point:** (MSMA) 243°F = 117°C = 390°K; (DSMA) 117°F = 58°C = 332°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** (DSMA) 1.0 at 20°C (solid); (MSMA solutions) 1.4 [illegible] at 25°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

3. CHEMICAL DESIGNATIONS (Cont'd.)

3.3 **Chemical Formula:**
$CH_3AsO(OH)(ONa)$
$CH_3AsO(ONa)_2 \cdot 6H_2O$

3.4 **NBCO United Nations Numerical Designation:** 6.1 1557

MOC	METHOXYCHLOR

Common Synonyms			
2,2 Di(p-anisyl)-1,1,1 trichloroethane DMDT Methoxy DDT 2 2 Bis(p-methoxyphenyl)-1, 1,1 trichloroethane	Solid Sinks in water	White to light yellow	Mild fruity odor

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear goggles and dust respirator
Call fire department
Stay upwind use water spray to knock down dust
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Extinguish with water dry chemicals foam or carbon dioxide

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Move victim to fresh air
If in eyes hold eyelids open and flush with plenty of water
If breathing is difficult give oxygen

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have vict m drink water or milk

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2,2 Bis (p-methoxyphenyl)-1,1,1 trichloroethane, 2,2-Di (p-anisyl) 1,1,1 trichloroethane, DMDT, Marlate 50, Methoxy DDT

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_{16}H_{15}Cl_3O_2$

3 4 **IMCO/United Nations Numerical Designation.** 6 1/1615

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Light cream, white to light yellow

4 3 **Odor:** Slightly fruity

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator if needed, gloves and goggles

5 2 **Symptoms Following Exposure:** Toxicity is relatively low Inhalation or ingestion causes generalized depression

5 3 **Treatment for Exposure:** EYES flush with water if irritated SKIN wash well with soap and water INGESTION consult physician

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 10 mg/m³

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 1, LD_{50} 5 to 15 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Burns only at high temperatures For liquid forms, see Kerosene

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents.** Water, foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Irritating and toxic hydrogen chloride gas may be formed in fire

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
0 035 ppm/96 hr/fathead/TL m/fresh water
0 004 012 ppm/96 hr/marine crustacea/TL m/salt water

8 2 **Waterfowl Toxicity:** LD_{50} = 2,000 mg/kg

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

1 Ansul Co
1 Stanton Street
Marinette Wis 54143

2 Chemical Formulators Inc
P O Box 26
Nitro W Va 25143

3 E I duPont de Nemours & Co
Biochemicals Department
308 East Lancaster Ave
Wynnewood, Pa 19096

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Technical flake or chip 88% plus 12% isomers, Wettable powders 50 75% Dust concentrate 40% Emulsifiable concentrate (liquid) 25% solution in petroleum distillate

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not Listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 345 7

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 171–192°F = 77–89°C = 350–362°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 1 41 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

MTT

METHYL ACETATE

Common Synonyms

Acetic acid, methyl ester

Liquid | Colorless | Mild sweet odor

Mixes with water. Flammable, irritating vapor is produced

Shut off ignition sources; call fire department
Stop discharge if possible; keep people away
Stay upwind; use water spray to knock down vapor
Isolate; evacuate; [illegible]
Notify local health and pollution control [illegible]

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemicals, alcohol foam, carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

Call fire department

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, or dizziness
Move victim to fresh air
If breathing has stopped give artificial respiration
If breathing difficult, give oxygen

LIQUID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify [illegible] Wildlife officials
Notify operators of downstream water intake

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetic acid, methyl ester
3.2 **Coast Guard Compatibility Classification:** Esters (13)
3.3 **Chemical Formula:** CH_3COOCH_3
3.4 **IMCO/United Nations Numerical Designation:** 3.2/1231

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Slightly acrid, sweet, fragrant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air mask or organic canister mask, goggles or face shield
5.2 **Symptoms Following Exposure:** (Very similar to those of methyl alcohol, which constitutes 20% of commercial grade.) Inhalation causes headache, fatigue, and drowsiness; high concentrations can produce central nervous system depression and optic nerve damage. Liquid irritates eyes and may cause defatting and cracking of skin. Ingestion causes headache, dizziness, drowsiness, fatigue, may cause severe eye damage
5.3 **Treatment for Exposure:** INHALATION: remove victim from affected area; if breathing has ceased, apply artificial respiration, call doctor. EYES: irrigate thoroughly with water for 15 min and call doctor. SKIN: wash affected area with water. INGESTION: get medical attention for methyl alcohol poisoning
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm
5.5 **Short-Term Inhalation Limits:** 400 ppm for 5 min
5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 3,700 mg/kg (rabbit)
5.7 **Late Toxicity:** Optic nerve may be damaged following overexposure to vapor or liquid
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 22°F (-6°C) (14°F (-10°C))
6.2 **Flammable Limits in Air:** 3.1% - 16%
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature:** 935°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 3.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly to form acetic acid and methyl alcohol; the reaction is not violent
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017
2. Monsanto Polymers & Petrochemicals Co.
800 North Lindbergh Boulevard
St. Louis, Mo. 63166
3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 78-82%; remainder is methyl alcohol
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X P Q R-S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 74.1
13.3 **Boiling Point at 1 atm.** 134.6°F = 57.0°C = 330.2°K
13.4 **Freezing Point:** −145.3°F = −98.5°C = 174.7°K
13.5 **Critical Temperature:** 452.7°F = 233.7°C = 506.9°K
13.6 **Critical Pressure:** 666 psia = 45.3 atm = 4.60 MN/m²
13.7 **Specific Gravity:** 0.927 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 2.8
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1192
13.12 **Latent Heat of Vaporization:** 174 Btu/lb = 97 cal/g = 4.1 × 10⁵ J/kg
13.13 **Heat of Combustion:** 9,260 Btu/lb = 5,150 cal/g = 215 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

MAP — METHYL ACETYLENE - PROPADIENE MIXTURE

Common Synonyms

Liquified compressed gas Colorless Garlic-like odor

*Floats and boils on water Flammable visible vapor cloud is produced

Shut off ignition sources Call fire department
Avoid contact with liquid Keep people away
Stop discharge if possible
Evacuate area in case of large discharge
Notify local health and pollution control agencies

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Let fire burn
Stop flow of gas if possible
Cool exposed containers and protect men in effecting shut off with water

Exposure

Call for medical aid

VAPOR
If inhaled will cause difficult breathing
Move victim to fresh air
If breathing is difficult give oxygen

LIQUID
Will cause frostbite
Flush affected areas with plenty of water
DO NOT RUB AFFECTED AREAS

Water Pollution

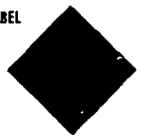
Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Evacuate area

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Allene methylacetylene mixture MAPP gas Methylacetylene allene mixture Propadiene methylacetylene mixture

3 2 **Coast Guard Compatibility Classification:** Olefin

3 3 **Chemical Formula:** $CH_3C{\equiv}CH + CH_2{=}C{=}CH$

3 4 **IMCO/United Nations Numerical Designation:** 2/1060

4. OBSERVABLE CHARACTERISTICS

4 **Physical State (as shipped):** Liquefied compressed gas

4 2 **Color:** Colorless

4 3 **Odor:** Offensive, like acetylene

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus for high concentrations safety goggles, protective gloves

5 2 **Symptoms Following Exposure:** Simple asphyxiant Toxicology of propadiene component not fully established Contact with liquid may burn eyes and cause frostbite of skin

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air, give artificial respiration if necessary EYES or SKIN treat burns caused by cold liquid

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 1000 ppm

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Not pertinent

5 7 **Late Toxicity:** Lung irritation in rats and dogs

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** 100 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (flammable liquefied compressed gas)

6 2 **Flammable Limits in Air:** 3% - 11%

6 3 **Fire Extinguishing Agents:** Let fire burn shut off gas supply, cool adjacent exposures

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Containers may explode

6 7 **Ignition Temperature:** 850°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction, except forms explosive compounds in contact with alloys containing more than 67% copper at high pressures

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich 48640

2 MAPP Products
100 Mountain Avenue
New Providence N J 07974

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 65% of a mixture of methylacetylene (85%) and propadiene (15%) plus 35% of a mixture of C_3 and C_4 saturated and unsaturated hydrocarbons

10 2 **Storage Temperature:** Ambient but less than 125°F

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-B C-D-E-F G

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight:** 40 1

13 3 **Boiling Point at 1 atm:** −36 to −4°F = −38 to −20°C = 235 to 253°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 57 at 15°C (liquid)

13 8 **Liquid Surface Tension:** 18 dynes/cm = 0 018 N/m at −24°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 1 48

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.1686

13 12 **Latent Heat of Vaporization:** 227 Btu/lb = 126 cal/g = 5 28 × 10^5 J/kg

13 13 **Heat of Combustion:** −19 800 Btu/lb = −11,000 cal/g = −460 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

MAM	METHYL ACRYLATE

Common Synonyms Acrylic acid methyl ester Methyl 2-propenoate	Watery liquid Colorless Sweet sharp odor Floats and mixes slowly with water. Flammable irritating vapor is produced
	[illegible]
Fire	FLAMMABLE Flashback along vapor trail may occur Containers may explode when heated Vapor may explode if ignited in an enclosed area [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat If inhaled, will cause dizziness or difficult breathing [illegible] LIQUID Will burn skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability
Evacuate area

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acrylic acid, methyl ester; Methyl 2-propenoate

3.2 **Coast Guard Compatibility Classification:** Acrylate

3.3 **Chemical Formula:** $CH_2{=}CHCOOCH_3$

3.4 **IMCO/United Nations Numerical Designation:** 3.2/1919

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic acrylic sweet, sharp, sharp fragrant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic cartridge for high vapor concentrations; rubber gloves; chemical goggles or face shield

5.2 **Symptoms Following Exposure:** May irritate skin, eyes, respiratory system, and gastrointestinal tract. Fumes cause tears

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air; lay patient down, keep him warm, administer artificial respiration if breathing has stopped, administer oxygen. SKIN OR EYES: flush with plenty of water for 15 min.; consult physician for eye exposure

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm

5.5 **Short-Term Inhalation Limits:** 25 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 3. LD_{50} 50 to 500 mg/kg (rabbit)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 27°F C.C., 44°F O.C.

6.2 **Flammable Limits in Air:** 2.8% - 25%

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated in fires

6.6 **Behavior in Fire:** May polymerize. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Heat may cause an explosive polymerization. Strong ultraviolet light can also initiate polymerization

7.6 **Inhibitor of Polymerization:** Hydroquinone and its methyl ether, in presence of air

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Celanese Corp.
   Celanese Chemical Co. Division
   245 Park Ave.
   New York, N.Y. 10017
2. Dow Badische Co.
   Freeport, Tex. 77541
3. Rohm and Haas Co.
   Independence Mall West
   Philadelphia, Pa. 19105

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.9%

10.2 **Storage Temperature:** Ambient if material is inhibited, under 40°F if no inhibitor

10.3 **Inert Atmosphere:** Air MUST be present

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-P-Q-T-U-V-W-Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 86.09

13.3 **Boiling Point at 1 atm:** 177°F = 80.6°C = 353.8°K

13.4 **Freezing Point:** −105.7°F = −76.5°C = 196.7°K

13.5 **Critical Temperature:** 505°F = 263°C = 536°K

13.6 **Critical Pressure:** 630 psia = 43 atm = 4.3 MN/m^2

13.7 **Specific Gravity:** 0.956 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 24.2 dynes/cm = 0.0242 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 3.0

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.102

13.12 **Latent Heat of Vaporization:** 150 Btu/lb = 90 cal/g = 3.8×10^5 J/kg

13.13 **Heat of Combustion:** (est.) −9900 Btu/lb = −5500 cal/g = -230×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** −392 Btu/lb = −218 cal/g = -9.13×10^5 J/kg

(Continued on pages 5 and 6)

NOTES

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MAL	METHYL ALCOHOL

Common Synonyms
Methanol
Wood alcohol
Wood naphtha
Wood spirit
Pyroxylic spirit

Watery liquid — Colorless — Alcohol odor

Floats and mixes with water. Flammable, irritating vapor is produced.

[illegible]

Fire

FLAMMABLE
Vapor may explode if ignited in an enclosed area
Flashback along vapor trail may occur
Extinguish with dry chemical, alcohol foam, carbon dioxide, sand
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have vomiting induced
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes
Notify municipal health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability
Restrict access
Evacuate area
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Colonial spirit, Wood alcohol, Columbian spirit, Wood naphtha, Methanol, Wood spirit

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** CH_3OH

3.4 **IMCO/United Nations Numerical Designation:** 3.2/1230

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Faint alcohol, like ethyl alcohol, faintly sweet, characteristic pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved canister mask for high vapor concentrations; safety goggles; rubber gloves

5.2 **Symptoms Following Exposure:** Exposure to excessive vapor causes eye irritation, headache, fatigue and drowsiness. High concentrations can produce central nervous system depression and optic nerve damage. 50 000 ppm will probably cause death in 1 to 2 hrs. Can be absorbed through skin. Swallowing may cause death or eye damage.

5.3 **Treatment for Exposure:** Remove victim from exposure and apply artifical respiration if breathing has ceased. INGESTION: induce vomiting, then give 2 teaspoons of baking soda in glass of water, call a physician. SKIN OR EYES: flush with water for 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5.5 **Short-Term Inhalation Limits:** 260 mg/m^3 for 60 min

5.6 **Toxicity by Ingestion:** Grade 1, 5 to 15 g/kg (rat)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 109 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 54°F C.C., 61°F O.C.

6.2 **Flammable Limits in Air:** 6.0% - 36.5%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Containers may explode

6.7 **Ignition Temperature:** 867°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 1.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 250 ppm/11 hr/goldfish/died/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 0.6 to 1.12 lb/lb in 5 days

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1. Borden Inc
   Borden Chemical Division
   Geismar, La. 70734
2. Celanese Corp.
   Celanese Chemical Co. Division
   245 Park Ave.
   New York, N.Y. 10017
3. E. I. du Pont de Nemours & Co., Inc.
   Industrial and Biochemical Dept.
   Wilmington, Del. 19898

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** CP, Crude, ACS all 99.9%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester) or pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P Q R S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** 32.04

13.3 **Boiling Point at 1 atm:** 148.1°F = 64.5°C = 337.7°K

13.4 **Freezing Point:** −144.0°F = −97.8°C = 175.4°K

13.5 **Critical Temperature:** 464°F = 240°C = 513°K

13.6 **Critical Pressure.** 1142.0 psia = 77.7 atm = 7.87 MN/m^2

13.7 **Specific Gravity:** 0.792 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 1.1

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.254

13.12 **Latent Heat of Vaporization:** 473.0 Btu/lb = 262.8 cal/g = 11.00 × 10^5 J/kg

13.13 **Heat of Combustion:** −8419 Btu/lb = −4677 cal/g = −195.8 × 10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) −9 Btu/lb = −5 cal/g = −0.2 × 10^5 J/kg

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

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MTA	METHYLAMINE

Common Synonyms		
Aminomethane Monomethylamine Mercurialin	Liquefied compressed gas Colorless Ammonia-like odor Mixes with water and boils	

[illegible]	[illegible]

Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Wear goggles and self-contained breathing apparatus Extinguish [illegible] Stop flow of gas [illegible] Cool exposed containers and protect [illegible] with water
Exposure	Call for medical aid VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing Move victim to fresh air If breathing has stopped, administer resuscitation If breathing is difficult, give oxygen LIQUID Will burn skin and eyes Remove clothing and shoes [illegible] Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED and victim is conscious, give two glasses of water DO NOT INDUCE VOMITING
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Notify local health and wildlife officials Notify owners of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability, air contaminant, water contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Aminomethane, Mercurialin, Monomethylamine, anhydrous
3.2 **Coast Guard Compatibility Classification:** Amines (4)
3.3 **Chemical Formula:** CH_3NH_2
3.4 **IMCO/United Nations Numerical Designation:** Anhydrous 2.1061, Aqueous soln. 3.1.1235

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied compressed gas
4.2 **Color:** Colorless
4.3 **Odor:** Like ammonia, pungent, fishy, suffocating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face mask, rubber suit, apron, sleeves, and/or gloves, rubber or leather safety shoes, air line mask, positive pressure hose mask, self contained breathing apparatus, or industrial canister type gas mask
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat, followed by violent sneezing, burning sensation in throat, coughing, constriction of larynx and difficulty in breathing, pulmonary congestion, edema of the lungs, and conjunctivitis. Contact with liquid burns skin and eyes. Severe exposure may cause blindness. Vapors may cause dermatitis. Ingestion causes burns of the mouth, throat, and esophagus.
5.3 **Treatment for Exposure:** Get medical attention for anyone overcome or injured by exposure to this compound. INHALATION: remove victim to fresh air at once, apply artificial respiration if breathing has stopped, administer oxygen. EYES: flush with water for at least 15 min. SKIN: flush with water, if skin is burned do not use ointments or cover for 24 hours. INGESTION: do NOT induce vomiting, give large amount of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2, LD50 = 0.5 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating, such that personnel will not usually tolerate moderate or high concentrations.

Continued on page 4

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (flammable liquefied compressed gas)
6.2 **Flammable Limits in Air:** 4.9 – 20.7
6.3 **Fire Extinguishing Agents:** Let gas fire burn, stop flow of gas. Extinguish solution fires with dry chemical, alcohol foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic nitrogen oxides may be formed
6.6 **Behavior in Fire:** Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature:** 806°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves completely
7.2 **Reactivity with Common Materials:** Corrosive to copper, copper alloys, zinc alloys, aluminum, and galvanized surfaces
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** > 10 and < 30 ppm 24 hr creek chub TL_m
8.2 **Waterborne Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0.8% of theoretical in 15 days
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Commercial Solvents Corporation, Terre Haute, Ind. 47808
2. E. I. duPont de Nemours & Co., Inc., Biochemicals Department, 1007 Market Street, Wilmington, Del. 19898
3. Matheson Gas Products Co., East Rutherford, N.J. 07073

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Anhydrous 99.5+, Water solutions 30 – 50% by weight
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(see Hazard Assessment Handbook, CG-446-3)

A B C-K I M N

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	2
Poisons	[illegible]
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	[illegible]
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES*

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 31.1
13.3 **Boiling Point at 1 atm:** 20.3°F = −6.5°C = 266.7°K
13.4 **Freezing Point:** −134.5°F = −92.5°C = 180.7°K
13.5 **Critical Temperature:** 315°F = 159°C = 432°K
13.6 **Critical Pressure:** 1090 psia = 73.6 atm = 7.47 MN/m²
13.7 **Specific Gravity:** 0.693 at −6.5°C (liquid)
13.8 **Liquid Surface Tension:** 100.59 dynes/cm = 0.1006 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 1.1
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1936
13.12 **Latent Heat of Vaporization:** 355 Btu/lb = 197 cal/g = 8.33 × 10⁵ J/kg
13.12 **Heat of Combustion:** −15,000 Btu/lb = −8,340 cal/g = −34.9 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

*Properties apply to anhydrous material

Continued on page 4 and 5

5 HEALTH HAZARDS (Cont'd)

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause second degree burns on long exposure
5.10 **Odor Threshold:** 0.021 ppm

MAC	METHYL AMYL ACETATE

Common Synonyms
4-Methyl 2-pentanol acetate
MAAc
4-Methyl 2-pentyl acetate
Hexyl acetate

Water: liquid — Colorless — Pleasant fruity odor

Floats on water

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Hexyl acetate
MAAc
Methylisobutylcarbinyl acetate
4-Methyl-2-pentanol acetate
4-Methyl 2 pentyl acetate

3.2 **Coast Guard Compatibility Classification:** Ester

3.3 **Chemical Formula:** $CH_3COOCH(CH_3)CH_2CH(CH_3)_2$

(Continued on page 4)

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Fruity, mild pleasant, mild and nonresidual

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister or air pack, rubber gloves, goggles
5.2 **Symptoms Following Exposure:** Headache, dizziness, nausea, irritation to respiratory passages. Irritates eyes
5.3 **Treatment for Exposure:** INHALATION: remove from exposure immediately, call a physician if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYE CONTACT: flush with water for at least 15 min
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1 LD_{50} 5 to 15 g/kg
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors [illegible] erate irritation such that personnel will find high concentrations unpleasant. The [illegible] emporary
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 113°F (C.C.) 110°F (O.C.)
6.2 **Flammable Limits in Air:** 0.9% [illegible]% (calc.)
6.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide, or dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 510°F (calc.)
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 230 ppm/24 hr/brine shrimp/TL_m
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** 20% of theoretical in 5 days/freshwater
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co
Houston, Tex. 77001
2. Shell Chemical Co
Polymers Division
Houston, Tex. 77001
3. Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 95–99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-5)

A T U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	[illegible]
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 144.22
13.3 **Boiling Point at 1 atm:** 295.2°F = 146.2°C = 419.4°K
13.4 **Freezing Point:** −62.8°F = −63.8°C = 209.4°K
13.5 **Critical Temperature:** 606°F = 319°C = 592°K
13.6 **Critical Pressure:** 382 psia = 26 atm = 2.6 MN/m^2
13.7 **Specific Gravity:** 0.860 at 20°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 25°C
13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 25°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.046
13.12 **Latent Heat of Vaporization:** 225 Btu/lb = 125 cal/g = 5.23 × 10^5 J/kg
13.13 **Heat of Combustion:** (est.) −14,400 Btu/lb = −8,000 cal/g = −335 × 10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

3. CHEMICAL DESIGNATIONS (Cont'd.)

3.4 **IMCO/United Nations Numerical Designation:** UN 1233

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MAA METHYL AMYL ALCOHOL

Common Synonyms
Isobutylmethylcarbinol
4-Methyl-2-pentanol
Methylisobutylcarbinol

Oily liquid — Colorless — Mild alcohol odor

Floats on water. Irritating vapors is produced

Stop discharge if possible. Keep people away.
All fire department
Avoid [illegible] with liquid and vapor
[illegible] Discharged material
[illegible]

Fire

Combustible
Extinguish with dry [illegible]
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause dizziness or difficult breathing
Harmful if skin is exposed
[illegible]
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Wash affected areas with plenty of water
IN EYES: Lift eyelids, open and flush with plenty of water
IN SWALLOWING: Do not induce vomiting. [illegible]
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Isobutylmethylcarbinol, Isobutylmethylmethanol, MAOH, Methylisobutylcarbinol, 4-Methyl-2-pentanol, MIC

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula.** $(CH_3)_2CHCH_2CH(OH)CH_3$

3.4 **IMCO United Nations Numerical Designation:** 3.3, 2053

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp, mild and unpleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Air pack or organic canister mask, rubber gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Vapor irritates eyes and nose. May cause anesthesia. Prolonged contact with liquid causes irritation and cracking of skin, and irritates eyes.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give artificial respiration if needed, call a doctor. SKIN: flush with water. EYES: flush with water for at least 15 min, consult a doctor.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 25 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 120–130°F O.C. (106°F C.C.)

6.2 **Flammable Limits in Air:** 1.0% – 5.5%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 559°F (calc.)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 4.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 370 ppm/24 hr/brine shrimp/TL_m

8.2 **Waterfowl Toxicity:**

8.3 **Biological Oxygen Demand (BOD)** 50% of theoretical in 5 days, freshwater

8.4 **Food Chain Concentration Potential:**

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co
   Houston, Tex. 77001
2. Shell Chemical Co
   Industrial Chemical Division
   Houston, Tex. 77001
3. Union Carbide Corp
   Chemicals and Plastics Division
   270 Park Ave
   New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P-Q-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 102.18

13.3 **Boiling Point at 1 atm:** 269.2°F = 131.8°C = 405°K

13.4 **Freezing Point:** <−130°F = <−90°C = <183°K

13.5 **Critical Temperature:** 556°F = 291°C = 564°K

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.807 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 22.8 dynes/cm = 0.0228 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.053

13.12 **Latent Heat of Vaporization:** 162 Btu/lb = 90.1 cal/g = 3.77×10^5 J/kg

13.13 **Heat of Combustion:** -16,640 Btu/lb = -9240 cal/g = -387×10^5 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

MAN	N-METHYLANILINE

Common Synonyms
Anilomethane
N-Methylaminobenzene
Methylaniline (mono)
Methylphenylamine

Liquid — Yellow to light brown — Chemical Odor

May float or sink in water

Avoid contact with liquid. Keep people away.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemicals, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not give anything; keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — poison, water contaminant.
Restrict access.
Mechanical containment.
Should be removed.
Chemical and physical treatment.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Anilomethane, N-Methylaminobenzene, Methylaniline (mono), Methylphenylamine
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $C_6H_5NHCH_3$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Yellow to light brown
4.3 **Odor:** Modera[illegible] aniline type

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved respirator, rubber gloves, splash proof goggles
5.2 **Symptoms Following Exposure:** Inhalation causes dizziness and headache. Ingestion causes bluish discoloration (cyanosis) of lips, ear lobes, and internal beds. Liquid irritates eyes. Absorption through skin produces same symptoms as ingestion.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air and call a physician at once; administer oxygen until physician arrives. INGESTION: give large amount of water; get medical attention at once. EYES or SKIN: flush with plenty of water for at least 15 min; if contamination is present, shower with soap and warm water, with special attention to scalp and finger nails; remove any contaminated clothing.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible] °C
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** [illegible] mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** May attack some forms of plastics
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. American Cyanamid Co., Bound Brook, N.J. 08805
2. Eastman Organic Chemicals, Rochester, N.Y. 14650
3. Aldrich Chemical Co., 940 W. Saint Paul Ave., Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, Pure 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A.T.C.-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 107.2
13.3 **Boiling Point at 1 atm:** 384.6°F = 195.9°C = 469.1°K
13.4 **Freezing Point:** −71°F = −57°C = 216°K
13.5 **Critical Temperature:** 802°F = 427°C = 701°K
13.6 **Critical Pressure:** 784 psia = 51 atm = 5.20 MN/m²
13.7 **Specific Gravity:** 0.989 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 39.6 dynes/cm = 0.0396 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** 3.70
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 150 Btu/lb = 100 cal/g = 4.20 × 10⁵ J/kg
13.13 **Heat of Combustion:** −16,350 Btu/lb = −9,085 cal/g = −38.1 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4 and 5

NOTES

MTB — METHYL BROMIDE

Common Synonyms
Bromomethane
Embafume

Liquefied gas — Colorless — Odorless to sweet odor

Sinks and boils in water. Poisonous vapor cloud is formed.
Boiling point is 39° F

Fire

Combustible
POISONOUS AND IRRITATING GASES ARE PRODUCED IN FIRE

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes.

LIQUID
Will burn skin and eyes.
Harmful if swallowed

Water Pollution

Not harmful to aquatic life
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — poison
Restrict access

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Bromomethane
Embafume
M B-C Fumigant
Monobromomethane

3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3.3 **Chemical Formula:** CH_3Br

3.4 **IMCO/United Nations Numerical Designation:** 2.0/1062

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied gas

4.2 **Color:** Colorless

4.3 **Odor:** Relatively odorless sweet, chloroform-like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, goggles

5.2 **Symptoms Following Exposure:** Inhalation of vapor causes lung congestion and pulmonary edema. Higher concentrations cause rapid narcosis and death. Contact with liquid irritates eyes and burns skin

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give artificial respiration if needed. SKIN OR EYES: flush with water for at least 15 min

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 15 ppm

5.5 **Short-Term Inhalation Limits:** 20 ppm for 5 min

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact

5.10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6.1 **Flash Point:** Practically not flammable

6.2 **Flammable Limits in Air:** 10% - 15%

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated when exposed to fire or heat

6.6 **Behavior in Fire:** Containers may explode

6.7 **Ignition Temperature:** 999°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co
Midland, Mich 48640
2. Great Lakes Chemical Corp
West Lafayette, Ind 47906
3. Northwest Industries, Inc
Michigan Chemical Corp
351 E. Ohio St
Chicago, Ill 60611

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial not less than 99.5%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B-C-I J

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	4
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 94.95

13.3 **Boiling Point at 1 atm:** 38.5°F = 3.6°C = 276.8°K

13.4 **Freezing Point:** −135°F = −93°C = 180°K

13.5 **Critical Temperature:** 376°F = 191°C = 464°K

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.68 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 24.5 dynes/cm = 0.0245 N/m at 15°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 3.3

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.247

13.12 **Latent Heat of Vaporization:** 108 Btu/lb = 59.7 cal/g = 2.50 × 10⁵ J/kg

13.13 **Heat of Combustion:** −3188 Btu/lb = −1771 cal/g = −74.15 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

MBK	METHYL n-BUTYL KETONE

Common Synonyms		
2-Hexanone n-Butyl methyl ketone	Liquid	Clear	Disagreeable Odor
	Floats and mixes with water		

[illegible]

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Hazardous Materials Handbook CG-446-4)

Issue warning: air contaminant, water contaminant, high flammability
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** n-Butyl methyl ketone, 2-Hexanone
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $CH_3(CH_2)_3COCH_3$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Clear
4.3 **Odor:** Characteristic, strong, disagreeable odor resembling acetone

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles or face shield, approved respirator (for major spills)
5.2 **Symptoms Following Exposure:** Inhalation of high concentrations of vapor may result in narcosis; peripheral neuropathy may develop. Ingestion of large amounts may cause some systemic injury. Contact with eyes causes mild to moderate irritation. Liquid irritates skin; prolonged or repeated contact may cause defatting of the skin with resultant dermatitis.
5.3 **Treatment for Exposure:** INHALATION: move to uncontaminated atmosphere and treat symptomatically, alert physician to possible development of peripheral neuropathy. INGESTION: give large amount of water and induce vomiting. EYES: irrigate immediately and thoroughly with water for 15 min. and get medical attention. SKIN: flush exposed areas thoroughly with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; oral LD_{50} = 2,590 mg/kg (rat)
5.7 **Late Toxicity:** Peripheral neuropathy in experimental animals and man (disease of motor and of sensory nerves)
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 83°F (C.C.) 77°F (C.C.)
6.2 **Flammable Limits in Air:** 1.3% - 8.0%
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** 795°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 5.4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastman Chemical Products, Inc., Kingsport, Tenn. 37662
2. Aldrich Chemical Co., 940 W. Saint Paul Ave., Milwaukee, Wis. 53233
3. Pfaltz and Bauer, Inc., 375 Fairfield Ave., Stamford, Conn. 06902

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 95%, Pure, 99%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

NFQ14

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 100.16
13.3 **Boiling Point at 1 atm:** 261°F = 127°C = 400°K
13.4 **Freezing Point:** −70.4°F = −56.9°C = 216.3°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.812 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 25.49 dynes/cm = 0.02549 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 9.73 dynes/cm = 0.00973 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** 3.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 145 Btu/lb = 82 cal/g = 3.4 × 10³ J/kg
13.13 **Heat of Combustion:** −16,100 Btu/lb = −8,940 cal/g = −37.4 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on next page)

NOTES

MTC	METHYL CHLORIDE

Common Synonyms Chloromethane	Liquefied compressed gas Colorless Sweet or sweet odor Floats and boils on water. Flammable. Visible vapor cloud is formed.
	[illegible]
Fire	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area [illegible]
Exposure	[illegible] VAPOR Not irritating to eyes, nose or throat If inhaled, will cause nausea, vomiting, headache, difficult breathing, or loss of consciousness [illegible] LIQUID Will cause frostbite [illegible]
Water Pollution	Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning by flammability, air contaminant
Restrict access
Evacuate air

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Arcton, Chloromethane
3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon
3.3 **Chemical Formula:** CH_3Cl
3.4 **IMCO/United Nations Numerical Designation:** 2.0 (106)

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied gas
4.2 **Color:** Colorless
4.3 **Odor:** Faint sweet, non irritating, faint ether like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved canister mask, leather or vinyl gloves, goggles or face shield
5.2 **Symptoms Following Exposure:** Inhalation causes nausea, vomiting, weakness, headache, emotional disturbances, high concentrations cause mental confusion, eye disturbances, muscular tremors, cyanosis, convulsions. Contact of liquid with skin may cause frostbite
5.3 **Treatment for Exposure:** Remove to fresh air. Call a doctor and have patient hospitalized for observation of signs developing over 48 hours
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5.5 **Short-Term Inhalation Limits:** 100 ppm for 5 min
5.6 **Toxicity by Ingestion:** Not pertinent
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and breath
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin because it evaporates quickly. May cause frostbite
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible] °F C.C.
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide. Stop flow of gas
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards on Combustion Products:** Toxic and irritating gases are generated in fires
6.6 **Behavior in Fire:** Container may explode
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 2.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Reacts with zinc, aluminum, magnesium, and their alloys, reaction is not violent
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** None
8.2 **Waterfowl Toxicity:** None
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Ancon Chemical Corp, Westlake, La. 70669
2. Dow Chemical Co, Midland, Mich. 48640
3. Ethyl Corp, Industrial Chemicals Divisn, 451 Florida St, Baton Rouge, La. 70801

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical grade, "Arctic" refrigerant grade
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-B-C-D-E-F-G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	2
Water Pollution	
Human Toxicants	0
Aquatic Toxicants	1
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 50.49
13.3 **Boiling Point at 1 atm:** −11.6°F = −24.2°C = 249°K
13.4 **Freezing Point:** −143.9°F = −97.7°C = 175.5°K
13.5 **Critical Temperature:** 290.5°F = 143.6°C = 416.8°K
13.6 **Critical Pressure:** 969 psia = 65.9 atm = 6.68 MN/m²
13.7 **Specific Gravity:** 0.99 at −24°C (liquid)
13.8 **Liquid Surface Tension:** 16.2 dynes/cm = 0.0162 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at −24°C
13.10 **Vapor (Gas) Specific Gravity:** 1.7
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.249
13.12 **Latent Heat of Vaporization:** 182.3 Btu/lb = 101.3 cal/g = 4.241 × 10⁵ J/kg
13.13 **Heat of Combustion:** −5290 Btu/lb = −2939 cal/g = −12.31 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 7 and 8

NOTES

REVISED 1978

METHYL CHLOROFORMATE

Common Synonyms

Chloroformic acid, methyl ester
Methyl chlorocarbonate

Liquid | Colorless to light yellow | Unpleasant odor

Sinks and reacts in water. Flammable, irritating vapor is produced

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in a enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Issue warning: corrosive, toxic, highly flammable
Restrict access
Dike and flush

2. LABELS

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chloroformic acid, methyl ester; chloroformic acid, methyl ester; Methyl chlorocarbonate

3.2 **Coast Guard Combustibility Classification:** Not applicable

3.3 **Chemical Formula:** $CClOOCH_3$

3.4 **IMCO/United Nations Numerical Designation:** 2.2 1238

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to light yellow

4.3 **Odor:** Acrid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid or organic vapor mask or self contained breathing apparatus; goggles or face shield; plastic glove

5.2 **Symptoms Following Exposure:** Inhalation of vapor irritates nose and throat and can cause delayed pulmonary edema. Liquid irritates eyes and causes severe skin burns. Fatal if swallowed. Ingestion causes burns of mouth and stomach

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure; if breathing stops, administer artificial respiration; call physician. EYES: irrigate with copious amounts of water for at least 15 min; call physician if needed. SKIN: flush with water for 15 min; get medical attention for burns. INGESTION: Give large amounts of water; do NOT induce vomiting; get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4. Oral LD_{50} = 70 mg/kg (rats)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 74°F (C.C.) = 23.3°C

6.2 **Flammable Limits in Air:** 11.1 v/v %

6.3 **Fire Extinguishing Agents:** Water dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and phosgene may be formed

6.6 **Behavior in Fire:** Vapor is heavier than air and can travel a considerable distance to a source of ignition and flashback

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 2.0 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly evolving hydrogen chloride (hydrochloric acid). Reaction can be hazardous if water is hot

7.2 **Reactivity with Common Materials:** Corrosive to metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; neutralize with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Chemetron Corporation
   Chemicals Group
   360 Seventh Avenue
   New York, N.Y. 10001
2. Air Products and Chemicals, Inc.
   Specialty Chemicals Department
   P.O. Box 538
   Allentown, Pa. 18105
3. Aldrich Chemical Co.
   940 West St. Paul Avenue
   Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 97+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

NONE

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 94.5

13.3 **Boiling Point at 1 atm:** 160°F = 71°C = 344°K

13.4 **Freezing Point:** < -12.4°F = < -24.5°C = < 248.7°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.22 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 3.25

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1544

13.12 **Latent Heat of Vaporization:** (est.) 151 Btu/lb = 85 cal/g = 3.6 × 10^5 J/kg

13.13 **Heat of Combustion:** 4,900 Btu/lb = 2,800 cal/g = 1.2 × 10^7 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

NOTES

MCT	METHYLCYCLOPENTADIENYLMANGANESE TRICARBONYL

Common Synonyms			
Combustion Improver C 12	Liquid	Yellow to dark orange	Faint pleasant odor
	Sinks in water		

AVOID CONTACT WITH LIQUID. KEEP PEOPLE AWAY
Wear rubber [illegible] clothing [illegible]
[illegible]
[illegible]
[illegible]
[illegible]

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus
Extinguish with water, dry chemical, carbon dioxide, foam

Exposure

CALL FOR MEDICAL AID
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
If swallowed will cause loss of consciousness
Remove contaminated clothing [illegible]
Flush affected areas with plenty of water
IF INHALED: Fresh air, oxygen and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS: Give [illegible] water, milk and bland [illegible]
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: [illegible] water

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify [illegible] and [illegible]
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: persons, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Combustion Improver C 12
3.2 **Coast Guard Compatibility Classification:** To be developed
3.3 **Chemical Formula:** $C_9H_7O_3Mn$
3.4 **IMCO/United Nations Numerical Designation:** 3.1

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Straw to dark orange
4.3 **Odor:** Faint pleasant herbaceous

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister mask, rubber gloves and apron, protective goggles or face shield
5.2 **Symptoms Following Exposure:** Inhalation, ingestion, or skin contact affect central nervous system, causing convulsions, respiratory depression, cyanosis, and coma. Liquid irritates eyes
5.3 **Treatment for Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove victim from exposure, administer artificial respiration if necessary. EYES: flush with plenty of water for at least 15 min. SKIN: wash well with soap and water. INGESTION: induce vomiting
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 (ppm) (Manganese)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 4 oral LD_{50} = 23 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** > 200°F (C.C.)
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, water spray, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic vapors are formed in a fire
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Data not available
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. Ethyl Corporation
   Industrial Chemicals Division
   Ethyl Tower, 451 Florida
   Baton Rouge, La. 70801
2. Veratron Corporation
   Alfa Products
   Box 159
   Beverly, Mass. 01915
3. PCR, Inc.
   P.O. Box 1466
   Gainesville, Fla. 32602

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.8%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

X X X

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 218
13.3 **Boiling Point at 1 atm:** 451°F = 233°C = 506°K
13.4 **Freezing Point:** 34°F = [illegible]°C = 274°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.38 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible] = [illegible] Btu/lb = [illegible] cal/g = [illegible] x 10[illegible] J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 7 and 8)

NOTES

MCP	METHYL CYCLOPENTANE

Common Synonyms			
Cyclopentane, methyl	Liquid	Colorless	Gasoline-like odor
	Floats on water Flammable, irritating vapor is produced.		

Shut off ignition sources Call fire department
Stop discharge if possible Keep people away
Isolate and remove fire exposed material
Notify local health and pollution control agencies

Fire

FLAMMABLE.
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemicals foam carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

Call for medical aid

VAPOR
If inhaled will cause dizziness or difficult breathing
Move victim to fresh air
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

LIQUID
Irritating to skin and eyes.
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning high flammability
Evacuate area
Mechanical containment
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Cyclopentane methyl
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula.** C_6H_{12}
3 4 **IMCO/United Nations Numerical Designation** 3 1/1241

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Like gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self-contained breathing apparatus goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure** Inhalation causes dizziness nausea and vomiting concentrated vapor may cause unconsciousness and collapse Liquid causes irritation of eyes and mild irritation of skin if allowed to remain Ingestion causes irritation of stomach Aspiration causes severe lung irritation rapidly developing pulmonary edema and central nervous system excitement followed by depression

5 3 **Treatment for Exposure** INHALATION remove victim from exposure if breathing has stopped begin artificial respiration call physician EYES flush with water for 15 min call physician SKIN flush well with water then wash with soap and water INGESTION do NOT induce vomiting guard against aspiration into lungs ASPIRATION enforce bed rest, give oxygen get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** 300 ppm for 60 min

5 6 **Toxicity by Ingestion:** Grade 1 LD_{50} 4 to 15 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Vapor are nonirritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of skin

5 10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** <0°F C C
6 2 **Flammable Limits in Air:** 1 1% 8 7% (approx)
6 3 **Fire Extinguishing Agents.** Dry chemical, foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back
6 7 **Ignition Temperature:** 624°F
6 8 **Electrical Hazard.** Data not available
6 9 **Burning Rate:** 7 1 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Phillips Petroleum Company
Chemical Department
Special Products Division
Bartlesville, Okla 74004

2 Aldrich Chemical Co
940 West St Paul Ave
Milwaukee Wis 53233

3 Pfaltz and Bauer, Inc
126-04 Northern Boulevard
Flushing, N Y 11368

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Research 99 94%, Pure 99 5%, Technical 96 5%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

A-T-U-V-W

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 84 2
13 3 **Boiling Point at 1 atm** 161 3°F = 71 8°C = 345 0°K
13 4 **Freezing Point.** −224°F = −142°C = 131°K
13 5 **Critical Temperature.** 499 3°F = 259 6°C = 532 8°K
13 6 **Critical Pressure** 550 psia = 37 4 atm = 3 79 MN/m²
13 7 **Specific Gravity** 0 749 at 20°C (liquid)
13 8 **Liquid Surface Tension.** 21 60 dynes/cm = 0 0216 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension.** (est) 35 dynes/cm = 0 035 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity** 2 9
13 11 **Ratio of Specific Heats of Vapor (Gas).** 1 0834
13 12 **Latent Heat of Vaporization** 162 Btu/lb = 90 cal/g = 3 8 × 10⁵ J/kg
13 13 **Heat of Combustion:** (liquid) −18 900 Btu/lb = −10 500 cal/g = −440 × 10³ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

MCS	METHYLDICHLOROSILANE

Common Synonyms	Liquid	Colorless	Sharp irritating odor
	Reacts violently with water Irritating gas is produced on contact with water		

AVOID CONTACT WITH LIQUID AND VAPOR KEEP PEOPLE AWAY
Wear goggles and self-contained breathing apparatus
Shut off ignition sources Call fire department
Stop discharge if possible
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemicals or carbon dioxide
DO NOT USE WATER OR FOAM ON FIRE
DO NOT USE WATER OR FOAM ON ADJACENT FIRES

Exposure

Call for medical aid

VAPOR

Irritating to eyes, nose and throat
If inhaled will cause difficult breathing
Move victim to fresh air
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen

LIQUID

Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

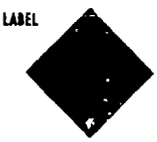
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Evacuate area
Disperse and flush with care

2. LABEL



3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification.** Not applicable
3 3 **Chemical Formula:** CH_3SiHCl_2
3 4 **IMCO/United Nations Numerical Designation.** 3 2/1242

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Acrid sharp, hydrochloric acid like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Full protective clothing, acid vapor type respirators protection, rubber gloves, chemical worker s goggles other protective equipment as necessary to protect skin and eyes
5 2 **Symptoms Following Exposure.** Inhalation causes irritation of respiratory tract heavy exposure can cause pulmonary edema Contact of liquid with skin or eyes causes severe burns Ingestion causes burns of mouth and stomach
5 3 **Treatment for Exposure:** Get medical attention following all exposures to this compound INHALATION remove victim from exposure if breathing has stopped begin artificial respiration EYES flush with water for 15 min SKIN flush with water INGESTION do NOT induce vomiting, give large amounts of water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Grade 3 LD_{50} 50 to 500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury They cannot be tolerated even at low concentrations
5 9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant Causes second and third degree burns on short contact and is very injurious to the eyes
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** −14°F O C
6 2 **Flammable Limits in Air:** 6% 55%
6 3 **Fire Extinguishing Agents** Dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water foam
6 5 **Special Hazards of Combustion Products.** Toxic hydrogen chloride and phosgene gases may be formed
6 6 **Behavior in Fire:** Difficult to extinguish re ignition may occur Contact with water applied to adjacent fires will generate irritating hydrogen chloride gas
6 7 **Ignition Temperature:** >600°F
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** 3 0 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently to form hydrogen chloride (hydrochloric acid)
7 2 **Reactivity with Common Materials.** Reacts with surface moisture to evolve hydrogen chloride which is corrosive to common metals
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Flood with water and rinse with sodium bicarbonate or lime solution
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York N Y 10017

2 Dow Corning Corporation
P O Box 592
Midland Mich 48640

3 PCR Inc
P O Box 1466
Gainesville Fla 32602

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 97%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	4
Liquid or solid irritant	4
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	4
Self-Reaction	1

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 115
13 3 **Boiling Point at 1 atm.** 106 7°F = 41 5°C = 314 7°K
13 4 **Freezing Point:** −135°F = −93°C = 180°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 11 at 25°C (liquid)
13 8 **Liquid Surface Tension:** (est) 35 dynes/cm = 0 035 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 4
13 11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13 12 **Latent Heat of Vaporization** 106 Btu/lb = 59 cal/g = 2 5 × 10³ J/kg
13 13 **Heat of Combustion** (est) −4 700 Btu/lb = −2 600 cal/g = −110 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Data not available
13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

MEK — METHYL ETHYL KETONE

Common Synonyms
MEK
2 Butanone
Ethyl methyl ketone

Liquid | Colorless | Sweet odor

Floats and mixes with water. Flammable, irritating vapor is produced

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to knock down vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, alcohol foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, if victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of affected water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2 Butanone; Ethyl methyl ketone; MEK
3.2 **Coast Guard Compatibility Classification:** Ketone
3.3 **Chemical Formula:** $CH_3COCH_2CH_3$
3.4 **IMCO/United Nations Numerical Designation:** 3.2/1193

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like acetone, pleasant, pungent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister or air pack, plastic gloves, goggles or face shield
5.2 **Symptoms Following Exposure:** Liquid causes eye burn. Vapor irritates eyes, nose, and throat, can cause headache, dizziness, nausea, weakness, and loss of consciousness.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYES: wash with plenty of water for at least 15 min and call physician.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm
5.5 **Short-Term Inhalation Limits:** 290 mg/m^3 for 60 min
5.6 **Toxicity by Ingestion:** Grade 2, 0.5 to 5 g/kg (rat)
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 10 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 20°F C.C., 22°F O.C.
6.2 **Flammable Limits in Air:** 1.8% - 11.5%
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 961°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 4.1 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 5640 mg/l/48 hr/bluegill/11 m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 214% 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Celanese Corp.
   Celanese Chemical Co. Division
   245 Park Ave.
   New York, N.Y. 10017
2. Exxon Chemical Co.
   Houston, Tex. 77001
3. Shell Chemical Co.
   Industrial Chemicals Division
   Houston, Tex. 77001

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.5+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q R-S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 72.11
13.3 **Boiling Point at 1 atm:** 175.3°F = 79.6°C = 352.8°K
13.4 **Freezing Point:** −123.3°F = −86.3°C = 186.9°K
13.5 **Critical Temperature:** 504.5°F = 262.5°C = 535.7°K
13.6 **Critical Pressure:** 503 psia = 41.0 atm = 4.15 MN/m^2
13.7 **Specific Gravity:** 0.806 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.075
13.12 **Latent Heat of Vaporization:** 191 Btu/lb = 106 cal/g = 4.44 × 10^5 J/kg
13.13 **Heat of Combustion:** −13 480 Btu/lb = −7491 cal/g = −313.6 × 10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** (est.) −9 Btu/lb = −5 cal/g = −0.2 × 10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

MEP — METHYLETHYLPYRIDINE

Common Synonyms
5-Ethyl 2-methyl pyridine
5-Ethyl-2-picoline
MEP

Liquid — Colorless — Sharp odor

Floats on water

Avoid contact with liquid. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber over-clothing.
Stop discharge if possible.
Stop discharge if possible.
Isolate and remove discharge material.
Notify local health and pollution control agencies.

Fire

Combustible

Wear goggles, self-contained breathing apparatus, rubber boots, and gloves.
Extinguish with water, dry chemical, alcohol foam, carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

LIQUID
Will burn skin and eyes
Harmful if swallowed

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, and not vomiting, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Aldehyde-collidine
Aldehydine
5-Ethyl 2 methylpyridine
5-Ethyl 2-picoline
MEP

3 2 **Coast Guard Compatibility Classification:** Aromatic amine

3 3 **Chemical Formula.** $C_8H_{11}N$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Sharp penetrating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air supplied mask for high vapor concentrations, plastic gloves, goggles or face shield

5 2 **Symptoms Following Exposure:** Breathing of vapors will cause vomiting and chest discomfort. Contact with liquid causes skin and eye burns.

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give oxygen if breathing is difficult, call a physician. SKIN OR EYES: immediately flush with plenty of water for at least 15 min, get medical care for eyes.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1 700 ppm 3 7 hr lethal (rat)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 0 5 to 5 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure, may cause secondary burns on long exposure.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 155°F O C

6 2 **Flammable Limits in Air:** 1 1% 6 6%

6 3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 939°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Flush with water, neutralize with dilute acetic acid

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** (theor) 4 4 %, 5 days 56 6%, 20 days, 0 12-2 14 lb/lb 5 days

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Lonza Inc
22-10 Route 208
Fairlawn N J 07410

2 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99 9%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P-Q-T-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive Material

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 121 18

13 3 **Boiling Point at 1 atm.** 352°F = 178°C = 451°K

13 4 **Freezing Point:** −94 5°F = −70 3°C = 202 9°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 922 at 20°C (liquid)

13 8 **Liquid Surface Tension.** 36 dynes/cm = 0 036 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

MTF

METHYL FORMAL

Common Synonyms

Methylal
Methylene dimethyl ether
Dimethoxymethane
Dimethyl formal
Formaldehyde dimethylacetal

Liquid — Colorless — Mild sweet odor

Mixes with water. Flammable, irritating vapor is produced.

Shut off ignition sources. Call fire department.
Stop discharge if possible. Keep people away.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Irritating gases may be produced when heated
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Extinguish with dry chemicals, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

Call for medical aid.

VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled

Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, having victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

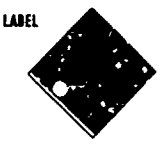
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability, water contaminant
Restrict access
Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dimethoxymethane, Dimethylformal, Formaldehyde dimethylacetal, Methylal, Methylene dimethyl ether

3.2 **Coast Guard Compatibility Classification:** Ether

3.3 **Chemical Formula:** $CH_2(OCH_3)_2$

3.4 **IMCO/United Nations Numerical Designation:** 3.1/1234

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild ethereal chloroform like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus or all purpose canister mask, rubber gloves, chemical safety goggles, impervious apron and boots

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory system and depression of central nervous system. Liquid causes irritation of eyes and will irritate skin if allowed to remain. Ingestion causes depression of central nervous system

5.3 **Treatment for Exposure:** INHALATION: remove victim from contaminated area and administer artificial respiration and oxygen if necessary. EYES: flush with plenty of water, get medical attention. SKIN: flush with plenty of water. INGESTION: induce vomiting, administer gastric lavage and saline cathartics, subsequent treatment is symptomatic and supportive

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1,000 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1: 1 Dose 5 to 15 g/kg

5.7 **Late Toxicity:** Liver and kidney injury may follow high exposures

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 0°F, 0°C

6.2 **Flammable Limits in Air:** 1.6% - 17.6%

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Irritating formaldehyde gas may be present in smoke

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 459°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 5.5 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Celanese Chemical Company
   245 Park Avenue
   New York, N.Y. 10017
2. Aldrich Chemical Co.
   940 West Saint Paul Ave.
   Milwaukee, Wis. 53233
3. Eastman Kodak Co.
   Eastman Organic Chemicals
   Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 97+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q R S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 76.1

13.3 **Boiling Point at 1 atm:** 108°F = 42°C = 315°K

13.4 **Freezing Point:** −157°F = −105°C = 168°K

13.5 **Critical Temperature:** 419°F = 215°C = 488°K

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.861 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 21.1 dynes/cm = 0.0211 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 2.6

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0888

13.12 **Latent Heat of Vaporization:** 161.5 Btu/lb = 89.8 cal/g = 3.76 × 10³ J/kg

13.13 **Heat of Combustion:** −10,970 Btu/lb = −6,100 cal/g = −255 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

MFM	METHYL FORMATE

Common Synonyms	Liquid	Colorless	Pleasant odor
Formic acid, methyl ester	Mixes with water. Flammable, irritating vapor is produced. Boiling point is 88° F		

Shut off ignition sources. Call fire department.
Stop leak if possible. Keep people away.
Isolate and evacuate discharged material.
Notify Coast Guard if pollution or hazardous

Fire

FLAMMABLE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemicals, alcohol foam, carbon dioxide.
Water may be ineffective.
Keep containers with water.

Exposure

Call a medical aid.

VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IN EYES, hold eyelids open and flush with plenty of water.
IN SWALLOWED, do NOT induce VOMITING. Give water or milk.
IN SWALLOWED, do NOT induce VOMITING. DO NOT HAVE VOMITING.
VOMITING if victim is conscious.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify adjacent and downstream water users.
Notify Coast Guard if pollution of navigable waters.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, water contaminant.
Restrict access.
Disperse and flush.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Formic acid, methyl ester
3.2 **Coast Guard Compatibility Classification:** Esters (13)
3.3 **Chemical Formula:** HCOOCH3
3.4 **IMCO/United Nations Numerical Designation:** 3/1243

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pleasant, agreeable

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or safety glasses, self-contained breathing apparatus, rubber gloves.
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membrane. Prolonged inhalation can produce narcosis and central nervous symptoms, including some temporary visual disturbance. Contact with liquid irritates eyes and may irritate skin if allowed to remain. Ingestion causes irritation of mouth and stomach and central nervous system depression including visual disturbances.
5.3 **Treatment for Exposure.** INHALATION: move to fresh air and rest; if pulmonary edema develops, administer oxygen, call physician. EYES: irrigate with water for 15 min. SKIN: wash thoroughly with soap and water. INGESTION: do NOT induce vomiting; get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value).** 100 ppm
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Grade 1. LD_{50} 5 to 15 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** −26°F C.C.
6.2 **Flammable Limits in Air:** 5% – 22.7%
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 853°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate.** 2.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Slow reaction to form formic acid and methyl alcohol; reaction is not hazardous.
7.2 **Reactivity with Common Materials.** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. E. I. duPont de Nemours & Co., Inc.
   Biochemicals Department
   1007 Market Street
   Wilmington, Del. 19898
2. Aldrich Chemical Co.
   940 West Saint Paul Ave.
   Milwaukee, Wis. 53233
3. Eastman Kodak Co.
   Eastman Organic Chemicals
   Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, practical and spectro grades, all 97.5+%
10.2 **Storage Temperature:** <85°F
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q-R-S

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 60.1
13.3 **Boiling Point at 1 atm:** 89.2°F = 31.8°C = 305°K
13.4 **Freezing Point:** −147.6°F = −99.8°C = 173.4°K
13.5 **Critical Temperature:** 417°F = 213°C = 487°K
13.6 **Critical Pressure:** 870 psia = 59.2 atm = 6.00 MN/m
13.7 **Specific Gravity:** 0.977 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 25 dynes/cm = 0.025 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.07
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1446
13.12 **Latent Heat of Vaporization:** 202 Btu/lb = 112 cal/g = 4.69 × 10³ J/kg
13.13 **Heat of Combustion:** −6,980 Btu/lb = −3,880 cal/g = −162 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

MHZ — METHYLHYDRAZINE

Common Synonyms

Monomethylhydrazine
MMH

Liquid — Colorless — Ammonia-like odor

Mixes with water. Poisonous, flammable vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
May explode if exposed to heat or flames

Exposure

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED
Irritating to eyes, nose and throat

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison, high flammability, water contaminant, air contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABELS

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Monomethylhydrazine, MMH
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** CH_3NHNH_2
3.4 **IMCO/United Nations Numerical Designation:** 3.2/1244

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like ammonia

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister mask or self-contained breathing apparatus, goggles or face shield, rubber gloves, protective clothing

5.2 **Symptoms Following Exposure:** Tremors and convulsions follow absorption by any route. Inhalation causes local irritation of respiratory tract, respiratory distress, and systemic effect. Contact of liquid with eyes or skin causes irritation and burns. Ingestion causes irritation of mouth and stomach

5.3 **Treatment for Exposure:** Get medical attention at once following all exposures to this compound. INHALATION: move victim to fresh air and keep him quiet; give artificial respiration if breathing stops. EYES: flush for at least 15 min. with large quantities of water. SKIN: immediately wash with large quantities of water and treat as for alkali burn. INGESTION: give egg whites or other emollient, followed by a 5% salt solution or other mild emetic. Keep patient as quiet as possible. To control convulsions, short acting barbituates may be administered parenterally by a physician with due regard for depression of respiration

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 ppm

5.5 **Short-Term Inhalation Limits:** 90 ppm for 10 min.; 30 ppm for 30 min.; 15 ppm for 60 min.

5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 33 mg/kg (rat)

5.7 **Late Toxicity:** Hemolytic anemia may result from large doses by any route

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations

(Continued on page 4)

6. FIRE HAZARDS

6.1 **Flash Point:** 62°F O.C.
6.2 **Flammable Limits in Air:** 2.5% - 98%
6.3 **Fire Extinguishing Agents:** Water or dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Irritating nitrogen oxides are produced
6.6 **Behavior in Fire:** May explode
6.7 **Ignition Temperature:** 382°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 2.0 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Reacts slowly with air, but heat may cause ignition of rags, rust, or other combustibles
7.3 **Stability During Transport:** Stable, not in contact with iron, copper, or their alloys
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Olin Corporation
   120 Long Ridge Road
   Stamford, Conn. 06904
2. Eastman Kodak Co.
   Eastman Organic Chemicals
   Rochester, N.Y. 14650
3. Aldrich Chemical Co.
   940 West St. Paul Ave.
   Milwaukee, Wis. 53233

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Propellant grade 99+%; Laboratory grade 98+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Padded with nitrogen
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V P Q R S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	4

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 46.1
13.3 **Boiling Point at 1 atm:** 189.5°F = 87.5°C = 360.7°K
13.4 **Freezing Point:** −62.3°F = −52.4°C = 220.8°K
13.5 **Critical Temperature:** 594°F = 312°C = 585°K
13.6 **Critical Pressure:** 1,195 psia = 81.3 atm = 8.25 MN/m²
13.7 **Specific Gravity:** 0.878 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 34.3 dynes/cm = 0.0343 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 1.59
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1326
13.12 **Latent Heat of Vaporization:** 376 Btu/lb = 209 cal/g = 8.75 × 10⁵ J/kg
13.13 **Heat of Combustion:** −12,178 Btu/lb = −6,766 cal/g = −283.1 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

5. HEALTH HAZARDS (Cont'd.)

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes

5.10 **Odor Threshold:** 1.3 ppm

MIC — METHYL ISOBUTYL CARBINOL

Common Synonyms
Methylamyl alcohol
4-Methyl-2-pentanol
Isobutylmethylcarbinol

Oily liquid — Colorless — Mild alcohol odor

Floats on water. Irritating vapor is produced

[illegible]

Fire

Combustible
Extinguish with dry [illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
Harmful if skin is exposed
If inhaled, will cause dizziness or difficult breathing
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Isobutylmethylcarbinol, Methylamyl Alcohol, MAOH, 4-Methyl 2 pentanol, MIBC, MIC

3 2 **Coast Guard Compatibility Classification:** Alcohol

3 3 **Chemical Formula:** $(CH_3)_2CHCH_2CH(OH)CH_3$

3 4 **IMCO, United Nations Numerical Designation:** 3 1/2053

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild sharp non residual

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air pack or organic canister mask, rubber gloves, goggles or face shield

5 2 **Symptoms Following Exposure:** Vapor irritates eyes and nose, may cause anesthesia. Prolonged contact with liquid causes irritation and cracking of skin, also irritates eyes

5 3 **Treatment for Exposure:** INHALATION: remove to fresh air, give artificial respiration if needed, call doctor. SKIN: flush with water. EYES: flush with water for at least 15 min, consult a doctor

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ 0.5 to 5 g/kg (rat)

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 120-130°F O C, 106°F C C

6 2 **Flammable Limits in Air:** 1 0% - 5 5%

6 3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 370 ppm/24 hr/brine shrimp/TL$_m$

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 50% of theoretical in 5 days, freshwater

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Exxon Chemical Co
Houston, Tex 77001

2 Shell Chemical Co
Industrial Chemicals Division
Houston Tex 77001

3 Union Carbide Corp
Chemicals & Plastics Division
270 Park Ave
New York N Y 10017

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-P-Q-T-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 102 18

13 3 **Boiling Point at 1 atm:** 269 2°F = 131 8°C = 405°K

13 4 **Freezing Point:** <-130°F = <-90°C = <183°K

13 5 **Critical Temperature:** 556°F = 291°C = 564°K

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 807 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 22 8 dynes/cm = 0 0228 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est) 25 dynes/cm = 0 025 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 053

13 12 **Latent Heat of Vaporization:** 162 Btu/lb = 90 1 cal/g = 3 77 × 10^5 J/kg

13 13 **Heat of Combustion:** (est) -16 600 Btu/lb = -9,300 cal/g = -387 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

MIK — METHYL ISOBUTYL KETONE

Common Synonyms
4-Methyl-2-pentanone
Isobutyl methyl Ketone
MIBK

Watery liquid — Colorless — Mild pleasant odor

Floats and mixes slowly with water. Flammable. Irritating vapor is produced.

[illegible]

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
[illegible]

Exposure

CAUTIOUS FOR MODERATE AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or loss of consciousness.
[illegible]

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES hold eyelids open and flush with copious amounts of water.
IF SWALLOWED and victim is CONSCIOUS give two glasses of water to drink.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning: high flammability
Evacuate area
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Hexone; Isobutyl methyl ketone; Isopropylacetone; 4-Methyl-2 pentanone, MIBK, MIK
3.2 **Coast Guard Compatibility Classification:** Ketone
3.3 **Chemical Formula:** $(CH_3)_2CHCH_2COCH_3$
3.4 **IMCO/United Nations Numerical Designation:** 3.2/1245

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pleasant mild characteristic, sharp non residual, ketonic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic canister or air pack, rubber gloves, goggles or face shield
5.2 **Symptoms Following Exposure:** Vapor causes irritation of eyes and nose, high concentrations cause anesthesia and depression. Liquid dries out skin and may cause dermatitis, irritates eyes but does not injure them
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, give artificial respiration if needed, call a doctor. SKIN OR EYES: wash eyes thoroughly with water, wash skin with water until irritation stops
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5.5 **Short-Term Inhalation Limits:** 100 ppm for 60 min.
5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg (rat)
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5.10 **Odor Threshold:** 0.47 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 73°F C.C., 75°F O.C.
6.2 **Flammable Limits in Air:** 1.4% - 7.5%
6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated
6.6 **Behavior in Fire:** Vapors may travel a considerable distance and ignite
6.7 **Ignition Temperature:** 854°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biochemical Oxygen Demand (BOD):** (theor.) 1.8%, 0.5 day, (theor.) 12%, 5 days
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co
   Houston, Tex. 77001
2. Shell Chemical Co
   Industrial Chemicals Division
   Houston, Tex. 77001
3. Union Carbide Corp
   Chemicals & Plastics Division
   270 Park Ave
   New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

A-P-Q-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 100.16
13.3 **Boiling Point at 1 atm:** 241.2°F = 116.2 = 389.4°K
13.4 **Freezing Point:** −119°F = −84°C = 189°K
13.5 **Critical Temperature:** 568.9°F = 298.3°C = 571.5°K
13.6 **Critical Pressure:** 475 psia = 32.3 atm = 3.27 MN/m
13.7 **Specific Gravity:** 0.802 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 23.6 dynes/cm = 0.0236 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 15.7 dynes/cm = 0.0157 N/m at 22.7°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.061
13.12 **Latent Heat of Vaporization:** 149 Btu/lb = 82.5 cal/g = 3.45 × 10⁵ J/kg
13.13 **Heat of Combustion:** (est.) −10,400 Btu/lb = −5,800 cal/g = −242 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** (est.) −9 Btu/lb = −5 cal/g = −0.2 × 10⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 3 and 4)

NOTES

REVISED 1978

MPK — METHYL ISOPROPENYL KETONE, INHIBITED

Common Synonyms

2 Methyl-1-butene-3-one

Liquid — Colorless — Sweet pleasant odor

Floats on water. Flammable. Irritating vapor is produced

Shut off ignition sources. Call fire department.
Stop discharge if possible. Keep people away.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Control fires from safe distance or protected location.
Extinguish with dry chemicals, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

Call for medical aid.

VAPOR

Irritating to eyes, nose and throat.

Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID

Irritating to skin and eyes.
Harmful if swallowed

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have vomit (induce vomiting).
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning — high flammability, water contaminant.
Restrict access.
Mechanical containment.
Should be removed.
Chemical and physical treatment.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Isopropenyl methyl ketone; 2 Methyl-1-butene-3-one

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CH_2COC(CH_3)=CH_2$

3.4 **IMCO/United Nations Numerical Designation:** 3.2/1246

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Very pungent, pleasant sweet

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Liquid may cause severe damage to eyes, resulting possibly in some permanent impairment of vision; vapor produces tears. If not removed promptly from skin, liquid may cause delayed pain and blistering. Ingestion causes irritation of mouth and stomach.

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure, give artificial respiration if needed, call physician. EYES: immediately irrigate with copious amounts of water for 15 min, call physician. SKIN: wash off skin with large volumes of water for 15 min, call physician if burn has occurred. INGESTION: induce vomiting, call physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 180 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting and first degree burns on short exposure; may cause second-degree burns on long exposure.

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** <71°F (C.C.)

6.2 **Flammable Limits in Air:** 1.8% - 9.0%

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** May polymerize and explode

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 4.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Will polymerize in the absence of inhibitor, especially when heated

7.6 **Inhibitor of Polymerization:** Up to 1% hydroquinone

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Eastern Chemical Division
   230 Marcus Boulevard
   Hauppauge, L.I., N.Y. 11787
2. Pfaltz and Bauer, Inc.
   126-04 Northern Boulevard
   Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

N.T.U.-A.-W.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	*
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	*
Water	0
Self Reaction	*

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 84.1

13.3 **Boiling Point at 1 atm:** 208°F = 98°C = 371°K

13.4 **Freezing Point:** −65°F = −54°C = 219°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.85 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 2.9

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0796 at 20°C (68°F)

13.12 **Latent Heat of Vaporization:** (est.) 182 Btu/lb = 101 cal/g = 4.23 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) −15,500 Btu/lb = −8,600 cal/g = −360 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** (est.) −380 Btu/lb = −210 cal/g = −8.8 × 10⁵ J/kg

Continued on pages 5 and 6

NOTES

MMC

METHYL MERCAPTAN

Common Synonyms

Methanethiol
Mercaptomethane
Thiomethyl alcohol
Methyl sulfhydrate

Liquefied compressed gas Colorless Strong garlic odor

Floats and boils on water. Poisonous flammable vapor is produced.

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Shut off ignition sources; call fire department.
Stop discharge if possible.
Evacuate area in case of large discharge.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
POISONOUS GASES ARE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Wear goggles and self-contained breathing apparatus.
Let fire burn.
Stop flow of gas if possible.
Cool exposed containers and protect personnel with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR

POISONOUS IF INHALED.
Irritating to eyes, nose and throat.

Move victim to fresh air.
If in eyes, hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID

POISONOUS IF SWALLOWED.
Irritating to skin and eyes.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is NOT CONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, water contaminant, air contaminant.
Restrict access.
Evacuate area.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Mercaptomethane, Methanethiol, Methyl sulfhydrate, Thiomethyl alcohol

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CH_3SH

3.4 **IMCO/United Nations Numerical Designation:** 2.1/1064

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied compressed gas

4.2 **Color:** Colorless

4.3 **Odor:** Garlic, foul, strong, offensive

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles or face shield, air line or self-contained breathing apparatus

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory system, coma, paralysis, unconsciousness, death may follow respiratory paralysis. Contact with liquid irritates eyes and skin. Ingestion causes irritation of mouth and stomach plus symptoms described for inhalation.

5.3 **Treatment for Exposure:** INHALATION: remove patient immediately from the contaminated area, keep him warm and at complete rest, if necessary give artificial respiration until medical assistance can be obtained, oxygen or oxygen-CO_2 inhalation is recommended, continuing after spontaneous breathing has returned. EYES: for exposure to vapor, apply hot and cold compresses to reduce pain of conjunctivitis; for exposure to liquid, wash with water and obtain medical assistance. SKIN: wash with water. INGESTION: induce vomiting and follow with gastric lavage.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0 ppm

5.5 **Short-Term Inhalation Limits:** 20 ppm for 5 min

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 0.0021 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (flammable liquefied compressed gas)

6.2 **Flammable Limits in Air:** 3.9% - 21.8%

6.3 **Fire Extinguishing Agents:** Preferably let fire burn, stop gas flow. Fires may be extinguished with dry chemical, foam or carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.

6.5 **Special Hazards of Combustion Products:** Irritating sulfur dioxide is produced.

6.6 **Behavior in Fire:** Containers may explode.

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 3.8 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 1.0 ppm/105 min/white bass/death/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Amoco Chemicals Corporation
   130 East Randolph Drive
   Chicago, Ill 60601
2. Pennwalt Corporation
   Chemicals Division
   Three Parkway
   Philadelphia, Pa 19102
3. Matheson Gas Products Co
   East Rutherford, N J 07073

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.5+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

N B C-K 1 M-N

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 48.1

13.3 **Boiling Point at 1 atm:** 43.2°F = 6.2°C = 279.4°K

13.4 **Freezing Point:** −189°F = −123°C = 150°K

13.5 **Critical Temperature:** 386.2°F = 196.8°C = 470.0°K

13.6 **Critical Pressure:** 1050 psia = 71.4 atm = 7.25 MN/m²

13.7 **Specific Gravity:** 0.692 at 6°C (liquid)

13.8 **Liquid Surface Tension:** 31 dynes/cm = 0.031 N/m at 5°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 1.66

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1938

13.12 **Latent Heat of Vaporization:** 220 Btu/lb = 122 cal/g = 5.10 × 10³ J/kg

13.13 **Heat of Combustion:** −11,054 Btu/lb = −6,141 cal/g = −257.0 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 3 and 4)

NOTES

MMM

METHYL METHACRYLATE

Common Synonyms
Methacrylic acid methyl ester

Liquid | Colorless | Pleasant sharp odor

Floats on water. Flammable, irritating vapor is produced

Fire

FLAMMABLE.
Flashback along vapor trail may occur
Container may explode when heated
Vapor may explode if ignited in an enclosed area

Exposure

FIRST AID FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

Water Pollution

Dangerous to aquatic life in high concentrations
Floats on water
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability
Evacuate area
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Methacrylate monomer
Methacrylic acid, methyl ester
Methyl α-methylacrylate
Methyl 2-methyl 2 propenoate

3.2 **Coast Guard Compatibility Classification:** Acrylate

3.3 **Chemical Formula:** $CH_2=C(CH_3)COOCH_3$

3.4 **IMCO/United Nations Numerical Designation:** 3.2/1247

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as Shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp, fragrant, pleasant smelling pungent ester

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air mask, plastic gloves, goggles

5.2 **Symptoms Following Exposure:** Irritation of eyes, nose, and throat. Nausea and vomiting. Liquid may cause skin irritation.

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, apply artificial respiration and oxygen if needed, refer to physician. SKIN OR EYES: flush with plenty of water for 15 min., refer to physician for eye exposure.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1, LD_{50} 5 to 15 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure, may cause secondary burns on long exposure

5.10 **Odor Threshold:** 0.05 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 50°F O.C.

6.2 **Flammable Limits in Air:** 2.1% - 12.5%

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Containers may explode in fire or when heated because of polymerization

6.7 **Ignition Temperature:** 790°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 2.5 mm/min.

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Heat, oxidizing agents, and ultraviolet light may cause polymerization

7.6 **Inhibitor of Polymerization:** Hydroquinone, 22-65 ppm, hydroquinone methyl ether, 22-120 ppm, dimethyl tert-butylphenol, 45-65 ppm

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 250 ppm/96 hr/bluegill/TL_m/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** (theor.) 1.47%, 30 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. American Cyanamid Co
Industrial Chemicals & Plastic Division
Wayne, N.J. 07470
2. E. I. duPont de Nemours & Co. Inc
Industrial and Biochemicals Dept
Wilmington, Del. 19898
3. Rohm and Haas Co
Independence Mall West
Philadelphia, Pa. 19105

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.8%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-Q-T-U-V-W-Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 100.12

13.3 **Boiling Point at 1 atm:** 214°F = 101°C = 374°K

13.4 **Freezing Point:** −54°F = −48°C = 225°K

13.5 **Critical Temperature:** 561°F = 294°C = 567°K

13.6 **Critical Pressure:** 485 psia = 33 atm = 3.3 MN/m²

13.7 **Specific Gravity:** 0.945 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 28 dynes/cm = 0.028 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 14.3 dynes/cm = 0.0143 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.059

3.12 **Latent Heat of Vaporization:** 140 Btu/lb = 77 cal/g = 3.2 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) −11,400 Btu/lb = −6,310 cal/g = −264 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** −248 Btu/lb = −138 cal/g = −5.78 × 10⁵ J/kg

(Continued on pages 5 and 6)

NOTES

REVISED 1978

MPT	METHYL PARATHION

Common Synonyms		
Metron MPT Parathi Alkron Nitrox Wofatox	Solid crystals or liquid or solution	White solid or brown liquid
	Rotten eggs or garlic odor	
	Solid and liquid sink in water, solution floats on water Melting (freezing) point is 65° F	

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED
Containers may explode in fire

Exposure

LIQUID OR SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Solution is foaming to shoreline
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 448-4)

Issue warning – poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** MPT, O,O-Dimethyl O-(p-Nitrophenyl) Phosphorothioate, O,O-Dimethyl O-p-Nitrophenyl thiophosphate, Parathion-methyl

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $(CH_3O)_2PSOC_6H_4NO_2$

3.4 **IMCO/United Nations Numerical Designation:** 6.1/1668

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid

4.2 **Color:** Colorless solid or brownish liquid

4.3 **Odor:** Characteristic; like rotten eggs or garlic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved mask or respirator, natural rubber gloves, over shoes, protective clothing, goggles

5.2 **Symptoms Following Exposure:** Exposure to fumes from a fire, or to the liquid, causes headache, blurred vision, constricted pupils of the eyes, weakness, nausea, cramps, diarrhea, and tightness in the chest. Muscle twitch and convulsions may follow. Symptoms may develop over a period of 8 hrs.

5.3 **Treatment for Exposure:** *Speed is essential.* INGESTION: call a doctor! If victim is not breathing, immediately institute artificial respiration by mouth-to-mouth, mouth-to-nose, or mouth-to-oropharyngeal method, when victim is conscious, give milk, water, or salt water and induce vomiting repeatedly. SKIN OR EYES: flood and wash exposed areas thoroughly with water, remove contaminated clothing under a shower.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ (solid), 100 ppm (solution)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4. LD_{50} below 50 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Poisonous when absorbed through skin

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 115°F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic gases are produced in fires

6.6 **Behavior in Fire:** Drums may rupture violently

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Half decomposed in 8 days at 40°C

7.2 **Reactivity with Common Materials:** is absorbed in wood, etc., which must be replaced to eliminate poison hazard

7.3 **Stability During Transport:** Decomposes above 50°C with possible explosive force

7.4 **Neutralizing Agents for Acids and Caustics:** Apply caustic or soda ash slurry until yellow stains disappear

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
1.9 ppm/96 hr/bluegill/TL_m/fresh water
2.3 ppm/96 hr/fathead/TL_m/fresh water

8.2 **Mammalian Toxicity:** LD_{50} = 10 mg/kg

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. Hercules, Inc
   Synthetics Dept
   Plaquemine, La 70764
2. Monsanto Co
   Agricultural Division
   800 N. Lindbergh Blvd
   St. Louis, Mo 63166
3. Stauffer Chemical Co
   Agricultural Chemicals Division
   Green Farms Rd
   Westport, Conn 06880

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure (solid); technical (liquid) 80% in xylene

10.2 **Storage Temperature:** Below 50°

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 448-3)

A-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification	
	Xylene sol'n	Solid
Health Hazard (Blue)	4	3
Flammability (Red)	3	1
Reactivity (Yellow)	2	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid or solid

13.2 **Molecular Weight:** 263.2

13.3 **Boiling Point at 1 atm:** Very high

13.4 **Freezing Point:** 65°F = 18°C = 291°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.360 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(See next page 5 and 6)

NOTES

REVISED 1978

MPD — METHYL PHOSPHONOTHIOIC DICHLORIDE (ANHYD)

Common Synonym			
MPTD	Liquid	Colorless	Sharp Unpleasant Odor
	Sinks and mixes violently with water		

Fire

Combustible
Irritating gases may be produced when heated

Exposure

AVOID MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - corrosive water contaminant
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** MPTD
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** CH_3PSCl_2
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Clear
4.3 **Odor:** Acid

5. HEALTH HAZARDS

Use extreme care when handling this compound. Avoid any contact with liquid or vapor.

5.1 **Personal Protective Equipment:** Rubber or neoprene gloves, respirator, protective goggles
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat; effects are quite similar to those of phosgene. Ingestion causes irritation of mouth and stomach. Delayed pulmonary edema may occur from exposure to vapor. Liquid causes severe irritation; contact with skin causes irritation and burns.
5.3 **Treatment for Exposure:** *Get medical attention after all exposures to this compound.* INHALATION: remove victim to fresh air, alert physician to delayed effects similar to those of phosgene. INGESTION: give large amount of water and induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** >122°F O.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam
6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride, sulfur dioxide and other fumes may be formed in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts with water to form hydrochloric acid and methylphosphonothioic acid and hydrogen chloride vapor. The reaction may be violent.
7.2 **Reactivity with Common Materials:** Corrosive to metals because of its high acidity.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, treat with dilute sodium bicarbonate or soda ash solution.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Ethyl Corporation
Industrial Chemicals Div.
451 Florida
Baton Rouge, La. 70801

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 134
13.3 **Boiling Point at 1 atm:** Data not available
13.4 **Freezing Point:** -14.1°F = -25.6°C = 24.6°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.42 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** (est.) 110 Btu/lb = 60 cal/g = 2.5 x 10⁵ J/kg
13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 2 and 3

NOTES

MPY	1-METHYLPYRROLIDONE

Common Synonyms
N-Methylpyrrolidone
1 Methyl-2 pyrrolidinone
N-Methylpyrrolidinone
N-Methyl-alpha-pyrrolidone

Liquid | White | Mild Fishy odor

May float or sink in water

As a liquid contact with liquid Keep people away
Stop discharge if possible
Call fire department
Isolate and remove leaking material
Notify local health and pollution control agencies

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
Wear goggles and self contained breathing apparatus
Extinguish with dry chemicals foam or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS and victim drink water, milk and induce vomiting immediately
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify downstream users of water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1-Methyl-2-pyrrolidinone, N-Methylpyrrolidinone, N Methyl pyrrolidone, N Methyl *alpha* pyrrolidone

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** C_5H_9NO

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild amine like

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation of hot vapors can irritate nose and throat Ingestion causes irritation of mouth and stomach Contact with eyes causes irritation Repeated and prolonged skin contact produces a mild transient irritation

5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amount of water and induce vomiting EYES flush with water for at least 15 min SKIN remove from skin and eyes by flooding the affected tissues with water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 3 5 mg/kg (rabbit)

5 7 **Late Toxicity:** Causes blood abnormalities in rats

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 204°F O C

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical alcohol foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may be formed in fire

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature.** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

2 Eastman Organic Chemicals
Rochester N Y 14650

3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 99

13 3 **Boiling Point at 1 atm:** 396°F = 202°C = 475°K

13 4 **Freezing Point:** 1°F = −17°C = 256°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 1 03 at 25°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 3 4

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion:** −13 000 Btu/lb = −7 220 cal/g = −302 × 10³ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

MSR	alpha-METHYLSTYRENE

Common Synonyms
Isopropenylbenzene
Phenylpropylene
1 Methyl-1 phenylethylene

Liquid — Colorless

Floats on water.

Avoid contact with liquid. Keep people away.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
Extinguish with dry chemicals, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID
LIQUID
Will burn skin and eyes
If swallowed will cause nausea and vomiting
Avoid contaminated clothing and shoes.
Wash skin with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS give victim drink water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes
Notify downstream users of water intakes.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Isopropenylbenzene
1 Methyl 1 phenylethylene
Phenylpropylene

3 2 **Coast Guard Compatibility Classification:** Olefin

3 3 **Chemical Formula.**
$C_6H_5C(CH_3)=CH_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Neoprene gloves, splashproof goggles or face shield

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory tract, headache dizziness, light headedness and breathlessness. Ingestion causes irritation of mouth and stomach. Contact with liquid irritates eyes. Prolonged skin contact can cause severe rashes, swelling and blistering.

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, if he is not breathing give artificial respiration, contact a physician, keep victim quiet and warm. INGESTION: do NOT induce vomiting, call physician. EYES: flush with water for at least 15 min, get medical attention. SKIN: wash area with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5 5 **Short-Term Inhalation Limits:** 100 ppm, 30 min

5 6 **Toxicity by Ingestion:** Grade 2 LD$_{50}$ 0 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** <10 ppm

6. FIRE HAZARDS

6 1 **Flash Point:** 137°F C C

6 2 **Flammable Limits in Air:** 1 9% 6 1%

6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** 1 065°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Hazardous polymerization unlikely to occur except when in contact with alkali metals or metallo-organic compounds

7 6 **Inhibitor of Polymerization:** 10 20 ppm tert butylcatechol

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 10 ppm, 96 hr/fathead minnow/TLm

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Plastics Division
P O Box 2 65R
Morristown N J 07960

2 United States Steel Co
Chemicals Division
600 Grant St
Pittsburgh Pa 15230

3 Dow Chemical Co
2030 Dow Center
Midland Mich 48640

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

CT-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 118 17

13 3 **Boiling Point at 1 atm.** 329°F = 165°C = 438°K

13 4 **Freezing Point:** −9 8°F = −23 2°C = 250 0°K

13 5 **Critical Temperature:** 719 1°F = 381 7°C = 654 9°K

13 6 **Critical Pressure:** 494 psia = 33 6 atm = 3 41 MN/m

13 7 **Specific Gravity:** 0 91 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 33 88 dynes/cm = 0 03388 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** Data not available

13 10 **Vapor (Gas) Specific Gravity:** 4 08

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 060 at 27°C

13 12 **Latent Heat of Vaporization:** 140 4 Btu/lb = 78 0 cal/g = 3 26 × 10⁵ J/kg

13 13 **Heat of Combustion:** −17,690 Btu/lb = −9 830 cal/g = −411 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization:** Data not available

(Continued on pages 5 and 6)

NOTES

NTS METHYLTRICHLOROSILANE

Common Synonyms

Liquid Colorless Sharp irritating odor

Reacts violently with water Irritating gas is produced on contact with water

AVOID CONTACT WITH LIQUID AND VAPOR KEEP FOREVER AWAY
Wear goggles Use a self contained breathing apparatus or chemical cartridge
Avoid flooding with water
Shut off leak if possible
Call fire department
Stop flash if possible
Is flammable? Is explosive? Is toxic? Is corrosive? Is reactive?
Notify local health and pollution control agencies

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self contained breathing apparatus
Extinguish with dry chemicals or carbon dioxide
DO NOT USE WATER OR FOAM ON FIRE
DO NOT USE WATER OR FOAM ON ADJACENT FIRES

Exposure

Call for medical aid
VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing
Move victim to fresh air
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen
LIQUID
Will burn skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
air contaminant
Restrict access
Evacuate area
Disperse and flush with care

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichloromethylsilane
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula.** CH_3SiCl_3
3.4 **IMCO/United Nations Numerical Designation:** 3/1250

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Acrid sharp like hydrochloric acid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full protective clothing, acid vapor type respirator protection rubber gloves chemical worker's goggles other protective equipment as necessary to protect skin and eyes
5.2 **Symptoms Following Exposure** Inhalation causes irritation of mucous membrane Contact with liquid causes severe burns of eyes and skin Ingestion causes severe burns of mouth and stomach
5.3 **Treatment for Exposure:** Get medical attention at once following all exposures to this compound INHALATION remove victim from exposure give artificial respiration if breathing has ceased EYES flush with water for 15 min SKIN flush with water INGESTION do NOT induce vomiting give large amounts of water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 LD50 to 560 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury They cannot be tolerated even at low concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant Causes second and third degree burns on short contact and is very injurious to the eyes
5.10 **Odor Threshold:** Decomposes in moist air creating HCl with odor threshold of 1 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 45°F O.C., 15°F C.C.
6.2 **Flammable Limits in Air:** 5.1% – 20%
6.3 **Fire Extinguishing Agents:** Dry chemical carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used.** Water foam
6.5 **Special Hazards of Combustion Products.** Toxic hydrogen chloride and phosgene gases may form in fire
6.6 **Behavior in Fire:** Difficult to extinguish re-ignition may occur Contact with water applied to adjacent fires produces irritating hydrogen chloride
6.7 **Ignition Temperature** >760°F
6.8 **Electrical Hazard** Data not available
6.9 **Burning Rate:** 1.9 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride (hydrochloric acid)
7.2 **Reactivity with Common Materials:** Reacts with surface moisture to evolve hydrogen chloride, which is corrosive to metals
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water rinse with sodium bicarbonate or lime solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York N.Y. 10017

2 Dow Corning Corporation
P.O. Box 592
Midland Mich 48640

3 General Electric Company
Silicone Products Department
Waterford N.Y. 12188

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 98+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid
13.2 **Molecular Weight:** 149.5
13.3 **Boiling Point at 1 atm.** 151.5°F = 66.4°C = 339.6°K
13.4 **Freezing Point:** −130°F = −90°C = 183°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.27 at 25°C (liquid)
13.8 **Liquid Surface Tension:** 20.3 dynes/cm = 0.0203 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 5.16
13.11 **Ratio of Specific Heats of Vapor (Gas).** Data not available
13.12 **Latent Heat of Vaporization.** 89.3 Btu/lb = 49.6 cal/g = 2.08 × 10⁵ J/kg
13.13 **Heat of Combustion:** (est.) −3,000 Btu/lb = −1,700 cal/g = −7.0 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

MVK — METHYL VINYL KETONE

Common Synonyms			
3 Buten 2-one	Liquid	Colorless to light yellow	Strong irritating

Mixes with water. Irritating vapor is produced

AVOID CONTACT WITH LIQUID. KEEP PEOPLE AWAY
Wear chemical protective clothing, including eyes
Stop flow if safe to do so
Stop flow if safe to do so
Isolate the area and evacuate
Notify local health and other authorities

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Extinguish with dry chemical, alcohol foam, or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

Move victim to fresh air
If breathing has stopped give artificial respiration
If breathing is difficult give oxygen
LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim CONSCIOUS give one or two glasses of water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

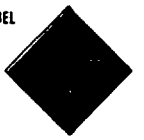
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: high flammability, water contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 3 Buten 2-one
3.2 **Coast Guard Compatibility Classification.** Not applicable
3.3 **Chemical Formula:** $CH_2COCH=CH_2$
3.4 **IMCO/United Nations Numerical Designation.** 3.2 1251

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to light yellow
4.3 **Odor:** Powerfully irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus with full face piece, rubber gloves, chemical goggles or face piece of breathing apparatus
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Vapor causes tears; contact with liquid can burn eyes. Liquid irritates skin and will cause burn if not removed at once. Ingestion causes irritation of mouth and stomach
5.3 **Treatment for Exposure.** Get medical attention for all exposures to this compound. INHALATION: move victim to fresh air, administer artificial respiration if necessary. EYES or SKIN: flush with copious quantity of water for 15 min. INGESTION: do NOT induce vomiting
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Grade 4, LD_{50} < 50 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns in short contact and is very injurious to the eyes
5.10 **Odor Threshold:** 0.5 mg/m³

6 FIRE HAZARDS

6.1 **Flash Point:** 30°F (0°C), 20°F (-7°C)
6.2 **Flammable Limits in Air:** 2.1 - 15.6%
6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. At elevated temperatures (fire conditions) polymerization may take place in containers, causing violent rupture. Unburned vapors are very irritating
6.7 **Ignition Temperature:** 918°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 4.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Polymerizes spontaneously upon exposure to heat or sunlight
7.6 **Inhibitor of Polymerization:** Up to 1% hydroquinone

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Pfizer, Incorporated
   Pfizer Chemical Division
   235 East 42nd Street
   New York, N.Y. 10017
2. Aldrich Chemical Co.
   940 West Saint Paul Ave.
   Milwaukee, Wis. 53233
3. Pfaltz and Bauer, Inc.
   126-04 Northern Boulevard
   Flushing, N.Y. 11368

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 98.5+%
10.2 **Storage Temperature:** Cool ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

V P Q R S

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	2
Aesthetic Effect	x
Reactivity	
Other Chemicals	x
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 70.1
13.3 **Boiling Point at 1 atm:** 178.5°F = 81.4°C = 354.6°K
13.4 **Freezing Point:** 20°F = -7°C = 266°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.864 at 20°C (Liquid)
13.8 **Liquid Surface Tension** (est.): 24 dynes/cm = 0.024 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.4
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1053
13.12 **Latent Heat of Vaporization** (est.): 203 Btu/lb = 113 cal/g = 4.73×10^5 J/kg
13.13 **Heat of Combustion:** (est.) -14 600 Btu/lb = -8 100 cal/g = -340×10^5 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** -455 Btu/lb = -253 cal/g = -10.6×10^5 J/kg

(Continued on pages 5 and 6)

NOTES

MNS	MINERAL SPIRITS

Common Synonyms Petroleum spirits Naphtha	Watery liquid Colorless Gasoline-like odor Floats on water
[illegible]	
Fire	**Combustible** Extinguish with water, dry chemical, or foam [illegible] [illegible] explosive vapors with water
Exposure	CALL FOR MEDICAL AID **LIQUID** **Irritating to skin and eyes** **Harmful if swallowed.** [illegible] Flush with plenty of water IF INHALED [illegible] fresh air IF SWALLOWED [illegible] 10°SEE [illegible] drink water [illegible] milk DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Naphtha
Petroleum spirits

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO/United Nations Numerical Designation:** 3 3/1300

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Like gasoline

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Plastic gloves, goggles or face shield (as for gasoline)

5 2 **Symptoms Following Exposure:** INHALATION mild irritation of respiratory tract ASPIRATION severe lung irritation and rapidly developing pulmonary edema central nervous system excitement followed by depression INGESTION irritation of stomach

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air ASPIRATION enforce bed rest, give oxygen call a doctor INGESTION do NOT induce vomiting, guard against aspiration into lungs EYES wash with copious amounts of water SKIN wipe off and wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5 5 **Short-Term Inhalation Limits:** 4000 - 7000 ppm for 60 min

5 6 **Toxicity by Ingestion:** Grade 2, 1 D_{50} 0 5 to 5 g/kg

5 7 **Lethal Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 105-140°F C C, depending on grade

6 2 **Flammable Limits in Air:** 0 8% - 5 0%

6 3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical

6 4 **Fire Extinguishing Agents Not to be Used:** Do not use straight hose water stream

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 540°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 8%, 5 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Atlantic Richfield Co
717 Fifth Ave
New York, N Y 10022

2 Phillips Petroleum
Bartlesville, Okla 74004

3 Shell Oil Co
1 Shell Plaza
Houston, Tex 77001

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Various grades available 70-100% of the materials are derived from petroleum, and 0-30% are aromatic hydrocarbons like benzene and toluene Flash points vary with the exact composition but are usually above 100°F

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 445-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** 310 395°F = 154 202°C = 428 475°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 78 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** (est) 1 030

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

MTO	MOLYBDIC TRIOXIDE

Common Synonyms	Solid	Colorless to white or yellow	Odorless
Molybdenum trioxide Molybdic anhydride	Sinks in water		

[illegible]

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID **SOLID** **Irritating to skin and eyes** **Harmful if swallowed** [illegible] IF SWALLOWED [illegible] CONSCIOUS [illegible] water [illegible] milk IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS **May be dangerous if it enters water intakes** [illegible] Notify operators of nearby water intake

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Molybdenum trioxide, Molybdic anhydride

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula:** MoO_3

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Colorless or white-yellow to yellow

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** U S Bu Mines approved respirator safety glasses or face shield, protective gloves

5 2 **Symptoms Following Exposure** Compound is relatively nontoxic Dust irritates eyes

5 3 **Treatment for Exposure:** No treatment necessary except those applicable to any nontoxic dust EYES flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m³

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 3 LD$_{50}$ 500 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 70 ppm/96 hr/fathead minnow/TLm soft water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential.** None listed

9. SELECTED MANUFACTURERS

1 Kennecott Copper Corp
Utah Copper Div
P O Box 11299
Salt Lake City Utah 84111

2 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown N J 07960

3 Climax Molybdenum Company
One Greenwich Plaza
Greenwich Conn 06830

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 99 8 61 6% Reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 143 94

13 3 **Boiling Point at 1 atm:** Not pertinent

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 4 69 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(continued on pages 5 and 6)

NOTES

MCA — MONOCHLOROACETIC ACID

Common Synonyms

Chloroacetic acid
Chloracetic acid

Solid or heated liquid — Cloudy white solid, liquid is colorless to light yellow — Strong vinegar-like odor

Mixes with water

Avoid contact with liquid. Keep people away.
[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

Call medical aid
LIQUID OR SOLID
Will burn skin and eyes.
Harmful if swallowed
[illegible]
IF IN EYES [illegible] water
IF SWALLOWED [illegible] CONSCIOUS [illegible]
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — corrosive
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chloracetic acid
Chloroacetic acid

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $ClCH_2COOH$

3.4 **IMCO/United Nations Numerical Designation:** Liquid 8/1750
Solid 8/1751

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid or solid

4.2 **Color:** Solid translucent white
Liquid clear to light amber

4.3 **Odor:** Characteristic penetrating odor similar to vinegar

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, vinyl or neoprene rubber gloves, goggles and protective face shield, rubberized or acid resistant clothing

5.2 **Symptoms Following Exposure:** Inhalation causes mucous membrane irritation. Contact with liquid causes severe irritation and burns of the eyes and irritation and burns of skin. Ingestion causes burns of mouth and stomach

5.3 **Treatment for Exposure:** Get medical attention for all exposures to this compound
INHALATION: remove victim to fresh air and enforce rest until medical attention is obtained
EYES: flush with running water for 15 min. SKIN: flush with water, get treatment for burns
INGESTION: give large amount of water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} 76.2 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes

5.10 **Odor Threshold:** 0.15 mg/m³

6. FIRE HAZARDS

6.1 **Flash Point:** (almost nonflammable) 259°F C.C.

6.2 **Flammable Limits in Air:** n/a (LFL)

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Hydrogen chloride and phosgene may be generated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available, difficult to ignite

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Causes mild corrosion of common metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water, rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Hercules Incorporated
Coatings & Specialty Products Dept
910 Market Street
Wilmington, Del. 19899

2. Dow Chemical Co.
Midland, Mich. 48640

3. McKesson Chemical Co.
Crocker Plaza
One Post St.
San Francisco, Calif. 94104

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 97-98

10.2 **Storage Temperature:** Solid ambient
Liquid 70°C (158°F)

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.**
Corrosive liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	4
Water	2
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 94.5

13.3 **Boiling Point at 1 atm**
372°F = 189°C = 462 K

13.4 **Freezing Point:**
140°F = 60°C = 333°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.58 at 20°C (solid)

13.8 **Liquid Surface Tension**
33 dynes/cm = 0.033 N/m at 50°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization** 250 Btu/lb
= 139 cal/g = 5.82 × 10⁵ J/kg

13.13 **Heat of Combustion.** (solid)
−1,814 Btu/lb = −1,008 cal/g
= −42.17 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** −63 Btu/lb
= −35 cal/g = −1.47 × 10⁵ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

MCF	MONOCHLORODIFLUOROMETHANE

Common Synonyms
Freon 22
Genetron 22
Isotron 22
Leon 22

Liquefied compressed gas Colorless Faint odor

Liquid sinks and boils in water Visible vapor cloud is formed

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

VAPOR
Not irritating to eyes, nose or throat
If inhaled, will cause dizziness or loss of consciousness

LIQUID
Will cause frostbite

Water Pollution

Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Chlorodifluoromethane
Eskimon 22 Genetron 22
F 22 Isotron 22
Freon 22 Freon 22

3 2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3 3 **Chemical Formula:** $CHClF_2$

3 4 **IMCO United Nations Numerical Designation:** 2 0 018

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied gas

4 2 **Color:** Colorless

4 3 **Odor:** Faint ethereal like carbon tetrachloride

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves, goggles

5 2 **Symptoms Following Exposure:** Inhalation at greater than 10% concentration vapor may cause narcosis. Liquid may cause frostbite

5 3 **Treatment for Exposure:** Remove victim to non-contaminated area and apply artificial respiration if breathing has stopped. Call a physician immediately. Oxygen inhalation may be utilized

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1000 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Not pertinent

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin because it evaporates quickly. Liquid may cause frostbite

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Decomposition gases are toxic and irritating

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** None

8 2 **Waterfowl Toxicity:** None

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 E I duPont de Nemours & Co, Inc
Freon Products Division
Wilmington Del 19898

2 Pennwalt Corp
Chemicals Division
3 Penn Center
Philadelphia, Pa 19102

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave.
New York, N Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Propellant grade

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NC 1 J

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Nonflammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight:** 86 48

13 3 **Boiling Point at 1 atm:** −40 9°F = −40 5°C = 232 7°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** 204 8°F = 96 0°C = 369 2°K

13 6 **Critical Pressure:** 716 psia = 4 87 atm = 4 93 MN/m

13 7 **Specific Gravity:** 1 41 at −40°C (liquid)

13 8 **Liquid Surface Tension:** (est) 15 dynes/cm = 0 015 N/m at −41°C

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** 3 0

13 11 **Ratio of Specific Heats of Vapor (Gas):** (est) 1 13

13 12 **Latent Heat of Vaporization:** 101 Btu/lb = 5 9 cal/g = 2 34 × 10⁴ J/kg

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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MEA	MONOETHANOLAMINE

Common Synonyms beta-Aminoethyl alcohol 2-Hydroxyethylamine Ethanolamine 2-Aminoethanol	Oily liquid Colorless Slight ammonia odor Sinks and mixes with water Freezing point is 51°F
	[illegible]
Fire	Combustible [illegible]
Exposure	[illegible] LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2-Aminoethanol
beta-Aminoethyl alcohol
Ethanolamine
2-Hydroxyethylamine

3.2 **Coast Guard Compatibility Classification:** Alkanolamines

3.3 **Chemical Formula:** $HOCH_2CH_2NH_2$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mildly ammoniacal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full face shield, goggles, eye wash facilities

5.2 **Symptoms Following Exposure:** Vapor irritates eyes and nose. Liquid causes local injury to mouth, throat, digestive tract, skin, and eyes

5.3 **Treatment for Exposure:** INGESTION: induce vomiting by giving large volumes of warm salt water (2 tablespoons per glass), call a doctor. EYES: flush with water for at least 15 min., call a doctor. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 3 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 185°F C.C., 200°F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Water spray, alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating vapors generated when heated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 7100 ppm/48 hr/shrimp/LC_{50}/salt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 78%, 5 days, (theor.) 0%, 5 days, 64% 20 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co
   Midland, Mich. 48640
2. Jefferson Chemical Co
   3336 Richmond Ave
   Houston, Tex. 77052
3. Union Carbide Corp
   Chemicals and Plastics Division
   270 Park Ave
   New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** NF 85% (15% water), commercial 99+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive Material

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	-
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 61.08

13.3 **Boiling Point at 1 atm:** 338°F = 170°C = 443°K

13.4 **Freezing Point:** 50.5°F = 10.3°C = 283.5°K

13.5 **Critical Temperature:** 646°F = 341°C = 614°K

13.6 **Critical Pressure:** 647 psia = 44 atm = 4.45 MN/m²

13.7 **Specific Gravity:** 1.016 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 360 Btu/lb = 200 cal/g = 8.37 × 10⁵ J/kg

13.13 **Heat of Combustion:** -10,710 Btu/lb = -5950 cal/g = -249 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible] = -10 cal/g = -0.4 × 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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MPA	MONOISOPROPANOLAMINE

Common Synonyms
Isopropanolamine
1 Amino 2-propanol
2-Hydroxypropylamine

Thick liquid — Colorless — Slight ammonia odor

Floats and mixes with water. Freezing point is 35° F

[illegible]

Fire

Combustible
[illegible]
Extinguish with [illegible]

Exposure

CAUTION MEDICAL AID
LIQUID OR SOLID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
IF SWALLOWED [illegible] CONSCIOUS [illegible] WATER
[illegible]
IF SWALLOWED [illegible] UNCONSCIOUS [illegible] BEHAVIOR [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1-Amino 2 propanol
2 Hydroxypropylamine
Isopropanolamine

3.2 **Coast Guard Compatibility Classification:** Alkanolamines

3.3 **Chemical Formula:** $CH_3CHOHCH_2NH_2$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mildly ammoniacal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full face shield, goggles, eye wash facilities

5.2 **Symptoms Following Exposure:** Vapor irritates eyes and nose. Liquid causes local injury to mouth, throat, digestive tract, skin, and eyes

5.3 **Treatment for Exposure:** INGESTION: induce vomiting by giving large volumes of warm salt water (2 tablespoons per glass) call a doctor. EYES: flush with water for at least 15 min and call a doctor. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 165°F O.C. 171°F C.C.

6.2 **Flammable Limits in Air:** 2.2% (calc.) 1.2% (test)

6.3 **Fire Extinguishing Agents:** Dry chemical, water spray, alcohol foam or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating vapors generated when heated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 706°F (est.)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 1.1 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** (theor.) 5.1% 5 days, 46%, 20 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich. 48640

2 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 98.5+%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 75.11

13.3 **Boiling Point at 1 atm:** 320°F = 160°C = 433°K

13.4 **Freezing Point:** 35.4°F = 1.9°C = 275.1°K

13.5 **Critical Temperature:** 622°F = 328°C = 601°K

13.6 **Critical Pressure:** 850 psia = 58 atm = 5.9 MN/m²

13.7 **Specific Gravity:** 0.941 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 272 Btu/lb = 151 cal/g = 6.32 × 10³ J/kg

13.13 **Heat of Combustion:** (est.) −13,900 Btu/lb = −7,700 cal/g = −322 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) −17 Btu/lb = −10 cal/g = −0.4 × 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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MPL	MORPHOLINE

Common Synonyms
Tetrahydro-2H-1,4-oxazine
Tetrahydro-p-oxazine

Oily liquid Colorless Fishy, ammonia odor

Floats and mixes with water. Irritating vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea, headache, or difficult breathing

LIQUID
Irritating to skin and eyes

Water Pollution

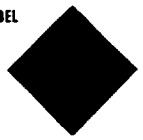
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diethylenimide oxide
Diethylene imidoxide
Diethylene oximide
Tetrahydro-2H-1,4-oxazine
Tetrahydro-p-oxazine

3.2 **Coast Guard Compatibility Classification:** Aliphatic amine

3.3 **Chemical Formula:** $OCH_2CH_2NHCH_2CH_2$

3.4 **IMCO/United Nations Numerical Designation:** 3.3/2054

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Fishy, ammoniacal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister or self-contained breathing apparatus, rubber boots and gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Liquid causes skin and eye burns. Breathing vapors or absorption through skin may cause nausea and headache

5.3 **Treatment for Exposure:** INHALATION: if ill effects occur, move patient to fresh air, keep him quiet and warm, and call a physician; if breathing stops, start artificial respiration. INGESTION: force milk or water, then immediately induce vomiting; treat symptomatically, no known antidote. SKIN OR EYES: immediately flush with plenty of water for at least 15 min; for eyes get medical attention promptly

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 20 ppm

5.5 **Short Term Inhalation Limits:** 20 ppm for 15 min

5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} 0.5 to 5 g/kg (guinea pig, rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** 0.01 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 100°F O.C.

6.2 **Flammable Limits in Air:** 1.8% - 10.8%

6.3 **Fire Extinguishing Agents:** Water fog, alcohol foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel some distance to source of ignition and flash back

6.7 **Ignition Temperature:** 590°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 1.9 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** (theor.) 0.9%, 5 days 5.1%, 20 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640
2. Jefferson Chemical Co., Inc.
3336 Richmond Ave.
P.O. Box 53300
Houston, Tex. 77052
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Several grades available, most above 99%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-P-O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 87.12

13.3 **Boiling Point at 1 atm:** 262.8°F = 128.2°C = 401.4°K

13.4 **Freezing Point:** 23.4°F = −4.8°C = 268.4°K

13.5 **Critical Temperature:** 653°F = 345°C = 618°K

13.6 **Critical Pressure:** 794 psia = 54 atm = 5.47 MN/m²

13.7 **Specific Gravity:** 1.00 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.091

13.12 **Latent Heat of Vaporization:** 182.9 Btu/lb = 101.6 cal/g = 4.254 × 10⁵ J/kg

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

MFA — MOTOR FUEL ANTI-KNOCK COMPOUNDS CONTAINING LEAD ALKYLS

Common Synonyms

Oily liquid — Dyed red, orange or blue — Sweet fruity odor

Sinks in water

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE
Container may explode when heated

Exposure

CALL FOR MEDICAL AID

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — poison
Restrict access
Evacuate area
Should be removed
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Motor fuel antiknock compound
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO/United Nations Numerical Designation:** 6.1/1649

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Red, orange, or blue
4.3 **Odor:** Sweet, musty, fruity odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor cartridge type face mask for emergencies or short duration, fresh air mask for longer duration, impervious protective gloves, goggles as required, boots and light-colored clothing
5.2 **Symptoms Following Exposure:** Increased urinary output of lead. Large degree of absorption from inhalation or skin contact may cause insomnia, excitability, delirium, coma and death
5.3 **Treatment for Exposure:** Call a physician for any exposure. INHALATION: remove from exposure. INGESTION: no specific antidote. EYES: flush with plenty of water for about 15 min. SKIN: flush with kerosene, wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 — 0.15 mg/m³ (as lead)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Lethal Toxicity:** Lead poisoning
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. Toxic absorption through skin may occur
5.10 **Odor Th.** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 89°F — 265°F O.C.
6.2 **Flammable Limits in Air:** None established
6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic lead-containing gases are generated in fires
6.6 **Behavior in Fire:** Containers may explode
6.7 **Ignition Temperature:** Begins to decompose above 212°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Reacts with oxidizing materials, active metals and rust, but not considered hazardous
7.3 **Stability During Transport:** A self sustaining decomposition occurs if the temperature of the bulk liquid is above 212°F and a flame or hot metal surface serves to ignite the mass. The presence of ethylene dibromide makes the compound stable at 300°F for 15 hrs.
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** See Tetraethyl Lead
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. E.I. duPont de Nemours & Co. Inc
   Petroleum Chemicals Division
   Wilmington, Del. 19898
2. Ethyl Corp.
   Industrial Chemicals Division
   451 Florida St.
   Baton Rouge, La. 70801
3. PPG Industries, Inc.
   Houston Chemical Co. Division
   One Gateway Center
   Pittsburgh, Pa. 15222

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
50-60% mixed lead alkyls
18-36% ethylene dibromide
0-19% ethylene dichloride
2-12% toluene, other solvents, dyes
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** >200°F = >93°C = >366°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.5 — 1.7 at 15°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** (est.) 45 dynes/cm = 0.045 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030
13.12 **Latent Heat of Vaporization:** (est.) 101 Btu/lb = 56.2 cal/g = 2.35 × 10⁵ J/kg
13.13 **Heat of Combustion:** (est.) −18,200 Btu/lb = −10,100 cal/g = −42.4 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

N0123

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NAB — NABAM

Common Synonyms			
EBDC sodium salt Ethylenebis [dithiocarbamic acid], 4 sodium salt Disodium ethylenebis [dithiocarbamate] Chem Rim Inhibitor	Solid or solution Mixes with water	Colorless to light amber	Slight odor

NOT CONTAINED SOLUTION AND SOLID KEEP PEOPLE AWAY

Fire

Not flammable
Poisonous and flammable gases are produced if the solution boils

Exposure

CALL FOR MEDICAL AID

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat

LIQUID OR SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning, prevent water contamination
Restrict access
Should it remain?
Chemical and physical treatment

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chem Rim, Disodium ethylenebis [dithiocarbamate], Dithane, EBDC, 4 sodium salt, Ethylenebis dithiocarbamic acid, disodium salt

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C_4H_6N_2S_4Na_2$

3.4 **IMCO/United Nations Numerical Designation:** 6.1 1709

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or 22% solution in water

4.2 **Color:** Colorless to amber

4.3 **Odor:** Slight sulfide

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, safety goggles, rubber gloves

5.2 **Symptoms Following Exposure:** Contact with liquid causes eye and skin irritation; inhalation causes irritation of nose and throat; ingestion causes nausea

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; if breathing difficult, give oxygen; if indicated, CPR. EYES: flush with copious quantities of water for 15 min. SKIN: wash thoroughly with soap and water. INGESTION: induce vomiting and lavage stomach with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3 (moderately toxic)

5.7 **Late Toxicity:** Degradation products which are toxic

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** If water contained boils, poisonous hydrogen sulfide and flammable carbon disulfide vapors form

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction unless water is boiling hot, when poisonous hydrogen sulfide and flammable carbon disulfide vapors form

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 96 hr TLm (threshold limit concentration) [illegible] ppm; 10 ppm [illegible]
*Time period not specified

8.2 **Waterfowl Toxicity:** LD [illegible] (Not pertinent to acute exposure)

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Rohm & Haas Company
Independence Mall West
Philadelphia, Pa. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 22% solution in water

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES*

*13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

*13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

*13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

*13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

*13.12 **Latent Heat of Vaporization:** Not pertinent

*13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

*13.15 **Heat of Solution:** [illegible]

*13.16 **Heat of Polymerization:** Not pertinent

*Data not [illegible]

(continued on page [illegible])

NOTES

NCT	NAPHTHA: COAL TAR

Common Synonyms: Mixture of coal tar naphtha systems	Watery liquid. Colorless to pale yellow. Gasoline-like odor. Floats on water. Irritating vapor is produced.
[illegible]	
Fire	Combustible. [illegible]
Exposure	[illegible] **VAPOR** Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. [illegible] **LIQUID** Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to [illegible]. May be dangerous if it enters water intakes. [illegible]

1. RESPONSE TO DISCHARGE

(See Annex on Methods for Oils, CG-446-4)

Mechanical containment. Should be removed. Chemical and physical treatment.

2. LABELS

No hazard label required by Code of Federal Regulations.

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Mixture of benzene, toluene and xylenes

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale yellow

4.3 **Odor:** Like benzene, toluene and xylene

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Hide [illegible] vapor. [illegible] protective equipment is needed.

5.2 **Symptoms Following Exposure:** [illegible] The symptoms of acute benzene poisoning are [illegible] headache, [illegible] and [illegible] benzene.

5.3 **Treatment for Exposure:** Remove [illegible] exposed. Support respiration if [illegible] physician.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes, nose and throat [illegible] The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. If spilled on clothing and allowed to remain, may cause a stinging and reddening of the skin.

5.10 **Odor Threshold:** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Not reactive

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]
[illegible] Madison Ave
New York, N.Y. [illegible]

[illegible]
Organic Materials Division
Koppers Bldg
Pittsburgh, Pa. [illegible]

[illegible] Chemical Co.
Neville Island
Pittsburgh, Pa. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Purity varies with [illegible] and distillation range [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

A T E S [illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transport, size:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (liquid)

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** Data not available

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

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NTM	NAPHTHALENE, MOLTEN

Common Synonyms
Naphthalin
Tar camphor

Molten solid — Colorless — Mothballs odor

Solubility: Sinks and floats or sinks in water

[illegible]

Fire

Combustible

Wear goggles and self-contained breathing apparatus
Extinguish with water from the protected area if safe
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
SOLID OR LIQUID
Irritating to skin and eyes.

Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES: Hold lids apart and flush with plenty of water

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes

Notify Public Health or Conservation Authorities
Notify persons downstream of water intake

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Naphthalin
Tar Camphor

3.2 **Coast Guard Compatibility Classification:** Aromatic hydrocarbon

3.3 **Chemical Formula:** $C_{10}H_8$

3.4 **IMCO/United Nations Numerical Designation** 4.1 1334

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Coal tar, moth balls

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** U.S. Bureau of Mines approved organic vapors canister unit (USEM Type 3), rubber gloves, chemical safety goggles, face shield, coveralls and/or rubber apron, rubber boots or boots

5.2 **Symptoms Following Exposure:** Vapors or fumes are irritating to eyes, nose, and throat and may cause headaches, dizziness, nausea, etc. Solid may be irritating to skin

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air. SKIN OR EYES: flushing with plenty of water for at least 15 min; remove contaminated clothing immediately; call a physician

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 10 ppm

5.5 **Short-Term Inhalation Limits.** 15 ppm for 5 min

5.6 **Toxicity by Ingestion** Grade 2, oral rat LD_{50} = 1780 mg/kg

5.7 **Irritant Toxicity:** Data not available

5.8 **Vapors (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics** Hot liquids can cause severe burn. The solid may irritate the skin

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point** 174°F C.C., 190°F O.C.

6.2 **Flammable Limits in Air:** 0.9% - 5.9%

6.3 **Fire Extinguishing Agents:** Water fog, carbon dioxide, dry chemical, or foam

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products.** Toxic vapors given off in a fire

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature** 979°F

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate:** 4.3 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Molten naphthalene spatters and foams in contact with water. No chemical reaction is involved

7.2 **Reactivity with Common Materials:** None

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 150 mg/L 96 hr/sunfish/TL_m/fresh water
1.8 ppm 72 hr/fingerling salmon/critical salt water

8.2 **Waterborne Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** (theor.) 99.5% 6 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp.
Industrial Chemicals Division
Morristown, N.J. 07960

2. Ashland Oil, Inc.
Ashland Chemical Co. Division
Columbus, Ohio 43216

3. United States Steel Corp.
USS Chemicals Division
525 William Penn Place
Pittsburgh, Pa. 15230

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure, crude 95%
Pure mp = 176°F
Crude mp = 165-176°F

10.2 **Storage Temperature:** Elevated

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U-X

12. HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** ORM-A

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	[illegible]
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid

13.2 **Molecular Weight** 128.16

13.3 **Boiling Point at 1 atm:** 424°F = 218°C = 491°K

13.4 **Freezing Point:** 176.4°F = 80.2°C = 353.4°K

13.5 **Critical Temperature.** 557.4°F = 475.2°C = 748.4°K

13.6 **Critical Pressure** 588 psia = 40.0 atm = 3.05 MN/m²

13.7 **Specific Gravity:** 1.145 at 20°C (solid)

13.8 **Liquid Surface Tension** 31.8 dynes/cm = 0.0318 N/m at 100°C

13.9 **Liquid-Water Interfacial Tension** Data not available

13.10 **Vapor (Gas) Specific Gravity.** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.068

13.12 **Latent Heat of Vaporization:** 148 Btu/lb = 80.7 cal/g = 3.44 × 10⁵ J/kg

13.13 **Heat of Combustion** −16,720 Btu/lb = −9287 cal/g = −388 × 10⁵ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5-616

NOTES

NSV	NAPHTHA: SOLVENT

Common Synonyms Petroleum solvent	Watery liquid Colorless Gasoline-like odor Floats on water. Vapor is produced
[illegible]	
Fire	Combustible [illegible]
Exposure	ALL FOR MEDICAL AID **VAPOR** Not irritating to eyes, nose or throat If inhaled, will cause dizziness or loss of consciousness [illegible] **LIQUID** Irritating to skin and eyes Harmful if swallowed [illegible] Flush [illegible] to Eyes with plenty of water IF IN EYES [illegible] IF SWALLOWED [illegible] CONSCIOUS [illegible] drink water [illegible] DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms** Light naphtha; Petroleum solvent
3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula** Not applicable
3 4 **IMCO/United Nations Numerical Designation:** 3 2 1256

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color** Colorless
4 3 **Odor:** Like kerosene and gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield (as for gasoline)
5 2 **Symptoms Following Exposure:** Higher concentration of vapors may cause intoxication. If liquid is swallowed it may get into lungs by aspiration, not very irritating to skin or eyes
5 3 **Treatment for Exposure.** INHALATION remove to fresh air, treat symptoms. INGESTION do NOT induce vomiting call a doctor. EYES flush with water for 15 min. SKIN wipe off, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm
5 5 **Short-Term Inhalation Limits:** 500 ppm for 30 min
5 6 **Toxicity by Ingestion:** Grade 2 LD: 0.5 to 5 g/kg
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat
5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard. If spilled on clothing and allowed to remain, may cause irritating and reddening of skin
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** >100°F C C
6 2 **Flammable Limits in Air:** 0.8% - 5.0%
6 3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature** 444°F
6 8 **Electrical Hazard.** Class I, Group D
6 9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Pennsylvania Refining Co
Butler, Pa 16001
2 Sun Oil Co
St Davids, Pa 19087
3 Union Oil Co
Amsco Division
3100 S Meacham Rd
Palatine, Ill 60067

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Refined solvent, crude light solvent, crude heavy solvent
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A r U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight.** Not pertinent
13 3 **Boiling Point at 1 atm:** 266 - 311°F = 130 - 155°C = 403 - 428°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.85 - 0.87 at 20°C (liquid)
13 8 **Liquid Surface Tension.** 19 - 23 dynes/cm = 0.019 - 0.023 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** 39 - 51 dynes/cm = 0.039 - 0.051 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** (est) 1.030
13 12 **Latent Heat of Vaporization:** 130 - 150 Btu/lb = 71 - 81 cal/g = 3.0 - 3.4 × 10⁵ J/kg
13 13 **Heat of Combustion:** (est) = -18,200 Btu/lb = -10,100 cal/g = -42.4 × 10⁶ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

NSS	NAPHTHA: STODDARD SOLVENT

Common Synonyms	
Petroleum solvent Drycleaner naphtha Spotting naphtha	Watery liquid — Colorless — Gasoline-like odor Floats on water

[illegible]

Fire	**Combustible** Extinguish with [illegible] Cool exposed [illegible]
Exposure	CAUTION MILD ACID **LIQUID** **Irritating to skin and eyes** **Harmful if swallowed** [illegible] DO NOT INDUCE VOMITING
Water Pollution	**Effect of low concentrations on aquatic life is unknown** **Fouling to shoreline** **May be dangerous if it enters water intakes** [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label is required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Drycleaners naphtha
Petroleum solvent
Spotting naphtha

3 2 **Coast Guard Compatibility Classification**
Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula** Not applicable

3 4 **IMCO-United Nations Numerical Designation:** 3 3 1268

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Like gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield (a for gasoline)

5 2 **Symptoms Following Exposure:** High concentration of vapors may cause intoxication If liquid is swallowed it may get into lungs by aspiration not very irritating to skin or eyes

5 3 **Treatment for Exposure:** INHALATION remove patient from exposure treat symptoms INGESTION do NOT induce vomiting Call a doctor EYES flush with water for 15 min SKIN wipe off and wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 200 ppm

5 5 **Short-Term Inhalation Limits** 500 ppm for 30 min

5 6 **Toxicity by Ingestion.** Grade 2 LD 0 5 to 5 g/kg

5 7 **Late Toxicity** None

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are nonirritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Thresholds.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 110°F C C

6 2 **Flammable Limits in Air** 0 8% 5 0%

6 3 **Fire Extinguishing Agents.** Foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature.** 540°F (est)

6 8 **Electrical Hazard:** Class I Group D

6 9 **Burning Rate** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Pennsylvania Refining Co
Butler Pa 16001

2 Sun Oil Co
St Davids Pa 19087

3 Exxon Oil Co
Amsco Division
3100 S Meacham Rd
Palatine Ill 60067

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight** Not pertinent

13 3 **Boiling Point at 1 atm:** 320 390°F = 160-199°C = 433 472°K

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 78 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 19-23 dynes/cm = 0 019 0 023 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** 39 51 dynes/cm = 0 039 0 051 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity:** Data not available

13 11 **Ratio of Specific Heats of Vapor (Gas)** (est) 1 030

13 12 **Latent Heat of Vaporization** 130 150 Btu/lb = 71 83 cal/g = 3 0 3 4 × 10⁵ J/kg

13 13 **Heat of Combustion** (est) −18 200 Btu/lb = −10 100 cal/g = −424 × 10³ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

NVM	# NAPHTHA: VM & P
	(75% NAPHTHA)

Common Synonyms
Petroleum solvent
Light naphtha

Watery liquid — Colorless — Gasoline-like odor

Floats on water. Flammable, irritating vapor is produced

Stop discharge if possible. Keep people away
Shut off ignition sources and call fire department
Stay out of wind and use water spray to knock down vapor
Avoid contact with liquid and vapor
In late and remote discharged material
Notify local health and pollution control agencies

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Extinguish with foam, dry chemical, or carbon dioxide
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause dizziness or loss of consciousness
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — high flammability
Evacuate area
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Light naphtha
Painter's naphtha
Petroleum solvent

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO/United Nations Numerical Designation:** 3.2 1255

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Like gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield (as for gasoline)

5.2 **Symptoms Following Exposure:** Vapor irritates respiratory tract, causes coughing and mild depression. Aspiration causes severe lung irritation with coughing, gagging, and rapidly developing pulmonary edema. Ingestion irritates mouth and stomach, causes nausea, vomiting, swelling of abdomen, cardiac arrhythmias

5.3 **Treatment for Exposure:** INHALATION: maintain respiration if required. INGESTION: do NOT induce vomiting; observe for pneumonia; support if central nervous system depression occurs. ASPIRATION: enforce rest; administer oxygen; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** 500 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 1 LD50 to 15 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 20-55°F C.C.

6.2 **Flammable Limits in Air:** 0.9% - 6.7%

6.3 **Fire Extinguishing Agents.** Foam, carbon dioxide, or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel long distances to a source of ignition and flash back

6.7 **Ignition Temperature:** 450°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Pennsylvania Refining Co.
Butler, Pa. 16001
2. Sun Oil Co.
St. Davids, Pa. 19087
3. Union Oil Co.
Amsco Division
3100 S. Meacham Rd.
Palatine, Ill. 60067

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Petroleum hydrocarbons (90%) plus aromatic hydrocarbons such as benzene and toluene (10%)

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T L V-W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** 200-300°F = 93-149°C = 366-422°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.75 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 19.23 dynes/cm = 0.019-0.023 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 39.51 dynes/cm = 0.039-0.051 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Data not available

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030

13.12 **Latent Heat of Vaporization:** 130-150 Btu/lb = 71 kcal/kg = 36.3-4 × 10^3 J/kg

13.13 **Heat of Combustion:** (est.) −18,200 Btu/lb = −10,100 cal/g = −424 × 10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

NTI	# NAPHTHENIC ACIDS

Common Synonyms	Liquid — Gold to black May float or sink in water

Avoid contact with liquid and vapor. Keep people away.
Stop flow if safe to do so.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Combustible
Extinguish with dry chemicals, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
If in eyes: hold eyelids open and flush with plenty of water.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES: hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS: Give victim lots of water or milk.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do not give liquids. Call a doctor.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms
3 2 **Coast Guard Compatibility Classification** Not listed
3 3 **Chemical Formula**
$R_2C(CR_2CR_2CR_2C)R(CH_2)_nCOOH$
where $n = 2\ 6$
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Golden to black
4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety glasses or face mask
5 2 **Symptoms Following Exposure:** Principal effect is that of mild primary irritation when encountered in high concentrations. Inhalation of vapor causes coughing. Liquid is moderately irritating to eyes and slightly to moderately irritating to skin; excessive exposure could result in dermatitis.
5 3 **Treatment for Exposure:** INHALATION: remove to fresh air. INGESTION: give large amounts of water. EYES: flush with water until irritation subsides. SKIN: wash with soap and water; remove contaminated clothing and launder before reuse.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m³
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Oral rat LD_{50} = 1000 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
5 10 **Odor Threshold** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** 300°F O.C.
6 2 **Flammable Limits in Air:** 1.0% (LFL)
6 3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products.**
6 6 **Behavior in Fire:**
5 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard.** Data not available
6 9 **Burning Rate.** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
< 50 ppm/48-60 hr crayfish lethal fresh water
< 6 ppm/96 hr bluegill TL_m fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (dOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Exxon Chemical Co
1333 West Loop South
Houston, Texas 77027
2 Eastman Organic Chemicals
Rochester, N.Y. 14650
3 Sun Oil Co
1608 Walnut St
Philadelphia, Pa. 19103

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 100%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	4
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 200 250 (mixture)
13 3 **Boiling Point at 1 atm:** 270 470°F = 132 243°C = 405 516°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.982 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Data not available
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

NAO	1-NAPHTHYLAMINE

Common Synonyms			
1 Aminonaphthalene alpha-Naphthylamine	Solid Sinks in water	Light to dark brown	Weak ammonia-like odor

AVOID CONTACT WITH SOLID AND DUST KEEP PEOPLE AWAY
Wear [illegible]
Isolate and remove discharged material
[illegible]

Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE Irritating gases are produced when heated Explosion with water [illegible]
Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED Irritating to eyes [illegible] SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED [illegible] IF IN EYES hold eyelids open and flush with plenty of water IF SWALLOWED [illegible] CONSCIOUS OR IF VOMITING OCCURS [illegible] IF SWALLOWED induce VOMITING IF UNCONSCIOUS OR IF VOMITING OCCURS [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

None required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1-Aminonaphthalene, alpha Naphthylamine
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula:** $C_{10}H_7NH_2$
3 4 **IMCO/United Nations Numerical Designation:** 6 1 1650

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Tan to brown darkens on storage
4 3 **Odor:** Characteristic amine

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Complete protection for respiratory system eyes and skin
5 2 **Symptoms Following Exposure:** Inhalation may cause cyanosis (blue color in lips and under finger nails) Contact with liquid causes local irritation of eyes Neither ingestion nor contact with skin produces any recognized immediate effects
5 3 **Treatment for Exposure:** *Persons undergoing severe exposure to this compound should have continuing medical attention for possible development of cancer* INHALATION obtain medical attention for cyanosis EYES flush with water for at least 15 min SKIN wash carefully with soap and water INGESTION get medical attention
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 779 mg/kg (rat) 4,900 mg/kg (mammal)
5 7 **Late Toxicity:** Considered cancer producing particularly since it may contain up to 0.5% of 2 naphthylamine
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point.** (combustible solid) 315°F (C.C. (molten solid)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents.** Water dry chemical carbon dioxide foam
6 4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products.** Toxic nitrogen oxides are produced in a fire
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Aldrich Chemical Co
940 West Saint Paul Ave
Milwaukee Wis 53233

2 Eastman Kodak Co
Eastman Organic Chemicals
Rochester N Y 14650

3 E I duPont de Nemours & Co
Organic Chemicals Dept
Dyes and Chemicals Division
Wilmington Del 19898

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure Technical
10 2 **Storage Temperature:** Cool ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open Store containers in well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 143.2
13 3 **Boiling Point at 1 atm** 572°F = 300°C = 573°K
13 4 **Freezing Point:** 122°F = 50°C = 323 K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.12 at 25°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** −15,290 Btu/lb = −8,495 cal/g = −355.4 × 10 J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 6

NOTES

NHX	NEOHEXANE

Common Synonyms	
2 2 Dimethylbutane	Liquid Colorless Gasoline like odor Floats on water Flammable irritating vapor is produced

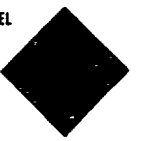
Fire	FLAMMABLE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes nose and throat If inhaled will cause dizziness coughing or difficult breathing LIQUID Irritating to skin and eyes. If swallowed will cause nausea or vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning high flammability
Restrict access
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2 2 Dimethylbutane

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula.** $CH_3CH_2C(CH_3)_2CH_3$

3 4 **IMCO/United Nations Numerical Designation:** 3 1 1288

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Like gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air supplied apparatus or organic vapor cartridge goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation causes dizziness nausea and vomiting concentrated vapor may cause unconsciousness and collapse Contact with liquid causes irritation of eyes repeated contact may produce irritation of skin Ingestion causes irritation of stomach Aspiration causes severe lung irritation rapidly developing pulmonary edema and central nervous system excitement followed by depression

5 3 **Treatment for Exposure:** INHALATION remove from exposure If breathing has stopped begin artificial respiration call a physician EYES flush with water for 15 min call physician if needed SKIN flush well with water then wash with soap and water INGESTION do NOT induce vomiting guard against aspiration into lungs call a doctor ASPIRATION enforce bed rest give oxygen get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** −54°F (C.C.)

6 2 **Flammable Limits in Air:** 1.2 to 7.0%

6 3 **Fire Extinguishing Agents.** Dry chemical foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature:** 797°F

6 8 **Electrical Hazard.** Data not available

6 9 **Burning Rate:** 9.2 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Phillips Petroleum Company
Chemical Department
Special Products Division
Bartlesville Okla 74004

2 Aldrich Chemical Co
940 West Saint Paul Ave
Milwaukee Wis 53233

3 Pfaltz and Bauer Inc
126-04 Northern Boulevard
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Research 99 9% Pure 99 9% Technical 96 4%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V E L A W

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight:** 86 2

13 3 **Boiling Point at 1 atm:** 121°F = 49.7°C = 322.9°K

13 4 **Freezing Point.** −147°F = −99.9°C = 173 3°K

13 5 **Critical Temperature:** 420 1°F = 215 6°C = 488 8°K

13 6 **Critical Pressure:** 447 psia = 30.4 atm = 3 08 MN/m²

13 7 **Specific Gravity:** 0.649 at 20°C (liquid)

13 8 **Liquid Surface Tension.** 16 3 dynes/cm = 0.0163 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension.** 35 dynes/cm = 0.035 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 3 0

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.064 at 16°C

13 12 **Latent Heat of Vaporization.** 144 Btu/lb = 72 9 cal/g = 3 05 × 10⁵ J/kg

13 13 **Heat of Combustion:** −18 410 Btu/lb = −10 230 cal/g = −428 9 × 10⁵ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

NKA	# NICKEL ACETATE

Common Synonyms			
Nickel acetate tetrahydrate Acetic acid, Nickel (II) salt Nickelous acetate	Solid	Dull green	Odorless
	Sinks and mixes slowly with water		

Avoid contact with solid and dust. Keep people away.
No discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID **DUST** Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If in eyes, hold eyelids apart and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing difficult, give oxygen. **SOLID** Irritating to skin and eyes If swallowed will cause nausea and vomiting Remove contaminated clothing and shoes. Flush affected area with plenty of water. IF IN EYES: hold eyelids apart and flush with water. IF SWALLOWED: do not induce CONSCIOUS person to drink water, if sick. IF SWALLOWED: do not induce CONSCIOUS person to drink if CONVULSIONS.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. No [illegible] available. No [illegible] available.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
Acetic acid, nickel(2+) salt
Nickel acetate tetrahydrate
Nickelous acetate

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula:** $Ni(C_2H_3O_2)_2 \cdot 4H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Dull green

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Bu. Mines approved respirator, rubber gloves, safety goggles, protective clothing

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes vomiting. Contact with eyes causes irritation. May cause dermatitis on contact with skin.

5 3 **Treatment for Exposure:** INHALATION: remove to fresh air, get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with water. IN [illegible] consult physician if irritation persists. SKIN: wash with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³ (as nickel)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} [illegible] g/kg

5 7 **Late Toxicity:** Possible lung cancer

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 American Hoechst Corp
Chemicals and Plastics Div
Somerville, N J 08876

2 The Harshaw Chemical Co
1945 E 97th St
Cleveland, Ohio

3 J T Baker Chemical Co
Phillipsburg, N J 08865

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99% Reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 249.68

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.74 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

NAS	# NICKEL AMMONIUM SULFATE

Common Synonyms		
Ammonium nickel sulfate Ammonium disulfatonickelate (II) Nickel ammonium sulfate hexahydrate	Solid Sinks and mixes slowly with water	Dark green blue Odorless

[illegible]

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	CAUTION: [illegible] DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting [illegible]
Water Pollution	Effect of low concentrations on aquatic life unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Ammonium disulfatonickelate(II) Ammonium nickel sulfate Nickel ammonium sulfate hexahydrate

3.2 **Coast Guard Compatibility Classification** Not listed

3.3 **Chemical Formula:** $NiO_2NH_4SO_4 \cdot 6H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid

4.2 **Color:** Dark blue green

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Bu Mines approved respirator, rubber gloves, face shield or safety goggles, protective clothing

5.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes vomiting. Contact with eyes causes irritation. Contact with skin may cause dermatitis

5.3 **Treatment for Exposure:** INHALATION move to fresh air, get medical attention if exposure has been severe. INGESTION give large amount of water. EYES flush with water for at least 15 min, get medical attention if irritation persists. SKIN wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible]

5.7 **Late Toxicity:** Possible lung cancer

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics.** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may be formed in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.**

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** Opposes Ne daphnia magna deleterious effect fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. J. T. Baker Chemical Co, Phillipsburg, N.J. 08865
2. McGean Chemical Co, 1250 Terminal Tower, Cleveland, Ohio 44113
3. Gaylord Schlesinger Chemical Mfg Co, 584 Mineola Ave, Carle Place, N.Y. 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 395.80

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.92 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

NBR	NICKEL BROMIDE

Common Synonyms			
Nickel bromide trihydrate	Solid	Yellowish-green	Odorless
	Sinks and mixes with water		

	[illegible]
Fire	Not flammable Irritating gases may be produced when heated
Exposure	[illegible] DUST Irritating to eyes, nose and throat If inhaled will cause coughing and difficult breathing [illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes. [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Nickel bromide trihydrate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $NiBr_2 \cdot 3H_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Yellowish green
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Bu Mines approved respirator, rubber gloves, face shield or safety goggles, protective clothing
5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. If large amounts are swallowed and not thrown up, it can cause drowsiness and other symptoms of bromide poisoning. Dust irritates eyes and may cause dermatitis on contact with skin
5.3 **Treatment for Exposure:** INHALATION: move to fresh air, get medical attention if exposure has been severe. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min. SKIN: wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m³ (as nickel)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 [illegible]
5.7 **Late Toxicity:** Possible lung cancer
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Irritating hydrogen bromide vapors may form [illegible]
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. D. F. Goldsmith Chemical and Metal Co
   [illegible] Pitner Ave
   Evanston, Ill 60202
2. Gallard-Schlesinger Chemical Mfg Co
   [illegible] Mineola Ave
   Carle Place, N.Y. 11514
   Ventron Corp
   P.O. Box [illegible]
   Beverly, Mass 01915

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent
Technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-2

NS

12. HAZARD CLASSIFICATIONS

12.1 **Coast Guard Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 272.6
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** test 3.4 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

NKC — NICKEL CARBONYL

Common Synonyms
Nickel tetracarbonyl

Liquid — Colorless to yellow — Musty, stale odor

Sinks in water. Poisonous, flammable vapor is produced.

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn skin and eyes

Water Pollution

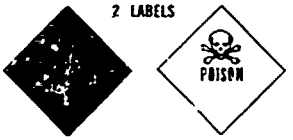
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONCE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison, high flammability, air contaminant, water contaminant
Restrict access
Evacuate area
Should be removed
Chemical and physical treatment

2. LABELS



2. CHEMICAL DESIGNATIONS

2.1 **Synonyms:** Nickel tetracarbonyl
2.2 **Coast Guard Compatibility Classification:** Not applicable
2.3 **Chemical Formula:** $Ni(CO)_4$
2.4 **IMCO/United Nations Numerical Designation:** UN 1259

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to yellow
4.3 **Odor:** Musty, characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, complete protective clothing
5.2 **Symptoms Following Exposure:** Inhalation causes giddiness, headache, shortness of breath, vomiting, if victim is removed from exposure, symptoms may disappear but recur 12-36 hours later, along with blue pallor of skin, fever and cough; death may occur. Ingestion or contact with skin may also produce these symptoms. Abnormal nickel content of urine and blood is a measure of the severity of exposure. Contact of liquid with eyes causes severe irritation.
5.3 **Treatment for Exposure:** *Medical help must be obtained following any exposures to vapor or liquid.* INHALATION: oral administration of sodium diethyldithiocarbamate trihydrate (Dithiocarb), complete bed rest and positive pressure oxygen are indicated for pulmonary edema; treatment otherwise is symptomatic. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: do NOT induce vomiting.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.001 ppm
5.5 **Short-Term Inhalation Limits:** 0.04 ppm for 5 min
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** May produce cancer
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.
5.10 **Odor Threshold:** 1 - 1 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** < -4°F (-20°C)
6.2 **Flammable Limits in Air:** 2% (LEL)
6.3 **Fire Extinguishing Agents:** Water
6.4 **Fire Extinguishing Agents Not to be Used:** Data not available
6.5 **Special Hazards of Combustion Products:** Unusually toxic gases formed by incomplete combustion
6.6 **Behavior in Fire:** Containers may explode when heated
6.7 **Ignition Temperature:** <200°F (vapor)
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 2.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable below 100°C
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Pressure Chemical Company
   4219 Smallman Street
   Pittsburgh, Pa. 15201
2. Gallard-Schlesinger Chemical Mfg. Co.
   Atomergic Chemetals Division
   584 Mineola Ave.
   Carle Place, L.I., N.Y. 11514
3. Matheson Gas Products Co.
   East Rutherford, N.J. 07073

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.9+%
10.2 **Storage Temperature:** Cool ambient
10.3 **Inert Atmosphere:** Carbon monoxide at 15 psi, carbon dioxide
10.4 **Venting:** Cylinders must be stored in a well ventilated area

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

X X X

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	4

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	3
Reactivity (Yellow)	1
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 170.7
13.3 **Boiling Point at 1 atm:** 109°F = 43°C = 316°K
13.4 **Freezing Point:** -13°F = -25°C = 248°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.322 at 17°C (liquid)
13.8 **Liquid Surface Tension:** 15.9 dynes/cm = 0.0159 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** 5.9
13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13.12 **Latent Heat of Vaporization:** 72 Btu/lb = 40 cal/g = 1.7 × 10⁵ J/kg
13.13 **Heat of Combustion:** -2970 Btu/lb = -1650 cal/g = -69.0 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

NCL	# NICKEL CHLORIDE

Common Synonyms			
Nickel chloride hexahydrate	Solid	Green	Odorless
	Sinks and mixes with water		

[illegible]

Fire	Not flammable
Exposure	SEE FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Nickel chloride hexahydrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $NiCl_2 \cdot 6H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Green

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, protective gloves. Bu Mines approved respirator, protective clothing

5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. Dust irritates eyes and may cause dermatitis in contact with skin

5 3 **Treatment for Exposure:** INHALATION move to fresh air, get medical attention if exposure has been severe. INGESTION give large amount of water. EYES flush with copious of water for at least 15 min. SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³ (as nickel)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] g/kg

5 7 **Late Toxicity:** Possible lung cancer

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent.

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
259 mg/l 96 minnow fundulus survived salt water
518 ppm/96 hr fathead minnow TLm soft water
424 ppm 96 hr fathead minnow TLm hard water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Tenneco Chemicals Inc
Intermediates Div
Turner Plaza P O Box 2
Piscataway N J 08854

2 The Harshaw Chemical Co
1945 East 97 Street
Cleveland, Ohio 44106

3 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown N J 07960

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 237.7

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 3.55 at 15°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** [illegible] Btu/lb = 4.9 cal/g = 0.21 × 10³ J/kg

13 15 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

NCN	# NICKEL CYANIDE

Common Synonyms	Solid — Light green or yellow-brown — Weak almond odor Sinks in water
[illegible]	
Fire	Not flammable
Exposure	[illegible] DUST POISONOUS IF INHALED Irritating to eyes, nose and throat [illegible] SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $Ni(CN)_2 \cdot nH_2O$ n=0 2 4
3 4 **IMCO/United Nations Numerical Designation:** 1653

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Anhydrous yellow-brown, hydrates pale green
4 3 **Odor:** Weak characteristic cyanide

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, rubber gloves, goggles
5 2 **Symptoms Following Exposure:** Inhalation of dust or ingestion — symptoms not certain salivation, numbness of throat, anxiety, irregular respiration, rapid pulse, convulsions loss of consciousness, paralysis, death
5 3 **Treatment for Exposure:** Get medical help, first aid treatment must be precise, the compound is much less toxic than sodium or potassium cyanides. Not cyanide poisoning is a possibility EYES or SKIN: flush with water, avoid getting solution in mouth. INGESTION: start artificial respiration if breathing has stopped, inhalation of amyl nitrite and intravenous doses of sodium nitrite and sodium thiosulfate should be administered by physician
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** 5 mg/m³ for 30 min (as cyanide)
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
>100 mg/L* Fish: Not very moderately alkaline water
In acid water releases hydrogen cyanide which is fatal to all species
*Time period not specified
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Platzer and Bauer Inc
[illegible] Northern Boulevard
Flushing N Y [illegible]
2 Varichem Chemical Co
666 N Front Street
Elizabeth N J [illegible]
Fisching Chemical Co
Forrest and Halladay Streets
Jersey City N J [illegible]

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature:** Not critical
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Sealed containers in well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous, Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** Mixture
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2 4 at 25°C (solids)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and

NOTES

NFB	NICKEL FLUOROBORATE

Common Synonyms	
Nickel(II) fluoborate Nickel fluoborate solution	Liquid — Green Sink and mixes with water

Fire	Not flammable
Exposure	VAPOR Irritating to eyes, nose and throat Harmful if inhaled LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning — water contaminant
Disperse and flush

2. LABELS

No hazard data is required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Nickel(II) fluoborate; Nickel fluoborate solution
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $NiB_2F_8H_{12}O_6$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Clear green
4.3 **Odor:** Data not available

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety glasses and face shield, rubber gloves, rubber apron
5.2 **Symptoms Following Exposure:** Ingestion causes irritation of mouth, throat, stomach. Liquid irritates eyes and skin and may cause dermatitis
5.3 **Treatment for Exposure:** INGESTION: give large amount of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 mg/m³ as metal
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] mg/kg
5.7 **Late Toxicity:** Possible lung cancer
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp
P.O. Box 1057R
Morristown, N.J. 07960
2. The Harshaw Chemical Co
1945 East 97th
Cleveland, Ohio 44106
3. Harstan Chemical Corp
1247 [illegible] Street
Brooklyn, N.Y. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 44.2 - 45.2% in water
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Response Methods Handbook, CG-446-3

N F

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Mixture
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.[illegible] at 20°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

NFM	NICKEL FORMATE

Common Synonyms			
Nickel formate dihydrate	Solid	Green	Odorless
	Sinks and mixes with water		

[illegible]

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID **DUST** **Irritating to eyes, nose and throat** **If inhaled will cause coughing or difficult breathing** [illegible] **SOLID** **Irritating to skin and eyes** **If swallowed will cause nausea and vomiting** [illegible] IF SWALLOWED [illegible] CONSCIOUS [illegible] drink water or milk IF SWALLOWED [illegible] CONSCIOUS OR HAVING CONVULSIONS [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Nickel formate dihydrate

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula** $Ni(HCO_3)_2 \cdot 2H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** Greenish

4 3 **Odor** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Bu Mines approved respirator rubber gloves face shield or safety goggles protective clothing

5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat Ingestion causes vomiting Dust irritates eyes and may cause dermatitis in contact with skin

5 3 **Treatment for Exposure:** INHALATION move to fresh air get medical attention if exposure has been severe INGESTION give large amounts of water EYES flush with water for at least 15 min SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 1 mg/m³ (as nickel)

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 - 5 g/kg

5 7 **Late Toxicity.** Possible lung cancer

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Irritating formic acid vapors may form in fire

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

McGean Chemical Co
1250 Terminal Tower
Cleveland Ohio 44115

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 184.8

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.15 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

NNT	# NICKEL NITRATE

Common Synonyms			
Nickel nitrate hexahydrate	Solid	Green	Odorless
	Sinks and mixes with water		

Avoid contact with solid and dust. Keep people away
Stop leak if safe
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Runoff discharge or contact with water

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
If in eyes hold eyelids open and flush with plenty of water
If person has stopped, give artificial respiration
If breathing difficult, give oxygen
SOLID
Irritating to skin and eyes
If swallowed, cause nausea and vomiting
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED induce vomiting CONSCIOUS: Give water or milk
IF SWALLOWED induce vomiting UNCONSCIOUS OR HAVING CONVULSIONS
Do nothing except get medical aid

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify public health and wildlife officials
Notify operators of affected water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Nickel nitrate hexahydrate
3.2 **Coast Guard Compatibility Classification.** Not listed
3.3 **Chemical Formula:** $Ni(NO_3)_2 \cdot 6H_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color:** Green
4.3 **Odor** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Bu Mines approved respirator, rubber gloves, face shield or safety goggles, protective clothing
5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. Dust irritates eyes and may cause dermatitis in contact with skin
5.3 **Treatment for Exposure:** INHALATION: move to fresh air, get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with water for at least 15 min. SKIN: wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 1 mg/m³ (as nickel)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 g/kg
5.7 **Late Toxicity:** Possible lung cancer
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable but may intensify fire
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents.** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen may form in fire
6.6 **Behavior in Fire.** May increase intensity of fire if in contact with combustible material
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.** Contact of solid with wood or paper may cause fires
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
2.44 ppm/* /stickleback/threshold cons / tap water
0.8 ppm/10 days/stickleback/11 m/ fresh water
*Time period not specified
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD).** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. The Harshaw Chemical Co
1945 East 97 St
Cleveland, Ohio 44106
2. Allied Chemical Corp
Specialty Chemicals Div
P.O. Box 1087R
Morristown, N.J. 07960
3. McGean Chemical Co
1250 Terminal Tower
Cleveland, Ohio 44113

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Purified 99.1%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification*	
Health Hazard (Blue)	0	1
Flammability (Red)	0	0
Reactivity (Yellow)	0	0
	OXY	OXY

*First column refers to no fire situation

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid
13.2 **Molecular Weight:** 290.8
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.05 at 20°C (solid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heat of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization.** Not pertinent
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution.** 47 Btu/lb = 26 cal/g = 1.1 × 10⁵ J/kg
13.16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

NKS	NICKEL SULFATE

Common Synonyms Nickelous sulfate	Solid crystals	Pale green	Odorless
	Sinks and mixes slowly with water		

Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID **SOLID** **Irritating to skin and eyes** Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES [illegible] flush with plenty of water
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes Notify local health and wildlife [illegible] [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Nickelous sulfate
3 2 **Coast Guard Compatibility Classification.** Not applicable
3 3 **Chemical Formula:** $NiSO_4$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid
4 2 **Color:** Pale green
4 3 **Odor:** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles gloves
5 2 **Symptoms Following Exposure:** Dermatitis
5 3 **Treatment for Exposure:** Wash all affected parts with plenty of water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 1 mg/m³
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Nose and lung cancer
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics:** Repeated contact can cause dermatitis
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not flammable
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
160 ppm/48 hr rainbow trout/TL_{50} fresh water
13.9 ppm/48 hr prawn in C_{50} salt water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Chemetron Corp
Inorganic Chemicals Division
1280 Terminal Tower
Cleveland Ohio 44113

2 Mallinckrodt Chemical Works
Industrial Chemicals Division
Second and Mallinckrodt Sts
St Louis Mo 63160

3 Shepherd Chemical Co
4900 Beech St
Cincinnati Ohio 45212

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical reagent
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 154.78
13 3 **Boiling Point at 1 atm:** Decomposes
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity** 3.68 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

NIC	# NICOTINE

Common Synonyms			
1 Methyl 2 (3 pyridyl) pyrrolidine 3 (1-methyl 2 pyrrolidyl) pyridine	Liquid	Colorless to brown	Fishy odor
	Mixes with water		

[illegible]

Fire

Combustible
POISONOUS GASES ARE PRODUCED WHEN BURNED
[illegible]

Exposure

[illegible] FORMED [illegible]

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant
Restrict access
Disperse and flush

2 LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 1 Methyl 2 (3 pyridyl) pyrrolidine 3 (1 Methyl 2 pyrrolidyl) pyridine

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula** [illegible]

3 4 **IMCO/United Nations Numerical Designation** 6 [illegible] 1654

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to brown

4 3 **Odor.** Fishy, develops a pyridine or tobacco like odor on exposure to air

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield, rubber gloves, protective clothing

5 2 **Symptoms Following Exposure:** Inhalation: nose burning sensation in mouth and throat, nausea, headache, confusion, [illegible] disturbances. Contact with liquid irritates eyes and causes local irritation of skin. Can be absorbed through skin in toxic amounts. Ingestion causes burning of mouth and stomach, vomiting, excitement, faintness, paralysis of lungs

5 3 **Treatment for Exposure** *Speed of treatment is important following exposure to this compound. Ingestion of as little as 40 mg can be fatal.* EYES: flush with water for at least 15 min. SKIN: wash thoroughly and immediately with cold water. INGESTION: call for physician at once, give 6 [illegible] tablespoons of activated charcoal as a slurry in water, give artificial respiration if breathing has stopped

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 0.5 [illegible] mg/m

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Oral rat LD_{50} = 53 mg/kg; oral rat LD_{50} = 1 mg/kg (human)

5 7 **Late Toxicity:** Birth defects in experimental animals

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics** No appreciable hazard. Practically harmless to the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Data not available

6 2 **Flammable Limits in Air** 0.7% - 4.0%

6 3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products** Smoke may contain toxic vapors of unburned compound

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature.** 471°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 3.29 ppm/* fish/toxic/fresh water
*Time period not specified

8 2 **Waterfowl Toxicity:** LD_{50} = 587 mg/kg

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Chemical Formulators Inc
Box 26
Nitro W Va 25143

2 Eastman Kodak Co
Eastman Organic Chemicals
Rochester N Y 14650

3 Pfaltz and Bauer Inc
126 04 Northern Boulevard
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 93 - 98%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	4
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aesthetic Effect	4
Reactivity	
Other Chemicals	
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 162.2

13 3 **Boiling Point at 1 atm** (decomposes) 482°F = 250°C = 523°K

13 4 **Freezing Point.** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.01 at 20°C (liquid)

13 8 **Liquid Surface Tension** 36.61 dynes/cm = 0.0366 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** (est.) 20 dynes/cm = 0.020 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** -15,336 Btu/lb = -8,520 cal/g = -368 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

NCS	NICOTINE SULFATE

Common Synonyms			
Neutral nicotine sulfate Black Leaf 40 (40% water solution)	Solid or solution Mixes with water	White to light brown solid or colorless solution	Odorless solid or tobacco odored solution

AVOID CONTACT WITH LIQUID AND SOLID KEEP OFF AND AWAY

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

ALL FOR MEDICAL AID

VAPOR OR DUST
POISONOUS IF INHALED

LIQUID OR SOLID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning, poison, water contaminant
Restrict access
Disperse and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Black Leaf 40 (40% water solution) Neutral nicotine sulfate
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $(C_{10}H_{14}N_2)_2H_2SO_4$
3 4 **IMCO/United Nations Numerical Designation:** 6 1/1658

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid or water solution
4 2 **Color:** Solid is off white to yellow tan darkens on exposure to light Water solution may be colorless
4 3 **Odor:** Solid is odorless water solution has odor of tobacco

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask rubber gloves
5 2 **Symptoms Following Exposure** Inhalation causes irritation of nose and throat Liquid irritates eyes and (on prolonged contact) skin Ingestion causes burning of mouth and stomach vomiting excitement faintness paralysis of lungs
5 3 **Treatment for Exposure** EYES flush with water SKIN wash thoroughly and immediately with water INGESTION call for medical aid induce immediate and repeated vomiting perform gastric lavage with dilute (1 10000) solution of potassium permanganate or activated charcoal in water or milk apply artificial respiration if breathing has stopped
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} - 55 mg/kg (rat)
5 7 **Late Toxicity** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Nonflammable as solid or water solution
6 2 **Flammable Limits in Air.** Not pertinent
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products:** Toxic decomposition products are released in a fire
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 1 29 ppm/* fish toxic fresh water (for nicotine)
* Time period not specified
8 2 **Waterfowl Toxicity:** LD_{50} = 587 mg/kg (for nicotine)
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Chemical Formulators Inc
Box 26
Nitro W Va 25143

2 Prentiss Drug and Chemical Co
363 Seventh Ave
New York N Y 10001

3 Platz and Bauer Inc
12644 Northern Boulevard
Flushing N Y 11368

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Solid Commercial Solution 40%
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Poisonous Class B
12 2 **IMAS Hazard Rating for Bulk Water Transports** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 422 5
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1 15 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

NTL	NITRALIN

Common Synonyms			
4-(Methylsulfonyl)-2,6-dinitro-N,N-dipropylaniline Planavin	Solid	Light yellow to orange	Mild odor
	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY
Wear goggles, self-contained breathing apparatus, [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

Fire

Combustible
Irritating gases are produced when heated
Containers may explode in fire
[illegible]

Exposure

CALL FOR MEDICAL AID
DUST
POISONOUS IF INHALED
[illegible]
SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
[illegible]
IF SWALLOWED [illegible] ONSCIOUS [illegible] of milk and [illegible]
IF SWALLOWED [illegible] UNCONSCIOUS OR IF VOMITING OCCURS [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 4-(methylsulfonyl)-2,6-dinitro-N,N-dipropylaniline, Planavin
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** $C_{13}H_{19}N_3O_6S$
3 4 **IMCO/United Nations Numerical Designation:** 6 1 1699

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Light yellow to orange
4 3 **Odor:** Mild chemical

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, rubber gloves
5 2 **Symptoms Following Exposure:** Dust irritates eyes. Other forms of exposure produce no observable symptoms
5 3 **Treatment for Exposure:** No cases of clinical toxicity on record. Supportive and symptomatic medical treatment recommended if massive overexposure occurs. EYES: flush with water if irritation occurs. SKIN: wash with soap and water. INGESTION: induce vomiting
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} > 2,000 mg/kg (rat)
5 7 **Late Toxicity:** None observed
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents.** Water
6 4 **Fire Extinguishing Agents Not to be Used** Data not available
6 5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur and nitrogen are formed in fire
6 6 **Behavior in Fire:** Decomposes vigorously in a self-sustaining reaction at or above 225°C
6 7 **Ignition Temperature:** 435°F
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 27 ppm 96 hr rainbow trout TL_{50} fresh water
1 ppm 96 hr oysters no effect salt water
8 2 **Waterfowl Toxicity:** Not toxic at 2,000 mg/kg (ducks)
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Shell Chemical Company
Agricultural Division
2401 Crow Canyon Road
San Ramon, Calif. 94583

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 94%+
Wettable powder 75%
Emulsifiable concentrate
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere:** No requirements
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not Listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 345.2
13 3 **Boiling Point at 1 atm.** (decomposes) >437°F = >225°C = >498°K
13 4 **Freezing Point:** 304°F = 151°C = 424°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** (est.) >1 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion.** Data not available
13 14 **Heat of Decomposition:** −450 Btu/lb = −250 cal/g = -10.5×10^5 J/kg
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 3 and 4

NOTES

NAC	NITRIC ACID

Common Synonyms	Watery liquid Colorless to light brown Choking odor Sinks and mixes with water. Harmful vapor is produced
AVOID CONTACT WITH LIQUID AND VAPOR [illegible]	
Fire	Not flammable May cause fire on contact with combustibles Flammable gas may be formed on contact with metals Poisonous gases are produced when heated [illegible]
Exposure	FATAL FOR MODERATE [illegible] **VAPOR** Will burn eyes, nose and throat If inhaled, will cause difficult breathing or loss of consciousness. [illegible] **LIQUID** Will burn skin and eyes Harmful if swallowed [illegible] IF IN EYES [illegible] IF SWALLOWED [illegible] CONSCIOUS [illegible] drink water [illegible] milk DO NOT INDUCE VOMITING
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Isolate water [illegible] corrosive
Restrict access
Evacuate area
Disperse and flush

2. LABELS

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Nitric acid
3.3 **Chemical Formula:** HNO_3 (aq)
3.4 **IMCO United Nations Numerical Designation:** NO 2031

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Acrid, sweet to acrid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air mask, rubber acid suit, hood, boots, and gloves, chemical goggles, safety shower and eye bath

5.2 **Symptoms Following Exposure:** Vapors irritate eyes and respiratory tract, lung injuries may not become apparent for several hours following exposure. Liquid may cause severe burns to eyes and skin

5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, administer oxygen, artificial respiration if required. INGESTION: drink large volumes of water, do NOT induce vomiting. SKIN OR EYES: flush with water for at least 15 min

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 2 ppm

5.5 **Short-Term Inhalation Limits:** 15 ppm for 5 min

5.6 **Toxicity by Ingestion:** Grade 3, LD_{50} 430 mg/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** 5.68% Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 95% Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Use water on adjacent fires
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products.** May give off poisonous oxides of nitrogen and acid fumes when heated in fires
6.6 **Behavior in Fire:** Decomposes and gives off poisonous oxides of nitrogen
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** May heat up on mixing, but explosion or formation of steam and gas
7.2 **Reactivity with Common Materials:** Very corrosive to wood, paper, cloth and most metals. Toxic red oxides of nitrogen are formed
7.3 **Stability During Transport:** When heated may give off toxic red oxides of nitrogen
7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
72 ppm 96 hr (mosquito fish) [illegible] fresh water
[illegible] 1000 ppm 48 hr [illegible] salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp
Agricultural Division
Morristown, N.J. 07960
2. E. I. duPont de Nemours & Co., Inc.
Explosives Dept
Wilmington, Del. 19898
3. Hercules, Inc.
Explosives & Chemical Propulsion Dept
Bessemer, Ala. 35020

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Various grades [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open or pressure-vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizer

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemical	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	0
Reactivity (Yellow)	0
	OX

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** 89.0°F = 89.4°C = 362.1°K
13.4 **Freezing Point:** −50°F = −45.5°C = 227.7°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.49 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** 214 Btu/lb = [illegible] cal/g = 4.98 × 10^5 J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** −205 Btu/lb = −114 cal/g = −4.76 × 10^5 J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

NTX	NITRIC OXIDE

Common Synonyms			
Mononitrogen monoxide Nitrogen monoxide	Compressed gas	Colorless	Sharp unpleasant odor
	Reacts with water. Poisonous red brown vapor cloud is produced		

Fire	Not flammable
Exposure	VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: poison, air contaminant
Restrict access
Evacuate area

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Mononitrogen monoxide; Nitrogen monoxide

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** NO

3.4 **IMCO/United Nations Numerical Designation:** 2.1660

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Compressed gas

4.2 **Color:** Colorless, but becomes red brown on contact with air because of formation of nitrogen tetroxide

4.3 **Odor:** (nitrogen tetroxide) Pungent acrid, mildly irritating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus or gas mask with universal canister

5.2 **Symptoms Following Exposure:** Continued inhalation of low concentrations causes chronic irritation, cough, headache, corrosion of teeth, loss of strength; symptoms from overexposure to higher concentrations which may be delayed for 6–24 hours include irritation of nose and throat, tightness in chest, difficult breathing, pallor, loss of consciousness, and death; pulmonary edema occurs. If patient recovers, pneumonia may develop.

5.3 **Treatment for Exposure:** *Get medical attention at once following inhalation of this gas.* INHALATION: if breathing has stopped, give artificial respiration with 100% oxygen, keep victim quiet and warm, keep head and chest lower than hips, to aid in drainage from lungs, alert physician to possibility of delayed pulmonary edema during 6–24 hours.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm

5.5 **Short-Term Inhalation Limits:** <100 ppm, 60 min.; <150 ppm, 30 min.; <200 ppm, 5 min.

5.6 **Toxicity by Ingestion:** Not pertinent (gas at normal temperatures)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (nonflammable compressed gas)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Supports combustion so all fires burn more vigorously

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts with water to form nitric acid. The reaction is not violent

7.2 **Reactivity with Common Materials:** Reacts rapidly with air to form nitrogen tetroxide; see this compound

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water; rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Not pertinent

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Matheson Gas Products
   P.O. Box 85
   East Rutherford, N.J. 07073
2. Union Carbide Corporation
   Linde Division
   Morristown, N.J. 07057
3. Air Products and Chemicals, Inc.
   Specialty Gas Department
   P.O. Box 351
   Allentown, Pa. 18105

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** C.P. 99+%

10.2 **Storage Temperature:** Cool ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief. Contents must be in well ventilated area

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

A C

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous, Class A

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classification:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Gas

13.2 **Molecular Weight:** 30.0

13.3 **Boiling Point at 1 atm:** −241.1°F = −151.7°C = 121.5°K

13.4 **Freezing Point:** −262.5°F = −163.6°C = 109.6°K

13.5 **Critical Temperature:** 347°F = 453°C = 180°K

13.6 **Critical Pressure:** 940 psia = 64 atm = 6.5 MN/m²

13.7 **Specific Gravity:** Not pertinent

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 1.5 (nitrogen dioxide)

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.400 at 15°C

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** 25°C Bubble = −143 cal/g = −598 × 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

NAA	NITRILOTRIACETIC ACID AND SALTS

Common Synonyms	
Triglycine NTA Disodium nitrilotriacetate Trisodium nitrilotriacetate	Solid White Odorless Sinks and mixes with water

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat SOLID Irritating to skin and eyes
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Disodium nitrilotriacetate, NTA, Triglycine, Trisodium nitrilotriacetate

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula.** $C_6H_6O_6NNa_3$, $C_6H_5O_6NNa_2$, $C_6H_4O_6N$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, rubber gloves, chemical safety goggles

5.2 **Symptoms Following Exposure:** Toxicity and health hazard of these compounds are low. Contact with eyes causes irritation

5.3 **Treatment for Exposure:** EYES flush with plenty of water, treat as mild alkaline irritation with boric acid solution, if eyes are irritated, get medical attention. SKIN flush with plenty of water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5–5 g/kg; Disodium Grade 2, LD_{50} 2 g/kg (rat); Trisodium Grade 2, LD_{50} 4 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 340 ppm, 24 hr, guppy, lethal conc., fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 0%, 5 days

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

W. R. Grace and Co.
Hampshire Chemical Div.
Poisson Avenue
Nashua, N. H. 03060

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 99.5+% a water solution of trisodium salt containing 43% solids is also shipped

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

(Acid) II
(Salts) SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** Acid 191, Disodium 253, Trisodium 275

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** >1 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

NTA	2-NITROANILINE

Common Synonyms	Solid	Orange	Musty odor
o-Nitroaniline 1-Amino-2-nitrobenzene o-Nitranline Azoic Diazo Component 6	Sinks and mixes slowly with water		

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause headache, dizziness or loss of consciousness

SOLID
Irritating to skin and eyes
If swallowed will cause headache, dizziness, nausea, vomiting or loss of consciousness

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1-Amino-2-nitrobenzene, Azoic Diazo Component 6, o-Nitraniline, o-Nitroaniline, ONA

3.2 **Coast Guard Compatibility Classification:** Not Listed

3.3 **Chemical Formula:** $1,2\text{-}C_6H_4NO_2NH$

3.4 **IMCO/United Nations Numerical Designation:** 6.1 1661

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Orange

4.3 **Odor:** Musty

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, neoprene gauntlets, safety goggles, rubber or neoprene sealed tongue work shoes and apron, close weave cotton coveralls capable of closing at wrist and ankle

5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, nausea, methemoglobinemia, vomiting, weakness and stupor; cyanosis caused by contact; nausea develops in 4-6 hrs; prolonged and excessive exposures may also cause liver damage. Contact with eyes or skin causes irritation; continued exposure may cause same symptoms as inhalation or ingestion

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, administer [illegible] if required, get medical attention. INGESTION: induce vomiting, get medical attention. [illegible] water for at least 15 min. SKIN: flush with water, wash with soap and water, be [illegible] the solid [illegible] under fingernails, in hair

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade [illegible] 0.5 - 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** [illegible]°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 24 ppm * daphnia threshold toxicity, fresh water
*Time period not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 American Aniline Products, Inc.
Mount Vernon St.
Lock Haven, Pa. 17745

2 Monsanto Company
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

3 Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 100%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

11

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not Listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 138.1

13.3 **Boiling Point at 1 atm:** 545°F = 284°C = 557°K

13.4 **Freezing Point:** 160°F = 71°C = 344 K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.44 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] × 10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

NAL	4-NITROANILINE

Common Synonyms			
p-Nitroaniline 1 Amino-4 nitrobenzene Azoic Diazo Component 37 Fast Red IG base Fast Red GG base PNA	Solid	Yellow	Mild Odor
	Sinks in water		

[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

ACUTE FOR MEDICAL AID

DUST
POISONOUS IF INHALED
If inhaled will cause headache, coughing difficult breathing, or loss of consciousness
[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause headache, coughing, or loss of consciousness
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 Amino-4 nitrobenzene
Azoic Diazo Component 37, Fast Red IG base, Fast Red GG base, p-Nitraniline, p-Nitroaniline, PNA

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_6H_6O_2N_2$

3 4 **IMO/United Nations Numerical Designation:** 6 1-1661

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellow

4 3 **Odor:** Faint ammonia, slightly pungent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Bu Mines dust canister, rubber gloves, chemical safety goggle, face shield, rubber safety shoes

5 2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, drowsiness, shortness of breath, nausea, methemoglobinemia and unconsciousness, fingernails, lips and ears become blue. Prolonged and excessive exposures may also cause liver damage. Contact with eyes causes irritation and possible corneal damage. Contact with skin causes irritation, continued exposure may cause same symptoms as inhalation or ingestion

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air, administer oxygen if required, get medical attention. INGESTION induce vomiting, get medical attention. EYES flush with water for at least 15 min. SKIN flush with water, wash with soap and water, be sure that no compound remains in the hair or under the fingernails

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 1 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, LD50 0.5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 329°F O.C. (molten solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire:** Melts and burns

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 24 ppm *(daphnia threshold toxicity, fresh water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Mallinckrodt Company
800 North Lindbergh Blvd
St Louis, Mo 63166

2 American Aniline Products, Inc
Mount Vernon St
Lock Haven, Pa 17745

3 Eastman Organic Chemicals
Rochester, N Y 14650

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 100%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 138.1

13 3 **Boiling Point at 1 atm:** 646°F = 336°C = 609°K

13 4 **Freezing Point:** 295°F = 146°C = 419°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.44 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** −9,920 Btu/lb = −5,510 cal/g = −231 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

NTB	NITROBENZENE

Common Synonyms: Nitrobenzol	Oily liquid. Light yellow to brown. Almond or shoe polish odor. Sinks in water. Freezing point is 41°F.
[illegible]	
Fire	Combustible. POISONOUS VAPOR IS PRODUCED WHEN HEATED. [illegible]
Exposure	LIQUID. POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-2

Issue warning: poison
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Essence of Mirbane; Nitrobenzol; Oil of Mirbane
3.2 **Coast Guard Compatibility Classification:** Nitrocompounds
3.3 **Chemical Formula:** $C_6H_5NO_2$
3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Light green to yellow
4.3 **Odor:** Faint shoe polish

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator approved by U.S. Bureau of Mines for organic vapors, rubber gloves, splashproof goggles, eyewash fountain, safety shower and medical oxygen supply.
5.2 **Symptoms Following Exposure:** If skin is exposed, it can be absorbed in toxic amounts. Inhalation of vapor or swallowed. First symptoms are blued skin, [illegible] and [illegible] produces headache, giddiness, weakness, [illegible]
5.3 **Treatment for Exposure:** Remove to fresh air and call physician at once. In case of skin contact immediately flush with copious amounts of water for at least 15 min. Remove contaminated clothing and shoes. Administer oxygen and physician care.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1 ppm
5.5 **Short-Term Inhalation Limits:** 10 ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 3. Moderate poisonous
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating to eyes, but persons will not usually tolerate prolonged exposure to high vapor concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting on the skin and first degree burns on short exposure; may cause second degree burns on long exposure.
5.10 **Odor Threshold:** 5.94 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 171°F O.C., 190°F C.C.
6.2 **Flammable Limits in Air:** 1.8 - 11.1 (11.1 not available)
6.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide or dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 924°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 2.9 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 20 ppm 96 hr minnow lethal. Fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0.7 g/g
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. American Cyanamid Co., Organic Chemicals Division, Bound Brook, N.J. 08805
2. E. I. duPont de Nemours & Co., Inc., Explosives Dept., Wilmington, Del. 19898
3. First Chemical Corp., 656 North State St., Jackson, Miss. 39205

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, 99% [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

X X Y

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous Liquid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
[illegible]	[illegible]
[illegible]	
Vapor Toxicity	3
Liquid or Solid Irritant	2
Poisons	4
Water Pollution	
Human Toxicity	[illegible]
Aquatic Toxicity	3
Aesthetic Effect	[illegible]
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	[illegible]

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 123.11
13.3 **Boiling Point at 1 atm:** 411.6°F = 210.9°C = 484.1°K
13.4 **Freezing Point:** 41.2°F = 5.1°C = 278.1°K
13.5 **Critical Temperature:** [illegible]°F = 447°C = 720°K
13.6 **Critical Pressure:** 580 psia = 47.62 atm = 4.824 MN/m²
13.7 **Specific Gravity:** 1.204 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 43.9 dynes/cm = 0.0439 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 25 dynes/cm = 0.025 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** 150 Btu/lb = 85 cal/g = 3.6 × 10⁵ J/kg
13.13 **Heat of Combustion:** −10,420 Btu/lb = −5,789 cal/g = −242.5 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

NTE	NITROETHANE

Common Synonyms	Liquid	Colorless	Fruity Odor
	May float or sink in water		

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing, or difficult breathing LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $CH_3CH_2NO_2$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mild fruity somewhat disagreeable chloroform-like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Supplied air or self-contained respirator, goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Inhalation causes moderate irritation of respiratory tract. Ingestion causes irritation of mouth and stomach. Contact with liquid causes irritation of eyes and mild irritation of skin
5.3 **Treatment for Exposure:** INHALATION - in case of pulmonary symptoms give bed rest and oxygen, obtain medical attention at once. INGESTION - give large amount of water. EYES or SKIN - flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = [illegible] mg/kg for mammals
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderate irritants such that personnel will find high concentrations unpleasant. The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin
5.10 **Odor Threshold:** [illegible] ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 104°F (C.C.), 95°F (T.C.C.)
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Water, carbon dioxide, or dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be used for cooling. Foam is not effective
6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** May attack some forms of plastics
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Commercial Solvents Corp.
245 Park Avenue
New York, N.Y. [illegible]

2. Ashland Chemical
[illegible] W. Saint Paul Ave.
Milwaukee, Wis. [illegible]

3. Pfizer and Bayer Inc.
[illegible] Fairfield Ave.
Stamford, Conn. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 95-[illegible]%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q T 1 - X Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	[illegible]
Health	
Vapor Irritant	2
Liquid or Solid Irritant	
Poisons	[illegible]
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	
Water	0
Self Reactive	4

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	3
Reactivity (Yellow)	[illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible]°F = [illegible]°C = [illegible] K
13.4 **Freezing Point:** [illegible]°F = [illegible]°C = [illegible] K
13.5 **Critical Temperature:** Data not available
13.6 **Critical Pressure:** Data not available
13.7 **Specific Gravity:** [illegible] at 20°C (liquid)
13.8 **Liquid Surface Tension:** [illegible] dynes/cm = [illegible] N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible] at 20°C
13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] kJ/kg
13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] kJ/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

NXX	NITROGEN, LIQUEFIED

Common Synonyms	Liquefied gas	Colorless	Odorless
	Floats and boils on water		

Fire	Not flammable
Exposure	VAPOR Not harmful In high concentrations may cause dizziness, difficult breathing or loss of consciousness LIQUID Will cause frostbite
Water Pollution	Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Liquid nitrogen

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** N_2

3.4 **IMCO/United Nations Numerical Designation:** None

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied gas

4.2 **Color:** Colorless

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety glasses or face shield, insulated gloves, long sleeves, cuffless trousers worn outside boots or over high boots. Use special breathing apparatus where data is lacking or none.

5.2 **Symptoms Following Exposure:** Inhalation: [illegible] of atmosphere [illegible] oxygen deficiency [illegible] Liquid and [illegible] causes frostbite.

5.3 **Treatment for Exposure:** INHALATION: remove [illegible] to open air; artificial respiration. Notify medical doctor. EYES: rinse [illegible] with liquid. SKIN: rinse [illegible] with lukewarm water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** None

5.5 **Short-Term Inhalation Limits:** None permissible

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** Frostbite

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent; nonflammable compressed gas

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Container may explode when heated

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Heat of water will vaporize liquid nitrogen

7.2 **Reactivity with Common Materials:** None. Normal reaction. Low temperature may cause brittleness in rubber and plastic.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
   Linde Division
   Morristown, New Jersey
2. Airco, Inc.
   575 Mountain Ave
   Murray Hill, New Jersey
3. Liquid Carbonic Corporation
   [illegible] Lawrence Street
   Chicago, Illinois

10. SHIPPING INFORMATION

*10.1 **Grades or Purity:** [illegible]

*10.2 **Storage Temperature:** [illegible]

*10.3 **Inert Atmosphere:** No requirement

*10.4 **Vending:** Open

11. HAZARD ASSESSMENT CODE

Hazard Assessment Handbook CG 446-3

[illegible]

12. HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** Nonflammable compressed gas

*12.2 **NAS Hazard Prelog for Bulk Water Transportation:** Not listed

*12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Gas

*13.2 **Molecular Weight:** 28.0

*13.3 **Boiling Point at 1 atm:** [illegible]

*13.4 **Freezing Point:** [illegible]

*13.5 **Critical Temperature:** [illegible]

*13.6 **Critical Pressure:** [illegible]

*13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

*13.9 **Liquid-Water Interfacial Tension:** Not pertinent

*13.10 **Vapor (Gas) Specific Gravity:** [illegible]

*13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

*13.12 **Latent Heat of Vaporization:** [illegible]

*13.13 **Heat of Combustion:** Not pertinent

*13.14 **Heat of Decomposition:** Not pertinent

*13.15 **Heat of Solution:** Not pertinent

*13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

NOX	# NITROGEN TETROXIDE

Common Synonyms
Nitrogen peroxide
Nitrogen dioxide
Red oxide of nitrogen
Oxides of nitrogen
Dinitrogen tetroxide

Liquefied compressed gas — Red-brown — Sharp unpleasant chemical odor

Sinks and reacts with water. Poisonous brown vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away
Wear goggles, self-contained breathing apparatus and rubber [illegible] including [illegible]
Stop flow if possible
Evacuate area of [illegible]
Notify local health and pollution control agencies

Fire

Not flammable
May cause fire and explode on contact with combustibles
POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED
Wear goggles, self-contained breathing apparatus and rubber [illegible]
Flood fire area with water
Stop flow of gas if safe to do so
[illegible] water

Exposure

CALL FOR MEDICAL AID
VAPOR
POISONOUS IF INHALED
Irritating to eyes
May cause death
Remove victim to open air if breathing is difficult or stopped, give artificial respiration
If breathing is difficult, give oxygen
LIQUID
Will burn skin and eyes
POISONOUS IF SWALLOWED
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED, [illegible] CONSCIOUS, give [illegible] water or milk
DO NOT INDUCE VOMITING

Water Pollution

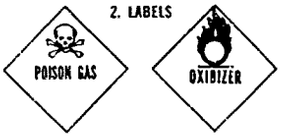
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
Notify [illegible] authorities
Notify [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: poison air contaminant, water contaminant, corrosive
Restrict access
Evacuate area

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Dinitrogen tetroxide, Nitrogen peroxide, Nitrogen dioxide, Oxides of nitrogen, Red oxide of nitrogen
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula** N_2O_4
3.4 **IMCO/United Nations Numerical Designation** 2-1067

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Red-brown at ambient temperatures, colorless below about 14°F
4.3 **Odor** Pungent, acrid, middle irritating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, safety goggles and face shield, protective clothing as dictated, under respirator or self-contained breathing apparatus
5.2 **Symptoms Following Exposure:** Very concentrated fumes produce coughing, choking, headache, nausea, pain in chest and abdomen, otherwise, few symptoms appear at time of exposure. After symptom free period of 5-72 hours, pulmonary edema gradually develops, causing fatigue, restlessness, causing difficulty in breathing, frothy expectoration, mental confusion, lethargy, bluish skin and weak, rapid pulse. Since NOX interferes with gas exchange in lungs, unconsciousness and death by asphyxiation can result, usually within a few hours after onset of pulmonary edema
5.3 **Treatment for Exposure.** INHALATION: remove patient to fresh air and have him breathe as deeply as possible, call a doctor, enforce complete rest for 24-48 hours, keep warm, give oxygen if coughing or cyanosis, physician may administer morphine (10 mg.) EYES AND SKIN: flush with water for at least 15 min.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 5 ppm
5.5 **Short-Term Inhalation Limits** 25 ppm for 5 min
5.6 **Toxicity by Ingestion.** Data not available
5.7 **Late Toxicity.** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations
5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes
5.10 **Odor Threshold:** 5 ppm

6. FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air.** Not flammable
6.3 **Fire Extinguishing Agents** Stop flow of gas
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products** Produces toxic gas when heated
6.6 **Behavior in Fire:** Does not burn, but supports combustion of combustible materials such as wood. May cause fire or explode on contact with other materials
6.7 **Ignition Temperature.** Not flammable
6.8 **Electrical Hazard** Data not available
6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves to form nitric acid and nitric oxide. Nitric oxide reacts with air to form more nitrogen tetroxide
7.2 **Reactivity with Common Materials** Very corrosive to metals when wet. Reacts vigorously with combustible materials such as wood
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Flush with water, then use soda ash or lime
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
72 ppm/96 hr mosquito fish, 11 cm fresh water
330-1,000 ppm/48 hr cockle, 10 cm salt water
8.2 **Waterfowl Toxicity.** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Hercules Inc.
Explosives and Chemical Propulsion Dept.
Hercules, Calif. 94547

10. SHIPPING INFORMATION

10.1 **Grades or Purity:**
10.2 **Storage Temperature.** Ambient. Storage and transfer structures shall be equipped with mechanical ventilation systems.
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Pressure relief valves on containers

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A I J O

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Poisonous gas or liquid, Class A
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	
Aesthetic Effect	3
Reactivity	
Other Chemicals	4
Water	2
Self Reactivity	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0
	OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid or gas
13.2 **Molecular Weight:** 92.02
13.3 **Boiling Point at 1 atm:** 70.1°F = 21.2°C = 294 K
13.4 **Freezing Point** 11.9°F = -11.2°C = 262°K
13.5 **Critical Temperature:** 317.0°F = 158.2°C = 431.4°K
13.6 **Critical Pressure.** 1470 psia = 100 atm = 10.1 MN/m²
13.7 **Specific Gravity.** 1.45 at 20°C (liquid)
13.8 **Liquid Surface Tension** Not pertinent
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 3.2
13.11 **Ratio of Specific Heats of Vapor (Gas).** (est.) 1.62
13.12 **Latent Heat of Vaporization** 178 Btu/lb = 99.1 cal/g = 4.15 × 10⁵ J/kg
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization** Not pertinent

Continued on pages 4 and 5

NOTES

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NMT	NITROMETHANE

Common Synonyms			
Nitrocarbol	Water liquid	Colorless	Strong odor

Sinks and mixes slowly with water. Irritating vapor is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
Harmful if inhaled.

LIQUID
No appreciable harm to skin or eyes.
Harmful if swallowed.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Dispersal and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Nitrocarbol
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** CH_3NO_2
3.4 **IMCO/United Nations Numerical Designation:** 3.3 (26)

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Fairly strong characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air mask (do NOT use organic canister), goggles
5.2 **Symptoms Following Exposure:** Liquid may dry out skin and cause irritation
5.3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2. LD50 = 0.5 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes slight smarting of the eyes or respiratory system if present in high concentration. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin.
5.10 **Odor Threshold:** Less than 200 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 110°F (C.C.) 95°F (C.C.)
6.2 **Flammable Limits in Air:** 7.3% (LEL)
6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Containers may explode
6.7 **Ignition Temperature:** 785°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 1.1 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Wet material corrodes steel and copper; dry the reaction is slow
7.3 **Stability During Transport:** Considered stable, but may become sensitized by organic bases (amines) and some metal oxides such as lead pigments
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Commercial Solvents Corp.
245 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 95-99%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open or pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A P Q R S

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	3

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 61.04
13.3 **Boiling Point at 1 atm:** 214.2°F = 101.2°C = 374.4°K
13.4 **Freezing Point:** −17°F = −29°C = 244°K
13.5 **Critical Temperature:** 599°F = 315°C = 588°K
13.6 **Critical Pressure:** 915 psia = 62.3 atm = 6.31 MN/m²
13.7 **Specific Gravity:** 1.14 at 20° (liquid)
13.8 **Liquid Surface Tension:** 36.3 dynes/cm = 0.0363 N/m at 25°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.175
13.12 **Latent Heat of Vaporization:** 241 Btu/lb = 134 cal/g = 5.61 × 10⁵ J/kg
13.13 **Heat of Combustion:** −4501 Btu/lb = −2817 cal/g = −10.8 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** (est.) −9 Btu/lb = −5 cal/g = −0.2 × 10⁶ J/kg
13.16 **Heat of Polymerization:** Not pertinent

(See Hazard Index Guide)

NOTES

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NTP

2-NITROPHENOL

Common Synonyms
o-Nitrophenol
2-Hydroxynitrobenzene
ONP

Solid Yellow

Sinks and mixes slowly with water

[illegible]

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

[illegible] FOR MEDICAL [illegible]

DUST
Irritating to eyes, nose and throat
If inhaled will cause headache or loss of consciousness
[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause headache, nausea, or loss of consciousness
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning, water contaminant should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** 2-Hydroxynitrobenzene, o-Nitrophenol, ONP
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $C_6H_5NO_3$
3.4 **IMCO/United Nations Numerical Designation:** 6.1 1663

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Yellow
4.3 **Odor:** Peculiar aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus, rubber gloves, goggles
5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, drowsiness, nausea and blue color in lips, ears, and fingernails (cyanosis). Contact with eyes causes irritation. Can be absorbed through the intact skin to give same symptoms as for inhalation
5.3 **Treatment for Exposure.** INHALATION or INGESTION: remove victim to fresh air, give artificial respiration, call a doctor if symptoms persist. EYES: flush with water for at least 15 min, get medical attention. SKIN: cleanse thoroughly with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 1,297 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents.** Water, foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]
6.5 **Special Hazards of Combustion Products:** Toxic and irritating fumes of unburned material and oxides of nitrogen can form in fire
6.6 **Behavior in Fire.**
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity.**
46.3 ml/liter 48 hr. bluegill, TL_m fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)**
4.2 mg/g 0.94 days acclimated culture
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Monsanto Company
800 North Lindbergh Blvd
St. Louis, MO 63166
2. J. T. Baker Chemical Co.
Phillipsburg, N.J. 08865
3. Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, Pure
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 139.1
13.3 **Boiling Point at 1 atm.**
417°F = 214°C = 487°K
13.4 **Freezing Point.**
111°F = 44°C = 317°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.49 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** −8,910 Btu/lb = −4,950 cal/g = −20.7 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

NPH	# 4-NITROPHENOL

Common Synonyms		
p-Nitrophenol 4-Hydroxynitrobenzene PNP	Solid — Yellow to [illegible]	Sweet odor
	Sinks and mixes with water	

[illegible]

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible]
Exposure	CALIFORNIA DIRECTIVE DUST Irritating to eyes, nose and throat If inhaled will cause headache or loss of consciousness [illegible] SOLID Irritating to skin and eyes If swallowed will cause headache, nausea or loss of consciousness [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 4-Hydroxynitrobenzene
p-Nitrophenol PNP

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** $C_6H_5NO_3$

3 4 **IMCO/United Nations Numerical Designation:** 6.1 1663

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellow to brown

4 3 **Odor:** Slight characteristic sweet

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Butyl rubber gloves, side shield safety glasses, dust mask or self contained breathing apparatus

5 2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, drowsiness, nausea and blue color in lips, ears and fingernails (cyanosis). Contact with eyes or skin causes irritation. Can be absorbed through skin to give same symptoms as for inhalation

5 3 **Treatment for Exposure:** INHALATION or INGESTION: remove victim to fresh air, give artificial respiration, call a doctor if symptoms persist. EYES: flush with water for at least 15 min, get medical attention. SKIN: flush with water and wash well with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion.** Grade 3 LD50: 500 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents.** Water, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.**

6 5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen and fumes of unburned material may form in fires

6 6 **Behavior in Fire:** Decomposes violently at 279°C and will burn even in absence of air

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 E I du Pont de Nemours & Co Inc
Wilmington Del 19898

2 Monsanto Company
800 North Lindbergh Blvd
St Louis Mo 63166

3 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical Pure

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

HSS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 139.1

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point.** 235°F = 113°C = 386°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.48 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** −8,870 Btu/lb = −4,930 cal/g = −206 × 10³ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued in part 4 and 5

NOTES

NPP	2-NITROPROPANE

Common Synonyms	Liquid	Colorless	Mild, fruity odor
Isonitropropane 2-NP sec-Nitropropane	May float or sink in water		

[illegible]

Fire

Combustible
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, dizziness, coughing, or difficult breathing
[illegible]

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
[illegible]
IF IN EYES [illegible]
IF SWALLOWED [illegible] CONSCIOUS [illegible] vomiting
IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Isonitropropane
sec Nitropropane 2 NP

3 2 **Coast Guard Compatibility Classification.**
Nitrocompound

3 3 **Chemical Formula** $CH_3CHNO_2CH_3$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild fruity

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Self contained breathing apparatus goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure** Inhalation causes respiratory tract irritation headache dizziness nausea and diarrhea Ingestion causes irritation of mouth and stomach Contact with liquid irritates eyes and causes mild irritation of skin

5 3 **Treatment for Exposure** INHALATION in case of pulmonary symptoms enforce bed rest and give oxygen get medical attention at once INGESTION give a small amount of water and induce vomiting EYES or SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 25 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 2 oral rat LD_{50} [illegible] mg/kg

5 7 **Late Toxicity** Causes liver cancer in rats

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of skin

5 10 **Odor Threshold:** 300 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** 100°F (O C 82°F C C)

6 2 **Flammable Limits in Air** 2 6% (LEL)

6 3 **Fire Extinguishing Agents.** Foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Alcohol foam water may be ineffective

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6 6 **Behavior in Fire**

6 7 **Ignition Temperature:** 692°F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** May attack some forms of plastics

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Commercial Solvents Corp
245 Park Avenue
New York N Y 10017

2 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

3 Eastman Organic Chemicals
Rochester N Y 14650

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Technical 94+%

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q T U-X Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	[illegible]
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	[illegible]
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	4

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	[illegible]
Reactivity (Yellow)	3

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight** 89 09

13 **Boiling Point at 1 atm**
248 55°F = 120 3°C = 393 5°K

13 4 **Freezing Point**
−132°F = −91°C = 182°K

13 5 **Critical Temperature** Data not available

13 5 **Critical Pressure** Data not available

13 7 **Specific Gravity:** 0 99 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
30 dynes/cm = 0 030 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** Data not available

13 10 **Vapor (Gas) Specific Gravity:** 3 06 at 16°C

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 090 at 20°C

13 12 **Latent Heat of Vaporization.** 178 Btu/lb
= 99 cal/g = 4 1 × 10³ J/kg

13 13 **Heat of Combustion** −9 850 Btu/lb
= −5 500 cal/g = −224 × 10³ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

NTC	NITROSYL CHLORIDE

Common Synonyms	Liquefied compressed gas Orange red Choking odor Liquid sinks and reacts with water. Poisonous visible vapor cloud is produced

Fire	Not flammable POISONOUS GASES ARE PRODUCED WHEN HEATED
Exposure	VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED Irritating to eyes LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to eyes
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** None common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** NOCl
3.4 **IMCO/United Nations Numerical Designation.** 2.0 1069

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied gas
4.2 **Color:** Yellow to red
4.3 **Odor:** Irritating, choking

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus (approved mask) may be used for short exposures only; rubberized clothing, gloves, shoes, chemical goggles
5.2 **Symptoms Following Exposure:** Gas is highly toxic. Inhalation causes severe irritation of respiratory tract and damage to mucous membranes. Delayed effects, which include severe pulmonary edema, may not be apparent for several hours.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, call a doctor, enforce complete rest, and doctor advised to observe at least 24 h for delayed effects. SKIN OR EYES: Flush with water for at least 15 min, consult physician
5.4 **Toxicity by Inhalation (Threshold Limit Value)** (Upper recommended)
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics.** Severe burns to eyes and skin
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Very toxic gases are generated when heated
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves and reacts to form acid solution and to form red oxides of nitrogen
7.2 **Reactivity with Common Materials.** Corrosive to most metals but reaction is not hazardous
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water. Residual acid may be neutralized with soda ash
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity.** Data not available
8.3 **Biological Oxygen Demand (BOD).** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals Inc
   Specialty Gas Dept
   [illegible] West Broad St
   Emmaus, Pa 18049
2. Hercules Inc
   Explosives & Chemical Propulsion Dept
   Hercules, Calif 94547

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 97%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT

(See Hazard Assessment Handbook 446-3)

ACO

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Nonflammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 65.46
13.3 **Boiling Point at 1 atm:** 21.6°F = −5.8°C = 267.4 K
13.4 **Freezing Point** −74°F = −59°C = 214°K
13.5 **Critical Temperature:** 334°F = 168°C = 441 K
13.6 **Critical Pressure:** 1300 psia = 90 atm = 9.1 MN/m²
13.7 **Specific Gravity:** 1.36 at −5.7°C (liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.3
13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.229
13.12 **Latent Heat of Vaporization.** 164 Btu/lb = 92.0 cal/g = 3.85 × 10³ J/kg
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

NTO	NITROUS OXIDE

Common Synonyms	
Laughing gas Dinitrogen monoxide	Liquefied compressed gas Colorless Odorless or mild sweet odor Sinks and boils in water. Visible vapor cloud is produced

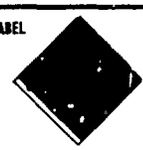
Fire	Not flammable but will intensify fires
Exposure	VAPOR If inhaled will cause dizziness, difficult breathing or loss of consciousness. LIQUID Will cause frostbite
Water Pollution	Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Restrict access

2. LABEL



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dinitrogen monoxide
Laughing gas

3.2 **Coast Guard Compatibility Classification**
Not applicable

3.3 **Chemical Formula:** N_2O

3.4 **IMCO/United Nations Numerical Designation:** 2 1070

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquefied compressed gas

4.2 **Color:** Colorless

4.3 **Odor:** None, slightly sweetish

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Self contained breathing apparatus for high vapor concentrations

5.2 **Symptoms Following Exposure.** Inhalation causes intense analgesia, concentrations of over 40 80% cause loss of consciousness preceded by hysteria. Contact of liquid with eyes or skin causes frostbite burn

5.3 **Treatment for Exposure:** INHALATION remove to fresh air. EYES get medical attention for frostbite burn. SKIN treat frostbite burn, soak in lukewarm water

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits:** 56,000 ppm for 60 min

5.6 **Toxicity by Ingestion:** Grade 0 LD$_{50}$ > 15 g/kg

5.7 **Late Toxicity:** Causes birth defects in rats, can cause lethal effects in chick eggs

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat

5.9 **Liquid or Solid Irritant Characteristics.** No appreciable hazard, product calls harmless to the skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
(nonflammable compressed gas)

6.2 **Flammable Limits in Air** Not pertinent

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6.5 **Special Hazards of Combustion Products**
Not pertinent

6.6 **Behavior in Fire** Will support combustion and may increase intensity of fire. Containers may explode when heated

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
Supports combustion but does not cause spontaneous ignition

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibits of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD)**
None

8.4 **Food Chain Concentration Potential:**
None

9 SELECTED MANUFACTURERS

1. Matheson Gas Products
P O Box 85
East Rutherford, N J 07073

2. Airco Incorporated
Ohio Medical Products Division
9950 Airco Drive
Madison, Wis 53701

3. Air Products and Chemicals Inc
Specialty Gas Department
P O Box 538
Allentown, Pa 18105

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 98.0+

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A C 1 J

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Nonflammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight** 44.0

13.3 **Boiling Point at 1 atm**
−129.1°F = −89.5°C = 183.7°K

13.4 **Freezing Point:**
−134.8°F = −90.5°C = 182.7°K

13.5 **Critical Temperature**
97.7°F = 36.5°C = 309.7°K

13.6 **Critical Pressure:**
1054 psia = 71.7 atm = 7.26 MN/m²

13.7 **Specific Gravity:** 1.266 at −89°C (liquid)

13.8 **Liquid Surface Tension.**
16 Dynes/cm = 0.0016 N/m at −25°C

13.9 **Liquid-Water Interfacial Tension.**
Data not available

13.10 **Vapor (Gas) Specific Gravity:** 1.53

13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.303 at 25°C

13.12 **Latent Heat of Vaporization** 167.7 Btu/lb
= 89.9 cal/g = 3.76 × 10⁵ J/kg

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

NAN	NONANE

Common Synonyms			
n-Nonane	Liquid	Colorless	Gasoline-like odor
	Floats on water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Fire Control Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** n-Nonane
3.2 **Coast Guard Compatibility Classification** Paraffin
3.3 **Chemical Formula** C_9H_{20}
3.4 **IMCO/United Nations Numerical Designation** UN 1920

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color** Colorless
4.3 **Odor** Like gasoline

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Self-contained breathing apparatus for high vapor concentrations, goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure** Inhalation of concentrated vapor causes depression, irritation of respiratory tract and pulmonary edema. Liquid can irritate eyes and for prolonged contact skin. Ingestion causes irritation of mouth and stomach. Aspiration causes severe lung irritation rapidly developing pulmonary edema and central nervous system excitement followed by depression
5.3 **Treatment for Exposure** INHALATION remove victim from exposure, give artificial respiration if needed. EYES irrigate with large amounts of water for 15 min. SKIN flush with water, wash with soap and water. INGESTION do NOT induce vomiting, call physician. ASPIRATION enforce bed rest, give oxygen, get medical attention
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short Term Inhalation Limits** Data not available
5.6 **Toxicity by Ingestion** Grade 0 (LD_{50} > 15 g/kg)
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Vapors are slightly irritating to eyes and throat
5.9 **Liquid or Solid Irritant Characteristics** No appreciable hazard. Practically harmless to the skin
5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 88°F C.C.
6.2 **Flammable Limits in Air** 0.8% - 2.9%
6.3 **Fire Extinguishing Agents** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire** Not pertinent
6.7 **Ignition Temperature** 401°F
6.8 **Electrical Hazard** Class I, Group D
6.9 **Burning Rate** 3.5 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction
7.2 **Reactivity with Common Materials** No reaction
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** [illegible] day
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Philips Petroleum Company
Chemical Department
Special Products Division
Bartlesville, OKLA 74004
2. The Humphrey Chemical Company
Devine Street
North Haven, Conn. 06473
3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades of Purity** Research, Pure, Technical all 99.5+
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T 1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not Listed
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** 128.3
13.3 **Boiling Point at 1 atm** 304°F = 151°C = 424°K
13.4 **Freezing Point** −64.3°F = −53.5°C = 219.7°K
13.5 **Critical Temperature** 610.5°F = 321.4°C = 594.6°K
13.6 **Critical Pressure** 335 psia = 22.8 atm = 2.31 MN/m²
13.7 **Specific Gravity** 0.718 at 20°C (liquid)
13.8 **Liquid Surface Tension** 22.9 dynes/cm = 0.0229 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension** [illegible] dynes/cm = 0.015 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity** 4.4
13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.042 at 16°C
13.12 **Latent Heat of Vaporization** 127 Btu/lb = 70 cal/g = 2.93 × 10⁵ J/kg
13.13 **Heat of Combustion** −19,087 Btu/lb = −10,593 cal/g = −44.3 × 10⁶ J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on page 1 and 4

NOTES

NNN	NONANOL

Common Synonyms 1 Nonanol Nonyl alcohol Octycarbinol	Liquid Colorless Rose or fruity odor Floats on water Freezing point is 23° F
Fire	Combustible
Exposure	LIQUID Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical Containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:**
1 Nonanol Octylcarbinol
Nonyl alcohol Pelargonic alcohol

3 2 **Coast Guard Compatibility Classification:**
Alcohol

3 3 **Chemical Formula.** $CH_3CH_2CH_2OH$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor** Rose citrus

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Liquid irritates eyes

5 3 **Treatment for Exposure:** Flush eyes and skin with water for at least 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 [illegible]

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor [illegible] to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics.** No appreciable hazard. Practically harmless to the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 210°F O.C. 165°F C.C.

6 2 **Flammable Limits in Air:** [illegible]

6 3 **Fire Extinguishing Agents.** Alcohol foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** (the [illegible] days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Givaudan Corp
Aroma Chemical Division
125 Delawanna Ave
[illegible]

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 97

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-5

A-T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12 3 **KFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight.** 144 2[illegible]

13 3 **Boiling Point at 1 atm** 415 F = 213 C = 486 K

13 4 **Freezing Point:** 2[illegible] F = [illegible] C = [illegible] K

13 5 **Critical Temperature:** [illegible] F = 404°C = [illegible] K

13 6 **Critical Pressure:** [illegible] psia = 24 atm = 2.4 MN/m

13 7 **Specific Gravity:** 0.827 at 20 C (liquid)

13 8 **Liquid Surface Tension:** 28 dynes/cm = 0.028 N/m at 24°C

13 9 **Liquid-Water Interfacial Tension:** 9.0 dynes/cm = 0.0090 N/m at 21.3°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** [illegible]

13 12 **Latent Heat of Vaporization** [illegible]

13 13 **Heat of Combustion:** -17,800 Btu/lb = -9360 cal/g = -413 × 10[illegible] J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 7 and 8

NOTES

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NON	NONENE

Common Synonyms Propylene trimer Nonene (non linear)	Liquid Colorless Gasoline-like odor Floats on water. Flammable. Irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled, will cause dizziness or loss of consciousness LIQUID Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Nonene (non linear)
Propylene trimer
Tripropylene

3.2 **Coast Guard Compatibility Classification:** Olefin

3.3 **Chemical Formula:** C_9H_{18}

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Characteristic, like gasoline

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator, organic vapor canister or air supplied mask. Use splash shield.

5.2 **Symptoms Following Exposure:** High vapor concentrations irritate eyes and respiratory tract and act as an anesthetic.

5.3 **Treatment for Exposure:** INHALATION: Remove patient. If breathing stops, apply artificial respiration and obtain medical attention. INGESTION: DO NOT induce vomiting because aspiration hazard.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause eye, skin and respiratory system irritation in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and is not removed, it may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] °C

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** [illegible] mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Atlantic Richfield Co.
ARCO Chemical Co. Division
2500 Broad St.
Philadelphia, Pa. 19101

Exxon Chemical Co.
Houston, Tex. 77001

Sun Oil Co.
Marcus Hook, Pa. 19061

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame at atmospheric pressure, vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

N 2 1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	1
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	
Aesthetic Effect	2
Reactivity	
Other Chemicals	
Water	0
Self Reactive	1

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 126.2

13.3 **Boiling Point at 1 atm.** 275–284°F = 135–140°C = 408–413°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Data not available

13.6 **Critical Pressure:** Data not available

13.7 **Specific Gravity:** 0.730 at 23°C (liquid)

13.8 **Liquid Surface Tension:** 22 dynes/cm = 0.022 N/m at 20°

13.9 **Liquid-Water Interfacial Tension:** 35.5 dynes/cm = 0.0355 N/m at 21.3°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** -19,100 Btu/lb = -10,600 cal/g = -445 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(See reverse side)

NOTES

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NNE	1-NONENE

Common Synonyms
1-Nonene
n-Heptylethylene

Liquid — Colorless — Gasoline-like odor

Floats on water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness.

LIQUID
Irritating to skin and eyes.

Water Pollution

Effect of low concentrations on marine life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment
Shoreline cleanup
Chemical and physical treatment

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** n-Heptylethylene; 1-Nonene
3.2 **Coast Guard Compatibility Classification:** Oil
3.3 **Chemical Formula:** $CH_3(CH_2)_6CH=CH_2$
3.4 **IMCO Units, Stations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Hydrocarbon [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator [illegible] and rubber boots and gloves
5.2 **Symptoms Following Exposure:** Headache, [illegible] and dizziness
5.3 **Treatment for Exposure:** INHALATION: [illegible] INGESTION: [illegible] NOT induce vomiting because vapor is a hazard
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor [illegible] irritation. The [illegible]
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Liquid on clothing [illegible] may cause irritation and [illegible]
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Data not available
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide or dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. The Humphrey Chemical Co., Derby St., North Haven, Conn. 06473
2. Phillips Petroleum Co., Bartlesville, Okla. 74004
3. Exxon Chemical Co., Houston, Tex. 77001

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

XTU

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Acute	
Chronic	
Reactivity	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetics	2
Reactivity	
Other Chemicals	
Water	
Self Reactive	

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 126.2
13.3 **Boiling Point at 1 atm.:** 147°F = 147°C = 420°K
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** 622°F = 327°C = 600°K
13.6 **Critical Pressure:** 360 psia = 24.5 atm = 2.48 MN/m²
13.7 **Specific Gravity:** 0.73 @ 20°C (Water = 1.0)
13.8 **Liquid Surface Tension:** 23.0 dynes/cm = 0.0230 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio: Specific Heats of Vapor (Gas):** Data [illegible]
13.12 **Latent Heat of Vaporization:** 24 Btu/lb = 55.8 cal/g = 233 J/g
13.13 **Heat of Combustion:** −19,500 Btu/lb = −44,600 cal/g = −186,600 J/g
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Liquid Water Density

NOTES

REVISED 1978

NNP	NONYLPHENOL

Common Synonyms	Thick liquid — Light yellow straw color — Medicinal odor Floats on water
Fire	Combustible
Exposure	Liquid Will burn skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required on
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** [illegible]
3.2 **Coast Guard Compatibility Classification:** [illegible]
3.3 **Chemical Formula:** [illegible]
3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color:** [illegible]
4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]
5.2 **Symptoms Following Exposure:** [illegible]
5.3 **Treatment for Exposure:** EYES [illegible] SKIN [illegible]
5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]
5.5 **Short-Term Inhalation Limits:** [illegible]
5.6 **Toxicity by Ingestion:** [illegible]
5.7 **Late Toxicity:** [illegible]
5.8 **Vapor (Gas) Irritant Characteristics.** [illegible]
5.9 **Liquid or Solid Irritant Characteristics:** [illegible]
5.10 **Odor Threshold** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air.** [illegible]
6.3 **Fire Extinguishing Agents.** [illegible]
6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]
6.5 **Special Hazards of Combustion Products.** [illegible]
6.6 **Behavior in Fire:** [illegible]
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** [illegible]
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]
7.2 **Reactivity with Common Materials:** [illegible]
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]
7.5 **Polymerization:** [illegible]
7.6 **Inhibitor of Polymerization:** [illegible]

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]
8.2 **Waterfowl Toxicity:** [illegible]
8.3 **Biological Oxygen Demand (BOD):** [illegible]
8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** [illegible]
10.4 **Venting:** [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid or Solid Irritant	2
Poisons	
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aquatic Effect	3
Reactivity	
Organic Chemicals	2
Water	0
Self Reactive	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	1
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** [illegible]
13.3 **Boiling Point at 1 atm.** [illegible]
13.4 **Freezing Point** [illegible]
13.5 **Critical Temperature** [illegible]
13.7 **Critical Pressure** [illegible]
13.7 **Specific Gravity.** 0.9494 at 25°C (liquid)
13.8 **Liquid Surface Tension** [illegible]
13.9 **Liquid-Water Interfacial Tension** [illegible]
13.10 **Vapor (Gas) Specific Gravity** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas)** [illegible]
13.12 **Latent Heat of Vaporization.** [illegible]
13.13 **Heat of Combustion** [illegible]
13.14 **Heat of Decomposition** [illegible]
13.15 **Heat of Solution** [illegible]
13.16 **Heat of Polymerization** [illegible]

Continued on next page

NOTES

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OAN	OCTANE

Common Synonyms
n-Octane

Liquid | Colorless | Gasoline like odor

Floats on water. Flammable irritating vapor is produced

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause headache, dizziness, difficult breathing or loss of consciousness

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floating to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4.

Issue warning: high flammability
Restrict access
Mechanically contain
Should be removed
Chemical and physical treatment

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: n-Octane
3.2 Coast Guard Compatibility Classification. Paraffin
3.3 Chemical Formula: C_8H_{18}
3.4 IMCO/United Nations Numerical Designation.

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped). Liquid
4.2 Color: Colorless
4.3 Odor: Like gasoline

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Self contained breathing apparatus, chemical goggles or face shield, rubber gloves
5.2 Symptoms Following Exposure: Inhalation: Irritation of the eyes, nose and throat, respiratory tract, dermatitis and pulmonary edema. Excessive exposure causes headache, dizziness, and loss of consciousness. Ingestion causes nausea and vomiting. Aspiration causes severe and extensive chemical pneumonitis, pulmonary edema, and hemorrhage.
5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, administer oxygen if required, artificial respiration if required, keep warm, medical attention. EYES: flush with plenty of water. SKIN: flush with plenty of water and water. INGESTION: DO NOT induce vomiting, call physician. ASPIRATION: administer oxygen, medical attention.
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits.
5.6 Toxicity by Ingestion
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics. Data not available
5.9 Liquid or Solid Irritant Characteristics. Data not available
5.10 Odor Threshold

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air.
6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products. None
6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flashback
6.7 Ignition Temperature
6.8 Electrical Hazard
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water
7.2 Reactivity with Common Materials. No reaction
7.3 Stability During Transport
7.4 Neutralizing Agents for Acids and Caustics. Not applicable
7.5 Polymerization. Not applicable
7.6 Inhibitor of Polymerization. Not applicable

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD) Data not available
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Phillips Petroleum Company
Chemical Department
Special Products Division
Bartlesville, Okla. 74004

Data supplied under contract
Arthur D Little
Cambridge, Mass. 02140

Chemical Research
Chemical Division
Rockville, Md. 20852

10 SHIPPING INFORMATION

10.1 Grades of Purity: Research, Pure, Technical
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: Not required
10.4 Venting: Open, flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A T F

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations. Flammable liquid
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications.

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm. Liquid
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm.
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension.
13.9 Liquid-Water Interfacial Tension.
13.10 Vapor (Gas) Specific Gravity
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion.
13.14 Heat of Decomposition
13.15 Heat of Solution
13.16 Heat of Polymerization

Continued on next page

NOTES

OTA	OCTANOL

Common Synonyms 1-Octanol Octyl alcohol Heptylcarbinol	Thick liquid Colorless Sweet odor Floats on water
Fire	Combustible
Exposure	LIQUID Irritating to skin Will burn eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

[illegible]

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible]
3.2 Coast Guard Compatibility Classification: [illegible]
3.3 Chemical Formula: $CH_3CH_2CH_2OH$
3.4 IMCO United Nations Numerical Designation: [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: [illegible]
4.3 Odor: [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]
5.2 Symptoms Following Exposure: [illegible]
5.3 Treatment for Exposure: [illegible]
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: [illegible]
5.6 Toxicity by Ingestion: Grade 1, oral rat LD_{50} > 3.2 g/kg
5.7 Late Toxicity: [illegible]
5.8 Vapor (Gas) Irritant Characteristics: [illegible]
5.9 Liquid or Solid Irritant Characteristics: [illegible]
5.10 Odor Threshold: 0.49 ppm

6 FIRE HAZARDS

6.1 Flash Point: [illegible]
6.2 Flammable Limits in Air: [illegible]
6.3 Fire Extinguishing Agents: [illegible]
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: [illegible]
6.8 Electrical Hazard: [illegible]
6.9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: [illegible]
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: [illegible]
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: [illegible]
8.2 Waterfowl Toxicity: [illegible]
8.3 Biological Oxygen Demand (BOD): [illegible]
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 Grades or Purity: [illegible]
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: [illegible]
10.4 Venting: Open [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-4

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Combustible Liquid
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: [illegible]
13.2 Molecular Weight: [illegible]
13.3 Boiling Point at 1 atm: [illegible]
13.4 Freezing Point: [illegible]
13.5 Critical Temperature: [illegible]
13.6 Critical Pressure: [illegible]
13.7 Specific Gravity: [illegible]
13.8 Liquid Surface Tension: [illegible]
13.9 Liquid-Water Interfacial Tension: [illegible]
13.10 Vapor (Gas) Specific Gravity: [illegible]
13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]
13.12 Latent Heat of Vaporization: [illegible]
13.13 Heat of Combustion: [illegible]
13.14 Heat of Decomposition: [illegible]
13.15 Heat of Solution: [illegible]
13.16 Heat of Polymerization: [illegible]

[illegible]

NOTES

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OTE	1-OCTENE

Common Synonyms
Caprylene
alpha-Octylene

Liquid Colorless Gasoline-like odor

Floats on water Flammable, harmful vapor is produced

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
If inhaled, will cause dizziness

LIQUID
Irritating to skin and eyes
If swallowed, will cause nausea or vomiting

DO NOT INDUCE VOMITING

Water Pollution

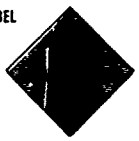
Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Evacuate area
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Caprylene
alpha-Octylene

3 2 **Coast Guard Compatibility Classification.** Olefin

3 3 **Chemical Formula:** $CH_3(CH_2)_5CH{=}CH_2$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Like gasoline

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic vapor canister goggles or face shield

5 2 **Symptoms Following Exposure** Generally low toxicity Mildly anesthetic at high vapor concentrations May irritate eyes

5 3 **Treatment for Exposure** INHALATION remove from exposure support respiration INGESTION do NOT induce vomiting

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present at high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** 70°F (O C

6 2 **Flammable Limits in Air:** 0 9 (LEL)

6 3 **Fire Extinguishing Agents:** Dry chemical foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature.** 493°F

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** 6 5 mm min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 0 9% (theor) 1 1 days

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Air Products and Chemicals Inc
Hoeurs Division
Paulsboro N J 08066

2 The Humphrey Chemical Co
Devine St
North Haven Conn 06473

3 Phillips Petroleum Co
Bartlesville Okla 74004

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Research 99 7% pure 99 3% technical 95%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

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12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 112 22

13 3 **Boiling Point at 1 atm:** 250 3°F = 121 3°C = 394 5°K

13 4 **Freezing Point:** −151°F = −102°C = 172°K

13 5 **Critical Temperature** 560 1°F = 293 4°C = 566 6°K

13 6 **Critical Pressure:** 400 psia = 27 2 atm = 2 76 MN/m

13 7 **Specific Gravity:** 0 715 at 20°C (liquid)

13 8 **Liquid Surface Tension.** 21 76 dynes/cm = 0 02176 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** (est) 50 dynes/cm = 0 05 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 050

13 12 **Latent Heat of Vaporization** 129 Btu/lb = 71 9 cal/g = 3 01 × 10 J/kg

13 13 **Heat of Combustion** −19 170 Btu/lb = −10 650 cal/g = −445 89 × 10 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

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OET — OCTYL EPOXY TALLATE

Common Synonyms			
Epoxidized tall oil, octyl ester	Liquid	Pale yellow	Mild odor
	Floats on water		

Avoid [illegible] liquid. Keep [illegible]
Stop discharge if possible
Isolate and [illegible]
[illegible]

Fire

Combustible
[illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]
IF INHALED [illegible]
IF SWALLOWED [illegible] UNCONSCIOUS [illegible]
[illegible]
IF SWALLOWED [illegible] UNCONSCIOUS OR VOMITING
CONVULSIONS [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Epoxidized tall oil octyl ester
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula.** Mixture
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Pale yellow
4 3 **Odor:** Mild

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical goggles face shield oil resistant gloves
5 2 **Symptoms Following Exposure:** Contact with eyes causes mild inflammation. Contact with skin may produce allergic response
5 3 **Treatment for Exposure:** EYES or SKIN remove excess oil with cloth or absorbent paper. Then wash with soap water and flush with clear water consult a physician
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion** Grade 0 LD_{50} > 15 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** 480°F O C
6 2 **Flammable Limits in Air.** Not pertinent
6 3 **Fire Extinguishing Agents:** Foam dry chemical carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective
6 5 **Special Hazards of Combustion Products.**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature.** Data not available
6 8 **Electrical Hazard.** Data not available
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

USS Chemicals
600 Grant St
Pittsburgh Pa 15230

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 420 (approx.)
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** (est.) 1.002 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 40.1 dynes/cm = 0.0401 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Data not available
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

OCF	OILS: CLARIFIED

Common Synonyms	Oily liquid Colorless Floats on water
[illegible]	
Fire	Combustible [illegible]
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes. [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Data not available
4 3 **Odor:** Data not available

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield
5 2 **Symptoms Following Exposure:** If liquid ingested an increased frequency of bowel movements will occur
5 3 **Treatment for Exposure:** INGESTION Do not induce vomiting SKIN Wipe off wash with soap and water EYES Wash with water for at least 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value)** No single TLV applicable
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Grade 1 LD_{50} 5 to 15g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Data not available
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical foam or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Shell Oil Co
1 Shell Plaza
Houston Tex 77001
2 Exxon Co
Houston Tex 77001
3 Sun Oil Co
St Davids Pa 19087

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

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12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** Data not available
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** (est) 0 85 at 20°C (liquid)
13 8 **Liquid Surface Tension:** (est) 25 dynes/cm = 0.025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** (est) 50 dynes/cm = 0.05 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** (est) −18,000 B.t.u./lb = −10,000 cal/g = −420 × 10³ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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OIL	OILS: CRUDE

Common Synonyms			
Petroleum	Oily liquid	Dark	Acrid odor
	Floats on water. Flammable vapor may be produced		

Fire

Combustible

Exposure

VAPOR
Not irritating to eyes, nose, or throat

LIQUID
Irritating to skin and eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Petroleum
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO United Nations Numerical Designation.** 3.1 1267

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Dark
4.3 **Odor:** Offensive tarry

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles, face shield, rubber gloves and boots
5.2 **Symptoms Following Exposure:** May irritate eyes and skin
5.3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off and wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard if spilled on clothing and allowed to remain; may cause smarting and reddening of the skin
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Data not available
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents.** Dry chemical, carbon dioxide, foam
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products.** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.**
Ippm* [illegible] fish toxic. Fresh water 200 ppm 24 hr [illegible] 20 ppm normal response [illegible] water
*Time period not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Dem. and (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Exxon Co. Houston, Tex. 77001
2. Shell Oil Co. Shell Plaza Houston, Tex. [illegible]
3. Sun Oil Co. St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Wide variety depending on oil field where produced
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	[illegible]
Health	
Vapor Irritant	0
Liquid or Solid Irritant	[illegible]
Poisons	[illegible]
Water Pollution	
Human Toxicity	[illegible]
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm.** [illegible]
13.4 **Freezing Point.** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] liquids
13.8 **Liquid Surface Tension.** [illegible]
13.9 **Liquid-Water Interfacial Tension** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

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ODS

OILS: DIESEL

Common Synonyms
Fuel Oil 1 D
Fuel Oil 2 D

Oily liquid — Yellow-brown — Lube oil fuel oil odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Fuel Oil 1 D
Fuel Oil 2 D

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO United Nations Numerical Designation:** 3 1 1270

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Light brown

4 3 **Odor:** Like fuel oil

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield

5 2 **Symptoms Following Exposure:** If liquid is ingested an increased frequency of bowel movements will occur

5 3 **Treatment for Exposure:** INGESTION do NOT induce vomiting SKIN wipe off wash with soap and water EYES wash with copious amounts of water for at least 15 min

5 4 **Toxicity by Inhalation (Threshold Limit Value)** No single TLV applicable

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD$_{50}$ 5 to 15 g/kg

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to certain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** (1 D) 100°F C C
(2 D) 125°F C C

6 2 **Flammable Limits in Air:** 1 3 6 0 vol %

6 3 **Fire Extinguishing Agents:** Dry chemical foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** (1 D) 350 625°F
(2 D) 490-545°F

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
204 mg 1/24 hr juvenile American shad/
TLm salt water

8 2 **Waterfowl Toxicity** >20 ml/kg
/LD50/mallards

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Exxon Co
Houston Tex 77001

2 Shell Oil Co
1 Shell Plaza
Houston Tex 77001

3 Sun Oil Co
St Davids Pa 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Diesel Fuel 1 D (ASTM) Diesel Fuel 2 D (ASTM)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 2)

A 1 1

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight.** Not pertinent

13 3 **Boiling Point at 1 atm.** 350 640°F
= 288 338°C = 561 612°K

Freezing Point: 0 to −40°F
−18 to −34°C = 255 to 239°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 0 841 a. 16°C (liquid)

13 8 **Liquid Surface Tension:**
(est 1 5 dynes/cm = 0 015 N/m at 20 C)

13 9 **Liquid-Water Interfacial Tension:**
(est 1 50 dynes/cm = 0 05 N/m at 20 C)

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** -18,400 Btu/lb
= -10,200 cal/g = 429 × 10^3 J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

OCA	OILS, EDIBLE: CASTOR

Common Synonyms	Oily liquid — Light yellow to green — Weak odor Floats on water
Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Light yellow to green
4 3 **Odor:** Characteristic odorless

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield
5 2 **Symptoms Following Exposure:** If ingested causes severe diarrhea
5 3 **Treatment for Exposure:** INGESTION if more than 2 tablespoons consult physician EYES flush with water for at least 15 min SKIN wipe off wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value).** None
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Grade 1 LD 5 to 15 g/kg (Fatal dose unknown but presumably large)
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics:** None
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 445°F C C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents.** Dry chemical foam or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature** 840°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 N L Industries Inc
Baker Castor Oil Co Division
20 Avenue A
Bayonne N J 07002

2 Textron Inc
Spencer Kellogg Division
Buffalo N Y 14240

3 Arthur C Trask Corp
7666 W 63rd St
Argo Ill 60501

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial meets Mil Specs and ASTM USP USP Odorless refined meets NAVORD Specs Technical All grades differ only in color and acid values
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** Varies, depending on composition
13 4 **Freezing Point:** [illegible]
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** [illegible] (liquid)
13 8 **Liquid Surface Tension:** 39 dynes/cm = 0 039 N m at 20°C
13 9 **Liquid-Water Interfacial Tension:** 19 2 dynes cm = 0 0192 N/m at 22°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13 12 **Latent Heat of Vaporization.** [illegible]
13 13 **Heat of Combustion** [illegible]
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

OCC	OILS, EDIBLE: COCONUT

Common Synonyms			
Coconut butter Copra oil Coconut oil	Solid or liquid Floats on water	Light yellow to orange	Weak odor

Fire	Combustible
Exposure	LIQUID OR SOLID Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(Spill Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Coconut butter
Coconut oil, Copra oil

3 2 **Coast Guard Compatibility Classification:** Esters

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid or solid

4 2 **Color:** Light yellow-orange

4 3 **Odor:** Weak acid

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Oil is essentially nontoxic, but can cause mild irritation of eyes on contact

5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 420°F (C.C. (crude)
580°F (C.C. (refined)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Foam, carbon dioxide, dry chemical

6 4 **Fire Extinguishing Agents Not to be Used.** Water or foam may cause frothing
water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 PVO International, Inc
1145 South Tenth Street
Richmond, Calif 94804

2 Cargill Inc
Cargill Building
Minneapolis, Minn 55402

3 Capital City Products Co
P O Box 569
Columbus, Ohio 43216

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Crude, Cochin
All grades contain 5% free fatty acids

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X T I

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Inflammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid or liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Not pertinent (very high)

13 4 **Freezing Point:** (approx.) 76°F = 24°C = 297°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.922 at 25°C (liquid)

13 8 **Liquid Surface Tension:** 33.4 dynes/cm = 0.0334 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 25°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est.) = 15,500 Btu/lb = 8,600 cal/g = 360 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

OCS	OILS, EDIBLE: COTTONSEED

Common Synonyms	Oily liquid	Pale yellow	Odorless
	Floats on water. Freezing point is 32° F		

Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Ester
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Pale yellow
4.3 **Odor:** Odorless

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield
5.2 **Symptoms Following Exposure:** None as used as a food
5.3 **Treatment for Exposure:** EYES: wash with water for at least 15 min
5.4 **Toxicity by Inhalation (Threshold Limit Value):** None
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** None
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** None
5.9 **Liquid or Solid Irritant Characteristics:** None
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** 486°F C.C. (refined oil), 610°F C.C. (cooking oil)
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical foam or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 650°F (refined oil)
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Diamond Shamrock Corp.
Nopco Chemicals Division
Morristown, N. J. 07960
2. Pacific Vegetable Oil Corp.
World Trade Center
San Francisco, Calif. 94111
3. Stokely Van Camp, Inc.
Capital City Products Co.
Columbus, Ohio 4321

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Refined, cooking
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A.T.L.

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Very high
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.922 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 35 dynes/cm = 0.035 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

OFS	OILS, EDIBLE: FISH

Common Synonyms	Oily liquid	Pale yellow	Fishy odor
	Floats on water		

Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Ester
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Pale yellow
4.3 **Odor:** Fishy

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield
5.2 **Symptoms Following Exposure:** None is a food
5.3 **Treatment for Exposure:** EYES: Flush with water for at least [illegible] min
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** None
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** None
5.9 **Liquid or Solid Irritant Characteristics:** None
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 420°F C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, foam or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Ashland Oil, Inc.
Chemical Product Division
Columbus, Ohio 43216

2 Diamond Shamrock Corp.
Nopco Chemical Division
Morristown, N.J. 07960

Marine Products Co.
[illegible]
Boston, Mass. 02127

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A T U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Very high
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.93 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 38 dynes/cm = 0.038 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on paper 5 and 6

NOTES

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OLD	OILS, EDIBLE: LARD

Common Synonyms			
Prime steam lard Kettle rendered lard Leaf lard Lard	Liquid or solid Floats on water	Colorless to Light yellow	Fatty odor

Fire	Combustible
Exposure	LIQUID OR SOLID Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Kettle-rendered lard, Leaf lard, Prime steam lard
3.2 **Coast Guard Compatibility Classification:** Esters (13)
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Fatty

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Substance is essentially nontoxic. Prolonged contact with skin may cause dermatitis (oil acne). Hot liquid can burn eyes or skin
5.3 **Treatment for Exposure:** EYES: flush with water for at least 15 min; get medical attention for burn. SKIN: wipe off; get medical attention for burn. INGESTION: do NOT induce vomiting
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]°F C.C.
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Dry chemical foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing; water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Swift Edible Oil Company
[illegible] West Jackson Boulevard
Chicago, Ill. 60604

2. Mayco Oil and Chemical Co., Inc.
Beaver and Canal Streets
Bristol, Pa. 19007

3. Colfax, Inc.
[illegible]
Pawtucket, R.I. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Various grades depending on source of animal [illegible] used and method of rendering
10.2 **Storage Temperature:** Ambient, or elevated (for liquid)
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A T U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAP Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.861 at 15°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 30°C
13.9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 30°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible] = −9,320 cal/g = −390 × 10^3 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 9

NOTES

001	OILS, EDIBLE: OLIVE

Common Synonyms	Oily liquid — Pale yellow Floats on water
Fire	Combustible
Exposure	Not normal
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-2

Mechanical containment
Manual containment
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Fuel
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Pale yellow green
4.3 **Odor:** Weak characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles, face shield
5.2 **Symptoms Following Exposure:** None reported
5.3 **Treatment for Exposure:** No treatment recommended
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not applicable
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** None
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** None
5.9 **Liquid or Solid Irritant Characteristics:** None
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, water, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water stream may cause frothing
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive
7.2 **Reactivity with Common Materials:** Not reactive
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

N T 1

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Not [illegible]
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] Liquid
13.8 **Liquid Surface Tension:** 36 dynes/cm = 0.036 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

OPM	OILS, EDIBLE: PALM

Common Synonyms			
Palm fruit oil Palm butter Palm oil	Liquid or solid Floats on water	Orange red	Pleasant odor

Fire	Combustible
Exposure	LIQUID OR SOLID Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Palm butter, Palm fruit oil
3.2 **Coast Guard Compatibility Classification:** Ester
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Semi-solid to liquid
4.2 **Color:** Orange red
4.3 **Odor:** Pleasant characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Oil is essentially nontoxic, may cause mild irritation of eyes
5.3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing; water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Capital Products Co.
P.O. Box [illegible]
Columbus, OH [illegible]

2. Welch, Holme & Clark Co., Inc.
[illegible] South Fourth Street
Harrison, N.J. 07029

3. PVO International, Inc.
[illegible] South Tenth Street
Richmond, Calif. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Various grades depending on source. Contains [illegible] fatty acids
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 426-3)

A T U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid to liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Not pertinent (very high)
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] liquid
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 7 and 8

NOTES

OPN	OILS, EDIBLE: PEANUT

Common Synonyms	Oily liquid — Pale yellow — Weak peanut odor Floats on water
Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula.** Not applicable
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Pale yellow
4 3 **Odor:** Characteristic slight nutty odor

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield
5 2 **Symptoms Following Exposure.** None is a food
5 3 **Treatment for Exposure** EYES flush with water for at least 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** None
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics** None
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 640°F O C 540°F C C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical foam, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire** Not pertinent
6 7 **Ignition Temperature.** 833°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Reilly Whiteman Inc
Conshohocken Pa 19428
2 Stokely-Van Camp, Inc
Capital City Products Co
Columbus Ohio 43216
3 Welch Holme and Clark Co Inc
1000 S 4th St
Harrison, N J 07029

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm** Very high
13 4 **Freezing Point:** 28°F = −2°C = 271 K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0 919 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 35.5 dynes/cm = 0 0355 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension.** 30 dynes/cm = 0 030 N/m at 70°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** (est) −16 000 btu/lb = −8 870 cal/g = −371 × 10³ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

OSF — OILS, EDIBLE: SAFFLOWER

Common Synonyms	Liquid	Light yellow	Bland fatty odor
Safflower oil Safflower seed oil Carthamus tinctorius oil	Floats on water		

Fire	Combustible
Exposure	LIQUID Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** *Carthamus tinctorius* oil, Safflower seed oil

3.2 **Coast Guard Compatibility Classification** Ester

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Pale yellow

4.3 **Odor:** Bland, fatty

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Oil is essentially nontoxic. Contact with eyes can cause mild irritation

5.3 **Treatment for Exposure.** EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold.** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Data not available

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective; water or foam may cause frothing

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate.** 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. PVO International Inc
   1148 South Tenth Street
   Richmond, Calif 94804
2. Capital City Products Co
   P O Box 89
   Columbus, Ohio 43216

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Food grade contains 0.02% propyl gallate, 0.01% citric acid or may contain no additives. Technical non break and alkali refined

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

X-T-L

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight** Not pertinent

13.3 **Boiling Point at 1 atm:** Not pertinent (very high)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature.** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity.** 0.923 at 25°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.** (est.) 50 dynes/cm = 0.050 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion:** (est.) −15,500 Btu/lb = −8,600 cal/g = −360 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

OSB	OILS, EDIBLE: SOYA BEAN

Common Synonyms	Oily liquid	Pale yellow	Weak odor
	Floats on water		

[illegible]

Fire	Combustible [illegible]
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Soybean oil
3 2 **Coast Guard Compatibility Classification.** Ester
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color:** Pale yellow
4 3 **Odor:** Weak

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield
5 2 **Symptoms Following Exposure** None is a food
5 3 **Treatment for Exposure:** EYES flush with water for at least 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits** Not pertinent
5 6 **Toxicity by Ingestion.** None
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics.** None
5 9 **Liquid or Solid Irritant Characteristics.** None
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 540°F C C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents.** Dry chemical foam, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire** Not pertinent
6 7 **Ignition Temperature** 833°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD).** 39%, 5 days
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Ashland Oil Co
Chemical Products Division
Peoria Ill 61601
2 A E Staley Manufacturing Co
Decatur, Ill 62525
3 Arthur C Trask Corp
7666 W 63rd St
Argo Ill 60501

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Refined, crude
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight** Not pertinent
13 3 **Boiling Point at 1 atm.** Very high
13 4 **Freezing Point:** −4°F = −20°C = 253°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity** 0 922 at 20°C (liquid)
13 8 **Liquid Surface Tension** (est) 25 dynes/cm = 0 025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension** (est) 50 dynes/cm = 0 05 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** (est) −16 000 Btu/lb = −8 870 cal/g = −371 × 10³ J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

OTC

OILS, EDIBLE: TUCUM

Common Synonyms

Aouara oil
American palm kernel oil
Palm seed oil
Tucum oil

Liquid — Light yellow — Weak odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Not harmful
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** American palm kernel oil, Aouara oil, Palm seed oil
3 2 **Coast Guard Compatibility Classification.** Esters (13)
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Light yellow
4 3 **Odor:** Weak acid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Oil is essentially nontoxic. Contact with eyes causes mild irritation, and prolonged contact with skin may cause dermatitis
5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** None known
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** 398°F C.C.
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Dry chemical foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing, water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Capital City Products Inc
P O Box 569
Columbus Ohio 43216

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not applicable
13 3 **Boiling Point at 1 atm:** Not pertinent (Very high)
13 4 **Freezing Point:** 86°F = 30°C = 303°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.908 at 60°C (liquid)
13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 30°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 30°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** (est.) −15 500 Btu/lb = −8 600 cal/g = −360 × 10³ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

OVG	OILS, EDIBLE: VEGETABLE

Common Synonyms	Oily liquid — Pale yellow — Weak, fatty odor Floats on water
	[illegible]
Fire	Combustible [illegible]
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Ester
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Weak fatty

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield
5.2 **Symptoms Following Exposure:** None is known
5.3 **Treatment for Exposure.** EYES: flush with water for at least 15 min
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** None
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics.** None
5.9 **Liquid or Solid Irritant Characteristics.** None
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** 610°F O.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical foam or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Ashland Oil Co
   Chemical Products Division
   Peoria, Illinois
2. Sherwin Williams Co
   101 Prospect Ave
   Cleveland, Ohio 44101
3. A.E. Staley Manufacturing Co
   Decatur, Ill 62525

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

N-R

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** Not pertinent
13.3 **Boiling Point at 1 atm** Very high
13.4 **Freezing Point.** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity:** 0.923 at 2[illegible]°C (liquid)
13.8 **Liquid Surface Tension** [illegible]
13.9 **Liquid-Water Interfacial Tension** [illegible]
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion** [illegible]
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

OSX	OILS, FUEL: 6

Common Synonyms	
Bunker C oil Residual fuel oil No 6	Thick liquid Black Tar odor Usually floats on water

[illegible]

Fire	Combustible [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if it enters water intakes [illegible]

6 FIRE HAZARDS

6 1 **Flash Point:** > 150°F C C

6 2 **Flammable Limits in Air:** [illegible]

6 3 **Fire Extinguishing Agents** Dry chemical foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 765°F

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate:** 4 mm min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
2400 ppm 48 hr juvenile American shad
[illegible] fresh water
24 7 mg 1 48 hr juvenile American shad
[illegible] salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

Atlantic Richfield Co
717 Fifth Ave
New York, N Y 10022

Shell Oil Co
1 Shell Plaza
Houston, Tex 77001

Sun Oil Co
St Davids, Pa 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Elevated

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 445 3

A T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm** 415 >> 1093°F = 212 >> 588°C = 485 >> 861°K

13 4 **Freezing Point** 25 to 55°F = 4 to +13°C = 269 to 286°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 967 at 16°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion.** −18 000 Btu/lb = −10 000 cal/g = −418 68 × 10⁻³ kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

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OTW	OILS, FUEL: 2

Common Synonyms Home heating oil	Oily liquid Yellow-brown Lube or fuel oil odor Floats on water
	[illegible]
Fire	Combustible [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes If swallowed will cause nausea vomiting [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Home heating oil
3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO United Nations Numerical Designation:** 3 3 1223

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Light brown
4 3 **Odor:** Distinctive characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective clothing goggles or face shield
5 2 **Symptoms Following Exposure:** INHALATION causes headache and slight giddiness INGESTION causes nausea vomiting and cramps depression of central nervous system ranging from mild headache to anesthesia coma and death pulmonary irritation and irritation of exhalation of solvent signs of nausea and liver damage may be delayed ASPIRATION causes severe irritation with coughing gagging dyspnea substernal pressure and rapidly developing pulmonary edema signs of bronchopneumonia and pneumonitis [illegible] followed by depression
5 3 **Treatment for Exposure:** INGESTION do NOT induce vomiting ASPIRATION [illegible] rest administer oxygen seek medical attention EYES wash with copious quantities of water SKIN remove solvent by wiping and wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** No single value applicable
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion** Grade 1 LD [illegible]
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Slight smarting of the eyes and respiratory system if present in high concentrations The effect is temporary
5 9 **Liquid or Solid Irritant Characteristics:** Moderate hazard If spilled on clothing and allowed to remain may cause severe irritation of the eyes and skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 136 F C C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents** Dry chemical foam or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire** Not pertinent
6 7 **Ignition Temperature** 494 F
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** 4 mm [illegible]

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
200 ppm 24 hr [illegible] American shad [illegible] freshwater
20 ppm 96 hr [illegible] salt water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Atlantic Richfield Co
[illegible] Fifth Ave
New York N Y 10022
2 Shell Oil Co
Shell Plaza
Houston Tex 77001
3 Sun Oil Co
St David Pa 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Not required
10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3)

A T T

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm**
[illegible] F = 282 [illegible] C = [illegible] K
13 4 **Freezing Point:**
-20 F = [illegible] C = 244 K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0 879 at 20°C (liquid)
13 8 **Liquid Surface Tension:**
[illegible] dynes/cm = 0.02 N/m at 20 C
13 9 **Liquid-Water Interfacial Tension:**
[illegible] dynes/cm = 0.03 N/m at 20 C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion** [illegible] Btu/lb = [illegible] Btu/gal = [illegible] x 10 J/m³
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

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OFR

OILS, FUEL: 4

Common Synonyms Residual fuel oil No 4	Oily liquid — Dark — Lube or fuel oil odor Floats on water
Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Residual fuel oil No 4

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula.** Not applicable

3 4 **IMCO United Nations Numerical Designation:** 1 3 1223

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Brown

4 3 **Odor:** Characteristic like kerosene

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Protective gloves goggles or face shield

5 2 **Symptoms Following Exposure:** INGESTION gastrointestinal irritation ASPIRATION pulmonary irritation is normally minimal but may become more severe several hours after exposure

5 3 **Treatment for Exposure:** INGESTION do NOT lavage or induce vomiting ASPIRATION treatment probably not required delayed development of pulmonary irritation can be detected by serial chest x rays consider prophylactic antibiotic regime if condition warrants EYES wash with copious quantities of water SKIN wipe off and wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits.** Not pertinent

5 6 **Toxicity by Ingestion.** Grade 1 LD 50 to 15 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** None

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** >130°F C C

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents** Dry chemical foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** 500°F

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** 4 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Atlantic Richfield Co
"1" Fifth Ave
New York N Y 10022

2 Shell Oil Co
1 Shell Plaza
Houston Tex 77001

3 Sun Oil Co
St Davids Pa 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

A T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight.** Not pertinent

13 3 **Boiling Point at 1 atm.** 214 to >1092°F = 101 to >588°C = 374 to 861° K

13 4 **Freezing Point** −20 to +5 F = −29 to −9 C = 244 to 264° K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 904 at 15°C (liquid)

13 8 **Liquid Surface Tension.** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** −17 400 Btu/lb = −9 700 cal/g = −406 1 × 10 J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 7 and 8

NOTES

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CFV	OILS, FUEL: 5

Common Synonyms Residual fuel oil No 5	Oily liquid Dark Strong lube oil odor Usually floats on water

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Residual fuel oil No 5
3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO United Nations Numerical Designation:** 3 3 1223

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Brown
4 3 **Odor:** Characteristic like kerosene

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective gloves goggles or face shield
5 2 **Symptoms Following Exposure:** INGESTION gastrointestinal irritation ASPIRATION pulmonary irritation is normally minimal but may become more severe several hours after exposure
5 3 **Treatment for Exposure:** INGESTION do NOT lavage or induce vomiting ASPIRATION treatment probably not required delayed development of pulmonary irritation can be [illegible] by serial chest x rays consider prophylactic antibiotic regime if condition warrants EYES wash with copious quantity of water SKIN wipe off and wash with [illegible] and water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion.** Grade 1 LD_{50} 5 to 15 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** None
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** > 130°F C C
6 2 **Flammable Limits in Air** [illegible]
6 3 **Fire Extinguishing Agents.** Dry chemical foam or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.** Water may be [illegible]
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Atlantic Richfield Co
717 Fifth Ave
New York N Y 10022
2 Shell Oil Co
1 Shell Plaza
Houston Tex 77001
3 Sun Oil Co
St Davids Pa 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Fuel oil No 5 (heavy) Fuel oil No 5 (light)
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-5

A T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight.** Not pertinent
13 3 **Boiling Point at 1 atm:** 426 > 1062°F = 218 > 570°C = 491 > 843°K
13 4 **Freezing Point:** [illegible]
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0 936 at 16°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension** Data not available
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion.** [illegible]
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

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OOD — OILS, FUEL: 1-D

Common Synonyms			
Diesel oil (light)	Oily liquid	Yellow-brown	Like or fuel oil odor
	Floats on water		

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shorelines
May be dangerous if enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook (CG 446-4)

Mechanical containment
Should be contained
Neutralize and treatment

2. LABELS

No hazard label required
Check Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Diesel oil, gas
3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO United Nations Numerical Designation:** 1 270

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Light brown
4 3 **Odor:** Characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective gloves, goggles, face shield
5 2 **Symptoms Following Exposure:** INHALATION causes headache and slight irritation. INGESTION causes nausea, vomiting, coma, and death, particularly if aspirated. Headache, nausea, and other signs of danger and injury may be delayed. ASPIRATION causes severe lung injury with coughing, gagging, dyspnea, cyanosis, and rapidly fatal pulmonary edema. [illegible] temporarily diminished by depressants
5 3 **Treatment for Exposure:** INGESTION & NOT induce vomiting, give milk or oil, or ASPIRATION call a physician, administer oxygen. EYES wash with clean water. SKIN remove contaminated clothing and wash thoroughly with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** No data available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 1 Data available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Slight irritating effects in concentrations of vapors in high concentrations. The effect is cumulative
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of skin
5 10 **Odor Threshold:** 0.7 ppm

6 FIRE HAZARDS

6 1 **Flash Point:** [illegible]
6 2 **Flammable Limits in Air:** [illegible]
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** [illegible]
8 2 **Waterfowl Toxicity:** [illegible] (mallard)
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Atlantic Richfield Co
[illegible] Ave
New York, N.Y. 10022

[illegible]
New Paris
[illegible]

[illegible] OTC
[illegible]

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Designated D [illegible] (ASTM)
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG 446-3)

ATU

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** [illegible]
13 4 **Freezing Point:** [illegible]
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** [illegible]
13 8 **Liquid Surface Tension:** [illegible]
13 9 **Liquid-Water Interfacial Tension:** [illegible]
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** [illegible]
13 13 **Heat of Combustion:** [illegible]
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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OTD	OILS, FUEL: 2-D

Common Synonyms Diesel oil medium	Oily liquid — Yellow brown — Like or fuel oil odor Floats on water
[illegible]	
Fire	Combustible [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Should be contained
Chemical and physical [illegible]

2 LABELS

No hazardous [illegible]
Code of Federal Regulations [illegible]

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Diesel oil medium
3.2 **Coast Guard Compatibility Classification.** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** [illegible]
3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Light [illegible]
4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible] goggles or face shield
5.2 **Symptoms Following Exposure:** INGESTION causes [illegible] and vomiting depression [illegible] headache, [illegible] and liver damage [illegible] INSPIRATION causes [illegible] coughing, gagging, [illegible] and rapidly developing pulmonary edema [illegible] depression
5.3 **Treatment for Exposure:** INGESTION is NOT [illegible] INSPIRATION [illegible] administer oxygen [illegible] EYES [illegible] SKIN [illegible] wipe and wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** No single TLV [illegible]
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade [illegible]
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** [illegible] irritation [illegible] The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** [illegible] irritating and [illegible] redness [illegible] and reddening [illegible]
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, [illegible] be used
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be [illegible]
6.5 **Special Hazards of Combustion Products.** Not [illegible]
6.6 **Behavior in Fire:** Not [illegible]
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not [illegible]
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials.** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not [illegible]
7.5 **Polymerization.** Not [illegible]
7.6 **Inhibitor of Polymerization:** Not [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity** [illegible] Flow [illegible]
8.2 **Waterfowl Toxicity:** Data [illegible]
8.3 **Biological Oxygen Demand (BOD)** Data [illegible]
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Diesel oil 2-D (ASTM)
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No [illegible]
10.4 **Venting:** Open flame [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook [illegible]

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	[illegible]
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not [illegible]
13.3 **Boiling Point at 1 atm.** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not [illegible]
13.6 **Critical Pressure:** Not [illegible]
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension.** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not [illegible]
13.12 **Latent Heat of Vaporization:** Not [illegible]
13.13 **Heat of Combustion.** [illegible]
13.14 **Heat of Decomposition:** Not [illegible]
13.15 **Heat of Solution:** Not [illegible]
13.16 **Heat of Polymerization.** Not [illegible]

[illegible]

NOTES

REVISED 1978

OON	OILS, FUEL: NO. 1

Common Synonyms Kerosene Kerosene Range oil JP-1	Water: liquid Color: [illegible] Kerosene odor Floats on water
Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations Foaming to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment
Should be removed
Chemical and physical [illegible]

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** JP
Kerosene
Kerosene
Range oil

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** [illegible]

4.3 **Odor** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** INGESTION [illegible] INSPIRATION [illegible]

5.3 **Treatment for Exposure:** INGESTION [illegible] INSPIRATION [illegible] EYES [illegible] SKIN [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause burning and reddening of the skin.

5.10 **Odor Threshold:** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** [illegible] foam or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** [illegible] days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Atlantic Richfield
[illegible] Avenue
New York, N.Y. [illegible]

2. Shell Oil Co.
Shell Plaza
Houston, Tex. [illegible]

3. Sun Oil Co.
St. Davids, Pa. [illegible]

10 SHIPPING INFORMATION

10.1 **Grade or Purity:** Light hydrocarbon distillate [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-5

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reactive	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization.** [illegible]

13.13 **Heat of Combustion.** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

OAS	OILS, MISCELLANEOUS: ABSORPTION

Common Synonyms
Absorbent oil

Liquid — Colorless to pale yellow — Fuel oil odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Floating to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Absorbent oil
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Pale yellow to colorless
4.3 **Odor:** Fuel oil odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles or face shield
5.2 **Symptoms Following Exposure:** INGESTION: irritation of stomach. INHALATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure. (Delayed development can be detected by serial chest x-rays.)
5.3 **Treatment for Exposure:** INGESTION: have victim drink water or milk; do NOT induce vomiting. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** Grade 1 [illegible]
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** None
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Cities Service Co. Inc.
60 Wall Tower
New York, N.Y. [illegible]
2. Exxon Co.
Houston, Tex. [illegible]
3. Standard Oil Co. (Indiana)
910 N. Michigan Ave.
Chicago, Ill. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open flame arrester

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

A T 1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** >300°F = >149°C = >422°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** (est.) 0.85 at 20°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** (est.) −19,000 Btu/lb = −10,000 cal/g = −420 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

NOTES

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OCT	OILS, MISCELLANEOUS: COAL TAR

Common Synonyms Light oil	Liquid — Colorless to yellow — Pleasant odor Floats on water. Flammable irritating vapor is produced
Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes, nose and throat LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating on shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:**

3.4 **IMCO United Nations Numerical Designation:**

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):**

4.2 **Color:**

4.3 **Odor:**

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:**

5.2 **Symptoms Following Exposure:**

5.3 **Treatment for Exposure:** INGESTION

5.4 **Toxicity by Inhalation (Threshold Limit Value):**

5.5 **Short-Term Inhalation Limits:**

5.6 **Toxicity by Ingestion:**

5.7 **Late Toxicity:**

5.8 **Vapor (Gas) Irritant Characteristics:**

5.9 **Liquid or Solid Irritant Characteristics:**

5.10 **Odor Threshold:**

6 FIRE HAZARDS

6.1 **Flash Point:**

6.2 **Flammable Limits in Air:**

6.3 **Fire Extinguishing Agents:**

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:**

6.8 **Electrical Hazard:**

6.9 **Burning Rate:**

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:**

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:**

7.4 **Neutralizing Agents for Acids and Caustics:**

7.5 **Polymerization:**

7.6 **Inhibitor of Polymerization:**

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**

8.2 **Waterfowl Toxicity:**

8.3 **Biological Oxygen Demand (BOD):**

8.4 **Food Chain Concentration Potential:**

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**

10.2 **Storage Temperature:**

10.3 **Inert Atmosphere:**

10.4 **Venting:**

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Toxicity	
Toxicity	
Pressure	
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aquatic Effect	4
Reactivity	
Other Chemicals	3
Water	0
Self Reactive	0

12.3 **NFPA Hazard Classifications:**

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:**

13.2 **Molecular Weight:**

13.3 **Boiling Point at 1 atm:**

13.4 **Freezing Point:**

13.5 **Critical Temperature:**

13.6 **Critical Pressure:**

13.7 **Specific Gravity:** (at 20°C (liquid))

13.8 **Liquid Surface Tension:**

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:**

13.11 **Ratio of Specific Heats of Vapor (Gas):**

13.12 **Latent Heat of Vaporization:**

13.13 **Heat of Combustion:**

13.14 **Heat of Decomposition:**

13.15 **Heat of Solution:**

13.16 **Heat of Polymerization:**

NOTES

REVISED 1978

OCR	OILS, MISCELLANEOUS: CROTON

Common Synonyms

Croton tiglium oil
Croton oil

Liquid — Dark — Unpleasant odor

Floats on water

AVOID CONTACT WITH LIQUID KEEP PEOPLE AWAY
Stop discharge if possible
Stop site deposition
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, foam, carbon dioxide, sand
Water may be ineffective on fire

Exposure

CALL FOR MEDICAL AID
LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to skin and eyes
Remove contaminated clothing and shoes
For both skin and eyes wash with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Crotonol, *Croton tiglium L* oil
3 2 **Coast Guard Compatibility Classification** Esters (13)
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color:** Dark
4 3 **Odor** Unpleasant acrid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield rubber gloves and any other protective clothing to prevent contact with skin
5 2 **Symptoms Following Exposure** Contact of liquid with eyes causes severe irritation May induce severe skin irritation inflammation swelling, and pustule formation Absorption through the skin may cause purging Ingestion causes burning of the mouth and stomach and drastic purging possible leading to collapse and death Small doses have a strong laxative effect
5 3 **Treatment for Exposure:** EYES flush with water a 2 5% hydrocortisone ointment is recommended SKIN remove as much liquid as possible from skin by use of a good solvent such as acetone or alcohol wash with soap and water INGESTION for gastrointestinal symptoms use demulcents further treatment is symptomatic do NOT induce vomiting
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 4 LD_{50} <50 mg/kg
5 7 **Late Toxicity:** Has been used in cancer research as a promoter for other compounds that cause skin cancer
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** Data not available
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents** Dry chemical foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Consolidated Midland Corporation
195 East Main Street
Brewster N Y 10509

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm** Not pertinent (very high)
13 4 **Freezing Point.** 0 to 18°F = −18 to −8°C = 255 to 265°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** (est.) 0.946 at 15°C (liquid)
13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion.** (est.) −16 800 Btu/lb = −9,300 cal/g or −390 × 10³ J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

OLS — OILS, MISCELLANEOUS: LINSEED

Common Synonyms

Flaxseed oil
Raw linseed oil
Linseed oil

Liquid — Light yellow to dark yellow — Paint like odor

Floats on water

Stop discharge if possible
Call fire department
Isolate and disperse discharged material
[illegible]

Fire

Combustible
Extinguish with dry chemical, foam, carbon dioxide
Water may be ineffective [illegible]

Exposure

LIQUID
Not harmful
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Flaxseed oil, Raw linseed oil
3 2 **Coast Guard Compatibility Classification** Esters (13)
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Pale yellow to dark amber
4 3 **Odor:** Like oil base paint

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Contact of liquid with eyes causes mild irritation. Prolonged contact with skin can cause dermatitis. Ingestion of large doses (over 1 oz) has laxative effect
5 3 **Treatment for Exposure.** EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: do NOT induce vomiting
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits.** Not pertinent
5 6 **Toxicity by Ingestion.** Grade 0 LD_{50} > 15 g/kg
5 7 **Late Toxicity:** Liver damage in rats (from addition of oil to diet)
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 535°F O.C., 403°F C.C.
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used.** Water or foam may cause frothing, water may be ineffective
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** 650°F
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Cargill Inc
Cargill Building
Minneapolis, Minn 55402

2 PVO International Inc
416 Division Street
Boonton, N J 07005

3 Textron, Inc
Spencer Kellogg Division
120 Delaware Ave
Buffalo, N Y 14240

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Raw grade, varnish grade, grinding grade, heat bodied grade, blown grade
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm** Not pertinent (very high)
13 4 **Freezing Point** −2°F = −19°C = 254°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 0.932 at 20°C (liquid)
13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion** −16,500 Btu/lb = −9,300 cal/g = −390 × 10⁶ J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

OLB — OILS, MISCELLANEOUS: LUBRICATING

Common Synonyms
Crankcase oil
Transmission oil
Motor oil

Oily liquid — Yellow-brown — Lube oil odor

Floats on water

[illegible]

Fire

Combustible
[illegible]

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harm if swallowed
[illegible]
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Crankcase oil, Motor oil, Transmission oil
3.2 **Coast Guard Compatibility Classification** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO United Nations Numerical Designation** 3/1270

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Yellow fluorescent
4.3 **Odor:** Characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Protective gloves, goggles or face shield
5.2 **Symptoms Following Exposure:** INGESTION minimally gastrointestinal tract irritation, increased frequency of bowel passage may occur. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure
5.3 **Treatment for Exposure** INGESTION do NOT lavage or induce vomiting. ASPIRATION treatment probably not required; delayed development of pulmonary irritation can be detected by serial chest x-rays. EYES wash with copious quantities of water. SKIN wipe off and wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1 LD50 5 to 15 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 300°F-450°F C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used** Water of foam may cause frothing
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire** Not pertinent
6.7 **Ignition Temperature** 500°F-700°F
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate:** 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Shell Oil Co
1 Shell Plaza
Houston, Tex. 77001
2 Standard Oil Co. (Indiana)
910 S. Michigan Ave.
Chicago, Ill. 60605
3 Sun Oil Co.
St. Davids, Pa. 19087

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Various viscosities
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-1-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Very high
13.4 **Freezing Point** Not pertinent
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity:** (est.) 0.902 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 36.37 dynes/cm = 0.036-0.037 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 33.54 dynes/cm = 0.033-0.054 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion.** −18,486 Btu/lb = −10,270 cal/g = −429.98 × 10³ J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

OMN — OILS, MISCELLANEOUS: MINERAL

Common Synonyms
White oil
Liquid Petrolatum

Oily liquid — Colorless — Odorless

Floats on water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and restrain discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical foam or carbon dioxide
Water may be ineffective in fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes.
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Liquid petrolatum
White oil

3.2 **Coast Guard Compatibility Classification**
Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO/United Nations Numerical Designation:** 13/1270

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Very faint

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield

5.2 **Symptoms Following Exposure** Ingestion of liquid can cause very loose bowel movements

5.3 **Treatment for Exposure.** EYES wash with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 1 LD50 5 to 15 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** None

5.9 **Liquid or Solid Irritant Characteristics:** None

5.10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point.** 380 F O.C

6.2 **Flammable Limits in Air** Data not available

6.3 **Fire Extinguishing Agents:** Dry chemical foam or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used**
Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products.**
Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature:** 500-700 F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential:**
None

9. SELECTED MANUFACTURERS

1. Shell Oil Co
1 Shell Plaza
Houston Tex 77001
2. Standard Oil Co (Indiana)
910 S Michigan Ave
Chicago Ill 60605
3. Sun Oil Co
St Davids Pa 19087

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial refined

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook G 446-3)

X T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight** Not pertinent

13.3 **Boiling Point at 1 atm** Very high

13.4 **Freezing Point** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.822 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
27 dynes/cm = 0.027 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
47 dynes/cm = 0.047 N/m at 70°C

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization.**
Not pertinent

13.13 **Heat of Combustion:**
Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

OMS — OILS, MISCELLANEOUS: MINERAL SEAL

Common Synonyms
Long time burning oil
300° oil
Mineral colza oil

Oily liquid — Colorless to yellow — Kerosene odor

Floats on water

No discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, foam or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID
LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES lift lids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Long time burning oil
Mineral colza oil
300° oil
Signal oil

3.2 **Coast Guard Compatibility Classification.** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula** Not applicable

3.4 **IMCO United Nations Numerical Designation** 3.3/1270

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to light brown

4.3 **Odor:** Like kerosene

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles or face shield

5.2 **Symptoms Following Exposure** Vapors cause slight irritation of eyes and nose. Liquid irritates stomach if taken in. To lungs causes coughing, distress, and rapidly developing pulmonary edema

5.2 **Treatment for Exposure:** ASPIRATION: enforced bed rest, administer oxygen, call a doctor. INGESTION: do NOT induce vomiting, have victim drink water or milk. EYES: wash with copious amounts of water. SKIN: wipe off, wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 200 ppm

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion** Grade 2, LD₅₀ 0.5 to 5 g/kg

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold.** 1 ppm

6 FIRE HAZARDS

6.1 **Flash Point.** 150/2°F (C.O.C.)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents** Dry chemical, foam, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** 4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Shell Oil Co
1 Shell Plaza
Houston, Tex. 77001
2. Standard Oil Co. (Indiana)
910 S. Michigan Ave.
Chicago, Ill. 60680
3. Sun Oil Co.
St. Davids, Pa. 19087

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Several grades of varying pour points, all highly refined

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A F U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm** >500°F = >260°C = >533 K

13.4 **Freezing Point.** 10.0°F = −12.2°C = 261.0 K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** 0.811-0.828 at 15°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 28 dynes/cm = 0.028 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 47-50 dynes/cm = 0.047-0.050 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion.** (est.) −18,000 Btu/lb = −10,000 cal/g = −420 × 10³ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

OMT — OILS, MISCELLANEOUS: MOTOR

Common Synonyms
Crankcase oil
Lubricating oil

Oily liquid — Yellow brown — Lube oil odor

Floats on water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, foam or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
EYES: hold eyelids open and flush with plenty of water
SWALLOWED: if victim is CONSCIOUS have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes
Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Crankcase oil, Lubricating oil, Transmission oil
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO/United Nations Numerical Designation** 3 (c)1270

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color:** Yellow fluorescent
4.3 **Odor:** Characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles or face shield
5.2 **Symptoms Following Exposure:** INGESTION: minimal gastrointestinal irritation, increased frequency of bowel passage may occur. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure
5.3 **Treatment for Exposure:** INGESTION: do NOT lavage or induce vomiting. ASPIRATION: treatment probably not required, delayed development of pulmonary irritation can be detected by serial chest x-rays. EYES: wash with copious amounts of water. SKIN: wipe off oil and wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1-1 Dose 5 to 15 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 275-600°F C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire.** Not pertinent
6.7 **Ignition Temperature:** 325-625°F
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Shell Oil Co
   1 Shell Plaza
   Houston, Tex 77001
2. Standard Oil Co (Indiana)
   910 S. Michigan Ave
   Chicago, Ill 60605
3. Sun Oil Co
   St. Davids, Pa 19087

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Various viscosities
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm** Very high
13.4 **Freezing Point:** −29.9°F = −34.4°C = 238.8°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.84-0.96 at 15°C (liquid)
13.8 **Liquid Surface Tension:** 36-37.5 dynes/cm = 0.036-0.0375 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 33-34 dynes/cm = 0.033-0.034 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** −18,486 Btu/lb = −10,270 cal/g = −429.98 × 10³ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

ONF	OILS, MISCELLANEOUS: NEATSFOOT

Common Synonyms	Oily liquid — Pale yellow — Peculiar odor Floats on water
	Stop discharge if possible Collect and separate Isolate and remove discharged material Notify local health and pollution control agencies
Fire	**Combustible** Extinguish with foam, chemical, carbon dioxide, dry chemical Water may be ineffective
Exposure	**Not harmful**
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification.** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Pale yellow
4.3 **Odor:** Peculiar

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Data not available
5.2 **Symptoms Following Exposure:** May cause dermatitis in sensitive individuals (humans)
5.3 **Treatment for Exposure:** Data not available
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 0 LD$_{50}$ above 15 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** 430°F O.C. – 470°F C.C.
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents.** Foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire.** Not pertinent
6.7 **Ignition Temperature** 828°F
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Atlas Refinery, Inc.
   142 Lockwood St.
   Newark, N.J. 07105
2. Neatsfoot Oil Refineries Corp.
   East Ontario and Bath Sts.
   Philadelphia, Pa. 19134
3. Arthur C[illegible] Corp.
   [illegible] W. [illegible]
   Argo, Ill. 60501

10 SHIPPING INFORMATION

10.1 **Grades of Purity:** Various grades designated by pour point (20°–40°), also various refined grades
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Data not available

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

X T I

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Very high
13.4 **Freezing Point:** 32°–34°F at 1 atm, –10°C = 273 to 263 K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.915 at 16°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

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NOTES

REVISED 1978

OPT	OILS, MISCELLANEOUS: PENETRATING

Common Synonyms	Oils Squire Yellow Motor oil-like odor Floats on water
	No [illegible] discharge if possible [illegible] deep water Avoid [illegible] with liquid Inhalation exposure [illegible] No [illegible] health and safety [illegible]
Fire	Combustible Extinguish with [illegible] Water may be effective [illegible]
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES hold eyelids open and flush with plenty of water IF SWALLOWED and conscious, give [illegible] drink water or milk DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes No [illegible] health and [illegible] No [illegible] of nearby water intake

1 RESPONSE TO DISCHARGE

(See Response Methods Manual, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Preservative oil
Water displacement

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO United Nations Numerical Designation** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Yellowish

4.3 **Odor:** Like motor oil

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Liquid may irritate stomach and intestines. Large quantities of liquid may cause diarrhea

5.3 **Treatment for Exposure:** INGESTION: Have victim drink water or milk. DO NOT induce vomiting. ASPIRATION: check for delayed development of pulmonary complications, serial x-rays. EYES: wash thoroughly with plenty of water. SKIN: wipe off, wash in soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 Data Sheet [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** [illegible] F

6.2 **Flammable Limits in Air.** Data not available

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or jet may cause spattering

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate.** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Not pertinent

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

Ashland Petroleum Co
1401 Winchester Ave
Ashland, Ky 41101

Penreco, Inc
Butler, Pa 16001

Standard Oil Co (Indiana)
910 N Michigan Ave
Chicago, Ill 60601

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

X 1 1

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** Very high

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.5961 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 29.8 dynes/cm = 0.0298 N/m at 24°C

13.9 **Liquid-Water Interfacial Tension:** 5.5 dynes/cm = 0.0055 N/m at 22°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] kcal/kg = [illegible] J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

ORG	OILS, MISCELLANEOUS: RANGE

Common Synonyms
Kerosene
Kerosene
Fuel oil No 1
JP-1

Waters liquid — Colorless — Kerosene odor

Floats on water

Fire

Combustible

Exposure

CALL FOR WRITTEN PLAN

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No 1 Fuel Oil
JP 1
Kerosene
Kerosine

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO/United Nations Numerical Designation:** 1223

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor.** Like kerosene

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective gloves goggles or face shield

5 2 **Symptoms Following Exposure:** Vapor causes slight irritation to eyes and nose. Liquid irritates stomach if taken into lungs causes coughing distress and rapidly developing pulmonary edema

5 3 **Treatment for Exposure.** INSPIRATION remove bed rest administer oxygen call a doctor INGESTION do NOT induce vomiting call a doctor EYES wash with copious amounts of water SKIN wipe off and wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD50 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause slight smarting of eyes and respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minor hazard Prolonged contact and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** 1 ppm

6 FIRE HAZARDS

6 1 **Flash Point** 100°F C C

6 2 **Flammable Limits in Air.** [illegible]

6 3 **Fire Extinguishing Agents** Foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** 444 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 2,000 ppm 24 hr Bluegills 11 m fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** [illegible]

8 4 **Food Chain Concentration Potential.** No

9 SELECTED MANUFACTURERS

Shell Oil Co
1 Shell Plaza
Houston Tex 77001

2 Standard Oil Co (Indiana)
200 N Michigan Ave
Chicago Ill 60601

Sun Oil Co
St Davids Pa 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Light hydrocarbon distillate 100%

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

X F U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	
Aesthetic Effect	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammables (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid

13 2 **Molecular Weight** Not applicable

13 3 **Boiling Point at 1 atm** 392 to 410 F = 200 210 C = 473 483 K

13 4 **Freezing Point** [illegible] F = [illegible] C = 230 to 225°K

13 5 **Critical Temperature:** Not applicable

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 0.800 to 0.820 at 20 C liquid

13 8 **Liquid Surface Tension.** 23 [illegible] dynes/cm = 0.02[illegible] N/m at 20 C

13 9 **Liquid-Water Interfacial Tension.** 47 49 dynes/cm = 0.047 0.049 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** 100 Btu/lb = [illegible] cal/g = 2.3 X 10[illegible] J/kg

13 13 **Heat of Combustion** −18 540 Btu/lb = −10 800 cal/g = −43 124 X 10[illegible] J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Data do not exist

NOTES

REVISED 1978

ORS	OILS, MISCELLANEOUS: RESIN

Common Synonyms	
Rosin oil Retinol Rosinol Codoil	Liquid — Light amber to red to black — Pinetree pitch odor Floats on water

[illegible]

Fire	Combustible [illegible]
Exposure	CALL FOR MEDICAL AID Exposure data not available [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Codoil, Retinol, Rosin oil, Rosinol

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO United Nations Numerical Designation:** 3.2 1256

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Light amber to red to black depending on grade

4.3 **Odor:** Characteristic pine tree pitch

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Data not available

5.2 **Symptoms Following Exposure:** Data not available

5.3 **Treatment for Exposure:** Data not available

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available but toxicity is probably low

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 255-390 F O C

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 648 F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Crosby Chemicals, Inc., Picayune, Miss. 39466
2. Crowley Hydrocarbon Chemicals, Inc., 271 Madison Ave., New York, N.Y. 10016
3. Natrochem, Inc., Savannah, Ga. 31402

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** A variety of grades that differ primarily in color and flash point

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-5

A T U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** 572-750 F = 300-400°C = 573-673°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.96-1.02 at 15°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** (est.) −18,000 B.u./lb = −10,000 cal/g = −420 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

ORD	OILS, MISCELLANEOUS: ROAD

Common Synonyms
Slow curing asphalt
Petroleum asphalt
Liquid asphalt

Oily liquid — Black — Tar odor

Floats on water

Fire

Combustible

Exposure

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Liquid asphalt
Petroleum asphalt
Slow curing asphalt

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO United Nations Numerical Designation:** 3 2 1999 3 3 1999

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Dark brown to black

4 3 **Odor:** Tarry

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Protective clothing for hot asphalt, face and eye protection when hot

5 2 **Symptoms Following Exposure:** Contact with skin may cause dermatitis. Inhalation of vapors may cause moderate irritation of nose and throat. Hot liquid burns skin

5 3 **Treatment for Exposure:** Severe burns may result from hot liquid. Cool the skin at once with water. Cover burn with sterile dressing and seek medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Some oil

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 5 to 5 g/kg

5 7 **Late Toxicity:** None observed

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns. Short exposure may cause secondary burns on long exposure

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 400 to 500°F

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 400 to 500 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Johns Manville Co
Greenwood Plaza
Denver, Colo 80217

2 Sun Oil Co
St Davids, Pa 19087

3 Witco Chemical Corp
Pioneer Division
277 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** SC 400 to SC 3

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

X T 1

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicants	0
Aquatic Toxicant	1
Aesthetic Effect	4
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Very high

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.0 1.2 at 25°C (Liquid)

13 8 **Liquid Surface Tension:** (est) 25 dynes/cm = 0.025 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension:** (est) 50 dynes/cm = 0.05 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est) = -18 000 Btu/lb = -10 000 cal/g = -420 X 10^3 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

REVISED 1978

ORN	OILS, MISCELLANEOUS: ROSIN

Common Synonyms
Resinol
Retinol
Resinol
Colofol

Liquid — Light amber to red to black — Pinetree pitch odor

Floats on water

Fire

Combustible

Exposure

Exposure data not available

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

Not hazard labeled per 46 Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Colofol
Resinol
Retinol
Resinol

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO United Nations Numerical Designation:** 3.2 1286

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Light amber to red to black depending on grade

4.3 **Odor:** Characteristic like pinetree pitch

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Data not available

5.2 **Symptoms Following Exposure:** Data not available

5.3 **Treatment for Exposure:** Data not available

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** No data available but toxicity is probably low

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] C C

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam
dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Data not available

6.6 **Behavior in Fire:** Data not available

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Cook Chemical Inc.
Pearson, Mississippi

Crosfield Hydrocarbon Chemicals Inc.
[illegible] Madison Ave
New York, N.Y. [illegible]

Neville Inc.
Neville Island, Pa. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Various grades that differ primarily in color and flash point

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-5

X T

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reactive	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] Liquid

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

REVISED 1978

OSP	OILS, MISCELLANEOUS: SPERM

Common Synonyms	Oily liquid Pale yellow Floats on water
Stop discharge if possible [illegible]	
Fire	Combustible [illegible]
Exposure	CALL FOR MEDICAL AID Exposure data not available [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Data not available
5.2 **Symptoms Following Exposure:** Data not available
5.3 **Treatment for Exposure:** Data not available
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available but toxicity is probably low
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical foam or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause [illegible]
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A T 1

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Very high
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.882 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** 5.7 dynes/cm = 0.0057 N/m at 30°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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OSD	OILS, MISCELLANEOUS: SPINDLE

Common Synonyms High speed bearing oil Bearing oil	Oily liquid Light brown Weak kerosene-like odor Floats on water
[illegible]	
Fire	Combustible Extinguish with [illegible]
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed [illegible] [illegible] IF IN EYES [illegible] water IF SWALLOWED [illegible] CONSCIOUS [illegible] drink water [illegible] DO NOT [illegible] VOMITING
Water Pollution	Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Bearing oil
High speed bearing oil

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Light brown

4.3 **Odor:** Weak, like kerosene

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Vapor causes slight irritation of eyes and nose. Liquid irritates stomach. Taken into lungs, causes coughing, distress and rapidly developing pulmonary edema

5.3 **Treatment for Exposure:** ASPIRATION: enforce bed rest, [illegible] INGESTION: do NOT [illegible] vomiting, call a doctor. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade [illegible] LD_{50} [illegible] g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of eyes or respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] ppm, 24 hr. bluegill, [illegible] fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** [illegible] days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Keystone Lubricating Co.
[illegible] and Lippincott Streets
Philadelphia, Pa. [illegible]

2 Penrece, Inc.
Butler, Pa. [illegible]

3 White and Bagley Co.
Worcester, Mass. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Several grades [illegible] with same hazard assessment

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

V T I

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** Very high

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.881 at 15°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

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OSY	OILS, MISCELLANEOUS: SPRAY

Common Synonyms			
Plant spray oil Dormant oil Foliage oil	Oily liquid	Light brown	Kerosene-like odor

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Note: Check health and pollution [illegible]

Fire

Combustible
Extinguish with foam, dry chemical, or carbon dioxide
Water may be ineffective [illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing [illegible]
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED, if victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes
Notify [illegible] wildlife [illegible]
Notify [illegible] water [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Dormant oil
Foliage oil
Kerosene heavy
Plant spray oil

3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula** Not applicable

3.4 **IMCO/United Nations Numerical Designation:** 3.3/1270

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless to light brown

4.3 **Odor** Like kerosene like fuel oil

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Protective gloves, goggles or face shield

5.2 **Symptoms Following Exposure:** Vapor causes slight irritation of eyes and nose. Liquid irritates stomach. If taken into lungs, causes coughing distress and rapidly developing edema

5.3 **Treatment for Exposure:** ASPIRATION: enforce bed rest, administer oxygen, call a doctor. INGESTION: do NOT induce vomiting, call a doctor. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion** Grade 2 LD_{50} 0.5 to 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** [illegible] ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 140°F (min) C.C.

6.2 **Flammable Limits in Air** 0.6% - 4.6%

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature:** 475°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
500 ppm/* salmon fingerling lethal, fresh water
* Time period not specified

8.2 **Waterfowl Toxicity.** Data not available

8.3 **Biological Oxygen Demand (BOD)** 53% 5 days

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Shell Oil Co
1 Shell Plaza
Houston, Tex 77001
2. Standard Oil Co (Indiana)
910 S. Michigan Ave
Chicago, Ill 60605
3. Sun Oil Co
St. Davids, Pa 19087

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-3 U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1.2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	3
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:**
590-700°F = 310-371°C = 583-644°K

13.4 **Freezing Point** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** 0.82 at 15°C (liquid)

13.8 **Liquid Surface Tension:**
(est) 25 dynes/cm = 0.025 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension**
(est) 50 dynes/cm = 0.05 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion:** −18,540 Btu/lb = −10,300 cal/g = −43.24 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

OTL	OILS, MISCELLANEOUS: TALL

Common Synonyms	Oils liquid Yellow Characteristic odor Floats on water

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	Combustible Extinguish with foam, dry chemical or carbon dioxide Water may be [illegible] fire
Exposure	CALL FOR MEDICAL AID Exposure data not available Flush affected areas with water
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Ester
3 3 **Chemical Formula:** Not applicable
3 4 **IMCO/United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color:** Yellow
4 3 **Odor:** Characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Data not available
5 2 **Symptoms Following Exposure** Data not available
5 3 **Treatment for Exposure:** Data not available
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 380°F O C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Foam dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature** Data not available
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Georgia Pacific Corp
Commonwealth Bldg
Portland Ore 97204
2 SCM Corp
Glidden Durkee Division
900 Union Commerce Bldg
Cleveland Ohio 44115
3 Union Camp Corp
Chemical Division
Jacksonville Fla 32205

10. SHIPPING INFORMATION

10 1 **Grades or Purity** Various grades which differ primarily in the relative content of fatty acids and rosin acids
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm** Very high
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0 951 at 16°C (liquid)
13 8 **Liquid Surface Tension** 34 3 dynes/cm = 0 0343 N/m at 24°C
13 9 **Liquid Water Interfacial Tension** 11 dynes/cm = 0 011 N/m at 22 5°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** (est) −18 000 Btu/lb = −10 000 cal/g = −420 × 10[illegible] kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

(Continued on page [illegible] and 6)

NOTES

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OTN	OILS, MISCELLANEOUS: TANNER'S

Common Synonyms Sulfated Neatsfoot oil	Oils liquid
[illegible]	
Fire	Combustible [illegible]
Exposure	ALL FOR MEDICAL AID Exposure data not available [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Data not available

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Sulfated neatsfoot oil sodium salt

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula.** Not applicable

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Data not available

4 2 **Color** Data not available

4 3 **Odor** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Data not available

5 2 **Symptoms Following Exposure:** Data not available

5 3 **Treatment for Exposure.** Data not available

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 0 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Data not available

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents:** Foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9. SELECTED MANUFACTURERS

1 Diamond Shamrock Corp
Super Chemicals Division
Morristown N J 07960

2 Reilly Whiteman Inc
Conshohocken Pa 19428

3 Arthur C Trask Corp
7656 W 63 St
Argo Ill 60501

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm** Very high

13 4 **Freezing Point:** Data not available

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (est.) 0.85 at 20°C (liquid)

13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension** (est.) 50 dynes/cm = 0.05 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est.) −18,000 Btu/lb = −10,000 cal/g = −420 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

(Continued on next page)

NOTES

REVISED 1978

OTF	OILS, MISCELLANEOUS: TRANSFORMER

Common Synonyms Insulating oil Electrical insulating oil Petroleum insulating oil	Oily liquid Colorless to light brown Motor oil-like odor Floats on water
[illegible]	
Fire	Combustible [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of [illegible] concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes. [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Electrical insulating oil
Insulating oil
Petroleum insulating oil

3 2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures

3 3 **Chemical Formula:** Not applicable

3 4 **IMCO/United Nations Numerical Designation:** 3 3/1270

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless to light brown

4 3 **Odor:** Like motor oil

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Protective gloves goggles or face shield

5 2 **Symptoms Following Exposure:** Ingestion of liquid may irritate stomach and cause increased frequency of bowel movements If taken into lungs detrived pulmonary irritation may occur

5 3 **Treatment for Exposure:** INGESTION do NOT induce vomiting ASPIRATION check for delayed irritation by serial X rays EYES wash with copious amounts of water SKIN wipe off and wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1, LD[illegible] to 15 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5 10 **Odor Threshold** Data not available

[illegible] HAZARDS

6 1 **Flash Point:** [illegible]

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Foam dry chemical, or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Shell Oil Co
1 Shell Plaza
Houston, Tex 77001

2 Standard Oil Co (Indiana)
910 S Michigan Ave
Chicago Ill 60605

3 Sun Oil Co
St Davids Pa 19087

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm** Very high

13 4 **Freezing Point:** −75°F = −59°C = 214°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 891 at 15°C (liquid)

13 8 **Liquid Surface Tension** Data not available

13 9 **Liquid-Water Interfacial Tension:** 49 dynes/cm = 0 049 N/m at 25°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

OTB — OILS, MISCELLANEOUS: TURBINE

Common Synonyms

Steam turbine oil
Steam turbine lube oil
Turbine oil

Liquid — Colorless to light brown — kerosene-like odor

Floats on water

Fire

Combustible

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Steam turbine oil, Steam turbine lube oil

3.2 **Coast Guard Compatibility Classification:** Petroleum oils (12)

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale brown

4.3 **Odor:** Weak, like lube oil

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Contact with liquid causes slight irritation of eyes and (on prolonged contact) skin. Ingestion causes slight irritation of stomach and bowel, increased frequency of bowel movement

5.3 **Treatment for Exposure:** EYES: wash with copious quantity of water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: do NOT induce vomiting, do NOT lavage. 2-4 oz. olive oil and 1-2 oz. activated charcoal may be given

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m³

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 0: LD_{50} > 15 g/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 390–485°F O.C.

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide, water fog

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing, water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 700°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** (approx.) 4 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Shell Oil Co
   One Shell Plaza
   Houston, Texas 77002
2. Exxon Co
   P.O. Box 2180
   Houston, Texas 77001
3. Sun Oil Co
   P.O. Box 426
   Marcus Hook, Pa. 19061

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Solvent refined paraffinic oils 98.5+% Grades vary in viscosity and flash point

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.87 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** (est.) −17,600 Btu/lb = −9,800 cal/g = −410 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

OLA	# OLEIC ACID

Common Synonyms cis-9 Heptadecylenecarboxylic acid cis-9 Octadecenoic acid cis-Δ^9 Octadecylenic acid Red oil	Liquid — Colorless to pale yellow — Mild odor Floats on water
[illegible]	
Fire	Combustible [illegible]
Exposure	[illegible] FORMED [illegible] LIQUID Irritating to skin and eyes If swallowed will cause nausea [illegible] EYES [illegible] IF SWALLOWED [illegible] CONSCIOUS [illegible] IF SWALLOWED [illegible] UNCONSCIOUS OR HAVING CONVULSIONS [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** cis-9 Heptadecylene carboxylic acid, cis-9 Octadecenoic acid, cis-Δ^9 Octadecylenic acid, Red oil

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** $CH_3(CH_2)_7CH{=}CH(CH_2)_7COOH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Pale

4 3 **Odor:** Faint

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Impervious gloves, goggles or face shield, impervious apron

5 2 **Symptoms Following Exposure:** Industrial use of compound involves no known hazards. Ingestion causes mild irritation of mouth and stomach. Contact with eyes or skin causes mild irritation

5 3 **Treatment for Exposure:** INGESTION: give large amount of water. EYES: if eye irritation occurs flush with water and get medical attention. SKIN: wash thoroughly with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD_{50} > 15 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 390–425°F (O.C.)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** 685°F

6 8 **Electrical Hazard.** Data not available

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Union Camp Corp.
2051 N. Lane Ave.
Jacksonville, Fla. 32206

2 Hercules, Inc.
Wilmington, Del. 19899

3 Armak Chemicals Div.
Box 1805
Chicago, Ill. 60690

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 79–83%

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A 1 U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 277 (avg.)

13 3 **Boiling Point at 1 atm:** 432°F = 222°C = 495°K

13 4 **Freezing Point:** 57°F = 14°C = 287°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0.89 at 25°C (liquid)

13 8 **Liquid Surface Tension.** 32.8 dynes/cm = 0.0328 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** 15.59 dynes/cm = 0.01559 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 103 Btu/lb = 57 cal/g = 2.4 × 10^5 J/kg

13 13 **Heat of Combustion.** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

OAP	OLEIC ACID, POTASSIUM SALT

Common Synonyms			
Potassium oleate	Solid or liquid	Brown	Soapy odor
	Sinks and mixes slowly with water		

Avoid contact with liquid and solid. Keep people away.
Stop the leak if possible.
Isolate and remove the leaked material.
Notify local health and pollution control agencies.

Fire	Combustible Extinguish with water, dry chemicals, alcohol foam, carbon dioxide
Exposure	CALL FOR MEDICAL AID **LIQUID OR SOLID** **Irritating to skin and eyes** **If swallowed will cause nausea and vomiting** Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep person warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Potassium oleate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_{17}H_{33}COOK$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid or liquid

4 2 **Color** Brown

4 3 **Odor** Faint soapy

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical goggles and rubber gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat, coughing and sneezing. Ingestion causes mild irritation of mouth and stomach. Contact with eyes causes irritation.

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water. EYES: flush with copious quantities of tap water for 15 min and seek appropriate medical attention. SKIN: flush with water.

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 140°F C.C.

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products**

6 6 **Behavior in Fire**

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Diamond Shamrock Chemical Co
1100 Superior Ave
Cleveland, Ohio 44114

2 Alco Chemical Corp
Trenton Avenue and William Street
Philadelphia, Pa 19134

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 19% solution in water

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

(liquid) A P
(solid) SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid or liquid

13 2 **Molecular Weight:** 320 (solute only)

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point:** 455–464°F = 235–240°C = 508–513°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** >1 at 20°C (solid or liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 5

NOTES

OAC	OLEIC ACID, SODIUM SALT

Common Synonyms			
Lunatrol Sodium oleate	Solid	Light tan	Slight tallow like odor
	Sinks and mixes slowly with water		

Fire	Combustible
Exposure	CAUTION MEDICAL AID SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Lunatrol Sodium oleate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_{17}H_{33}COONa$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Light tan

4 3 **Odor:** Slight tallow like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask and gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat coughing and sneezing Ingestion causes mild irritation of mouth Contact with eyes causes irritation

5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amount of water EYES flush with copious quantities of tap water SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:**

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Diamond Shamrock Chemical Co
1100 Superior Ave
Cleveland Ohio 44114

2 Witco Chemical Corp
Organics Division
277 Park Avenue
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 304 (approx)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 450 455°F = 232 235°C = 505 508°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** >1 1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

OLM	OLEUM

Common Synonyms
Fuming sulfuric acid

Oily liquid Colorless to cloudy Sharp choking odor

Mixes and reacts with water producing heat Irritating mist is produced

AVOID CONTACT WITH LIQUID AND MIST. Keep [illegible]
[illegible]

Fire

Not flammable
May cause fire on contact with combustibles
Flammable gas may be produced on contact with metals
[illegible]
DO NOT USE WATER ON ADJACENT FIRES

Exposure

CALL FOR MEDICAL AID

MIST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

LIQUID
Will burn skin and eyes
Harmful if swallowed
[illegible]
DO NOT INDUCE VOMITING

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning, [illegible]
Restrict access
Chemical and physical treatment
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Fuming sulfuric acid
3.2 **Coast Guard Compatibility Classification:** Inorganic acid
3.3 **Chemical Formula:** $SO_3 \cdot H_2SO_4$
3.4 **IMCO United Nations Numerical Designation:** NA 1831

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to cloudy
4.3 **Odor:** Sharp penetrating choking

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Respirator approved by U.S. Bureau of Mines for acid mists, rubber gloves, plastic or rubber apron, eyewash, [illegible] in and safety shower, rubber footwear, face shield
5.2 **Symptoms Following Exposure:** Acid mist is irritating to eyes, nose and throat. Liquid causes severe burns on skin and eyes
5.3 **Treatment for Exposure:** INGESTION: [illegible] do NOT induce vomiting. EYES: Flush with plenty of water, [illegible] call a doctor. SKIN: Flush with plenty of water
5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]
5.5 **Short-Term Inhalation Limits:** [illegible] for 30 min
5.6 **Toxicity by Ingestion** Severe burns, [illegible] and stomach
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentration
5.9 **Liquid or Solid Irritant Characteristics.** Severe irritant. Causes second and third degree burns on short contact. Very injurious to the eye
5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Avoid use of water on adjacent fires
6.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors are generated
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Violent reaction with water, spatter
7.2 **Reactivity with Common Materials.** May react with cast iron with explosive violence. Attacks many metals releasing flammable hydrogen gas. Capable of igniting finely divided combustible material on contact. Extremely hazardous in contact with many materials
7.3 **Stability During Transport:** Normally stable
7.4 **Neutralizing Agents for Acids and Caustics** Cautiously dilute with water with precaution against violent spattering. Diluted acid may be neutralized with lime or soda ash
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
24 ppm 24 hr bluegill lethal fresh water
42 ppm 48 hr prawn LC50 salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp
Industrial Chemical Division
Morristown, N.J. 07960
2. Monsanto Co
Monsanto Industrial Chemicals Co
800 N. Lindbergh Blvd
St. Louis, Mo. 63166
3. Stauffer Chemical Co
Industrial Chemicals Division
299 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 20% [illegible] sulfuric acid to 65% [illegible] sulfuric acid
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A O P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Corrosive material
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	3
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Decomposes
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.91 [illegible] (Liquid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

OXA	OXALIC ACID

Common Synonyms Ethanedioic acid	Solid crystals White Odorless Sinks and mixes with water

[illegible]

Fire	Not flammable Poisonous gases are produced in fire [illegible]
Exposure	ALL FOR MEDICAL AID DUST Will burn eyes, nose and throat If inhaled, will cause difficult breathing [illegible] SOLID Will burn skin and eyes If swallowed, will cause nausea or loss of consciousness [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

[illegible]

2. LABEL

CORROSIVE

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** [illegible]

3.2 **Coast Guard Compatibility Classification** [illegible]

3.3 **Chemical Formula:** $C_2H_2O_4$

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** [illegible]

4.2 **Color** White

4.3 **Odor** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** [illegible] INHALATION [illegible] INGESTION [illegible] NOT [illegible] EYES AND SKIN [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value).** [illegible]

5.5 **Short-Term Inhalation Limits.** [illegible]

5.6 **Toxicity by Ingestion** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics.** [illegible]

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents.** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products:** Generates poisonous gases

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** Not flammable

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** [illegible]

7.2 **Reactivity with Common Materials:** [illegible]

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 4000 mg/l, 24 hr, bluegill, TL_m, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** [illegible] days

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp.
   Industrial Chemicals Division
   [illegible]
2. Mallinckrodt Chemical Works
   Industrial Chemicals Division
   [illegible]
   St. Louis, Mo. [illegible]
   Pfizer Inc.
   Chemicals Division
   [illegible]
   New York, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere** None required

10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

NN

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Corrosive Material

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	2
Flammability (Red)	
Reactivity (Yellow)	[illegible]

*[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.** Decomposes

13.4 **Freezing Point.** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

OXY	# OXYGEN, LIQUEFIED

Common Synonyms			
Liquid oxygen LOX	Liquefied gas	Light blue	Odorless
	Sinks and boils in water		

[illegible]

Fire	Not flammable Containers may explode in fire [illegible]
Exposure	[illegible] VAPOR If inhaled will cause dizziness or difficult breathing LIQUID Will cause frostbite [illegible]
Water Pollution	Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Restrict access

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Liquid oxygen LOX

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula.** O_2

3.4 **IMCO/United Nations Numerical Designation.** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquefied gas

4.2 **Color:** Light blue

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety goggles or face shield, insulated gloves, long sleeves, trousers worn outside boots or secured for [illegible] spilled liquid

5.2 **Symptoms Following Exposure:** Inhalation of oxygen can cause nausea, dizziness, [illegible] lungs, pulmonary edema, pneumonia, and collapse. Liquid may cause [illegible] eyes and skin

5.3 **Treatment for Exposure:** INHALATION: [illegible] precautions [illegible] rapid [illegible] oxygen pressure, supportive treatment should be [illegible] medical [illegible] therapy [illegible] needed and rest. EYES: [illegible] with [illegible] SKIN: [illegible] warm water.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits.** Not pertinent

5.6 **Toxicity by Ingestion** Not pertinent

5.7 **Late Toxicity:** Not pertinent

5.8 **Vapor (Gas) Irritant Characteristics** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable but supports combustion

6.2 **Flammable Limits in Air** Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire:** Increases intensity of any fire. Mixtures of liquid oxygen and any fuel are highly explosive

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Heat of water will significantly vaporize liquid oxygen

7.2 **Reactivity with Common Materials.** Avoid organic and combustible materials such as oil, grease, coal dust, etc. Ignited such materials can explode. The low temperature may cause brittleness in some materials

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD)** None

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. [illegible] Corporation
   Linde Division
   Morristown, N.J. [illegible]
2. Airco, Inc.
   Industrial Gases Division
   [illegible] Mountain Avenue
   Murray Hill, N.J. [illegible]
3. Liquid Air Inc.
   Embarcadero Center
   San Francisco, Calif. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere.** [illegible]

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Nonflammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight.** 32.0

13.3 **Boiling Point at 1 atm:** [illegible] = [illegible] K

13.4 **Freezing Point:** [illegible] = [illegible] K

13.5 **Critical Temperature:** [illegible] = [illegible] K

13.6 **Critical Pressure:** [illegible] = [illegible] MN/m²

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension.** [illegible] dynes/cm = [illegible] N/m at [illegible]

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas)** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

PFA	PARAFORMALDEHYDE

Common Synonyms Polyformaldehyde Polyoxymethylene Formaldehyde polymer	Solid powder White Irritating odor Sinks and mixes with water
[illegible]	
Fire	Combustible [illegible]
Exposure	[illegible] DUST Irritating to eyes, nose and throat Harmful if inhaled [illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Dispose and flush

2. LABELS

No Hazard Label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Formaldehyde polymer
Polyformaldehyde
Polyoxymethylene
Polyoxymethylene glycol

3.2 **Coast Guard Compatibility Classification.** Aldehyde

3.3 **Chemical Formula.** $HO(CH_2O)_nH$

3.4 **IMCO United Nations Numerical Designation:** 9.0

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid

4.2 **Color:** White

4.3 **Odor:** Pungent and irritating like formaldehyde

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible] face shield, protective clothing

5.2 **Symptoms Following Exposure:** Vapors [illegible] eyes, mucous membranes and [illegible] may cause dermatitis. Ingestion [illegible] irritates mouth, throat and stomach and may cause death

5.3 **Treatment for Exposure:** INGESTION [illegible] with water [illegible] SKIN OR EYES [illegible] with copious amounts of water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion** Grade 3 LD$_{50}$ 500-[illegible] mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors moderately irritating [illegible] eyes, nose and throat [illegible] vaporization

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard if splashed on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 199°F (approx 93°C) [illegible]

6.2 **Flammable Limits in Air:** [illegible] formaldehyde gas [illegible]

6.3 **Fire Extinguishing Agents:** Water fog, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Data not available

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Changes to formaldehyde gas which is highly flammable

6.7 **Ignition Temperature:** [illegible] (approx)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Forms water solution of formaldehyde

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Stable decomposes to formaldehyde gas

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
32 ppm 24 hr catfish [illegible] fresh water
100-300 ppm 48 hr flounder [illegible] salt water

8.2 **Waterborne Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD),** [illegible] 5 days (theor [illegible] 5 days)

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

Celanese Corp
Celanese Chemical Co. Division
245 Park Ave
New York, N.Y. [illegible]

2 Mallinckrodt Chemical Works
2nd and Mallinckrodt St
St Louis, Mo 63160

3 Tenneco Chemicals Inc
Tenneco Intermediates Division
Liberty Place
Piscataway, N.J. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible] powder and flake

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open flame arresters

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

RRC

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature** [illegible]

13.6 **Critical Pressure** [illegible]

13.7 **Specific Gravity** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

PTO

PARATHION, LIQUID

Common Synonyms
Ethyl parathion
Phosphorothioic acid O,O-diethyl O-p-nitrophenyl ester
O,O-Diethyl O-(p-nitrophenyl) phosphorothioate
O,O-diethyl O-p-nitrophenyl thiophosphate

Liquid — Light to dark brown

Sinks in water. Freezing point is 43°F.

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Isolate hazard area and deny entry
Keep people away
Stop discharge if possible
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** O,O-Diethyl O-(p-nitrophenyl) phosphorothioate; O,O-Diethyl O-(p-nitrophenyl) thiophosphate; Ethyl Parathion; Phosphorothioic acid O,O-diethyl O-p-nitrophenyl ester
3.2 **Coast Guard Compatibility Classification** — Not applicable
3.3 **Chemical Formula:** $C_{10}H_{14}O_5PO_2SN$
3.4 **IMCO/United Nations Numerical Designation:** 1704

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color:** Dark to light brown
4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Neoprene coated gloves, aprons, boots, or overshoes; rubber apron; goggles; respirator or mask approved for toxic dusts and organic vapors.
5.2 **Symptoms Following Exposure:** Inhalation, ingestion, and absorption through the skin are dangerous. Impaired by inhalation of the pupils, headache and tightness of the chest. Nausea, vomiting, abdominal cramps, diarrhea, muscle twitches, convulsions and possible death may follow. Acute cases may be fatal in 24 hours. Chronic effects may cause blurred vision, pulmonary edema, bronchial asthma, nausea, diarrhea.
5.3 **Treatment for Exposure:** Call a doctor in all cases of exposure. Immediately remove victim from exposure. Immediately flush eyes and skin with copious amounts of water. Do not induce vomiting if victim is unconscious or convulsing. Give 2 PAM tablets and repeat by physician. EYES: flush with water immediately after contact to eyes. SKIN: remove all clothing and shoes immediately; wash the affected area with a solution of sodium carbonate and a detergent; dry and apply a sterile dressing. Do not apply oil. Wash the affected area separately with soap and water. INGESTION: Induce vomiting by mechanical means and repeat until the fluid vomit may contain no more than a few parts per million. Give water, but not milk, to drink and induce vomiting.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³
5.5 **Short-Term Inhalation Limits.** 0.3 mg/m³ for 30 min
5.6 **Toxicity by Ingestion:** Grade 4. Oral LD_{50} 2 mg/kg rats
5.7 **Late Toxicity:** Both acute and chronic effects
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available

continued on page 4

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Water, or alcohol foam
6.4 **Fire Extinguishing Agents Not to be Used:** High pressure water jets; may scatter parathion or be ineffective; inhalation of decomposition products is a hazard
6.5 **Special Hazards of Combustion Products.** Fumes from dense, poisonous water vapor that contain oxides of sulfur and nitrogen
6.6 **Behavior in Fire:** Containers may explode when heated
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Slow reaction; not considered hazardous
7.2 **Reactivity with Common Materials.** Not reactive
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]
8.2 **Waterfowl Toxicity:** [illegible]
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** Not [illegible]

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible] Sometimes distributed as solid [illegible] emulsifiable in water
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Not required
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Poisonous Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** Very high; decomposes
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 25°C liquid
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension.** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization.** Not pertinent
13.13 **Heat of Combustion** [illegible]
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

continued on page 4

5 HEALTH HAZARDS (Cont'd.)

5.10 **Odor Threshold:** [illegible] ppm

PTB	PENTABORANE

Common Synonyms	Liquid	Colorless	Strong sour milk odor
(9) Pentaborane monohydride	Ignites when exposed to air. Floats on water		

Fire

IGNITES WHEN EXPOSED TO AIR

Exposure

HAZARD IS FROM PRODUCTS OF COMBUSTION

VAPOR
POISONOUS IF INHALED

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Isolate area. High flammability
Water contamination
Restrict access
Evacuate area
Disperse and flush

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** (9) Pentaborane monohydride
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula:** B_5H_9
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Characteristic [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus [illegible] rubber gloves and protective clothing
5.2 **Symptoms Following Exposure:** Inhalation: [illegible] causes dizziness, nausea, vomiting, severe headache [illegible] chest, difficult breathing, poor [illegible] coordination, difficulty in speech, [illegible] and convulsions. [illegible] redness and swelling. Can be absorbed through the skin. Vapor cannot be evaluated because [illegible]
Treatment for Exposure: [illegible] following exposure: [illegible] INHALATION: [illegible] EYES: wash with copious quantities of water for a least 15 min. Holding eyelids apart to ensure thorough flushing. SKIN: wash immediately with soap and water. [illegible] affected area with a [illegible] solution followed by additional flushing with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.005 ppm
5.5 **Short-Term Inhalation Limits:** [illegible]
5.6 **Toxicity by Ingestion:** Grade 4 LD[illegible] [illegible]
5.7 **Late Toxicity:** Data not available

Continued on page 4

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Preferred: [illegible] chemical and/or fire foam [illegible]
6.4 **Fire Extinguishing Agents Not to be Used:** Halogenated hydrocarbons, water
6.5 **Special Hazards of Combustion Products:** Toxic fumes may be formed
6.6 **Behavior in Fire:** Tendency [illegible] with water apparently advantageous. Fire produces flammable and toxic gas
6.7 **Ignition Temperature:** [illegible] flammable [illegible] when pure
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts [illegible] flammable hydrogen gas. Reaction [illegible] unless inhibited
7.2 **Reactivity with Common Materials:** [illegible] rubber, some synthetics, [illegible] some greases and some lubricants
7.3 **Stability During Transport:** Stable [illegible]
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Callery Chemical Company
Callery, Pa. 16024

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical [illegible] Hi-Purity [illegible]
10.2 **Storage Temperature:** [illegible]
10.3 **Inert Atmosphere:** Inert [illegible] nitrogen
10.4 **Venting:** Safety valve

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Water Pollution	
Reactivity	

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm.** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** [illegible]
13.6 **Critical Pressure:** [illegible]
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas)** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4

5 HEALTH HAZARDS (Cont'd.)

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that persons will find high concentrations objectionable. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** 0.5 ppm

PCP	PENTACHLOROPHENOL

Common Synonyms	
Dowicide 7 Penta Santophen 20	Solid beads or flakes White to light brown Sinks in water

Avoid contact with solid and dust. Keep people away.
Wear goggles and self-contained breathing apparatus.
Stop discharge if possible.
Isolate and remove discharged material.
Notify authorities if public health and pollution are involved.

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID **DUST** **Irritating to eyes, nose and throat** **If inhaled will cause coughing or difficult breathing** May be fatal if inhaled. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. **SOLID** **POISONOUS IF SWALLOWED** **Will burn skin and eyes** Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES hold eyelids open and flush with plenty of water. IF SWALLOWED induce vomiting. CONSCIOUS: have victim drink water or milk and have vomiting continued. IF SWALLOWED unconscious or convulsions: DO NOT INDUCE VOMITING.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify appropriate fish and wildlife agencies. Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning: poison
Restrict access
Should be removed

2 LABELS

Not hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Dowicide 7, Penta, Santophen 20

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula** C_6Cl_5OH

3.4 **IMCO/United Nations Numerical Designation.** 6.1 2020

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid

4.2 **Color** Colorless to light brown

4.3 **Odor** Very weak

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Respirator for dust, goggles, protective clothing

5.2 **Symptoms Following Exposure** Dust or vapor irritates skin and mucous membranes causing coughing and sneezing. Ingestion causes loss of appetite, rapid respiration, difficulty, anesthesia, sweating, coma. Overexposure can be fatal.

5.3 **Treatment for Exposure** Call a doctor. INGESTION: induce vomiting if conscious. EYES: wash with water for 15-30 min. SKIN: wash well with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 0.5 mg/m³

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion** Grade 3 LD₅₀ 50 to 500 mg/kg (rat)

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentration.

5.9 **Liquid or Solid Irritant Characteristics** Causes smarting of the skin and irritation; severe burns on heat exposure; may cause secondary burns on long exposure.

5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products.** Gaseous toxic and irritating vapors

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 5 ppm 48-hr trout lethal fresh water

8.2 **Waterfowl Toxicity** 4500 ppm/1 C_{50}/mallards

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

1. Dow Chemical Co, Midland, Mich 48640
2. Reichold Chemicals Inc, RCI Bldg, White Plains, N.Y. 10602
3. Sanford Chemical Co, Port Neches, Tex 77651

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 86-100%

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (blue)	3
Flammability (red)	0
Reactivity (yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid

13.2 **Molecular Weight:** 266.35

13.3 **Boiling Point at 1 atm:** 590 F = 310 C = 583 K

13.4 **Freezing Point:** 370 F = 188°C = 461 K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** 1.98 at 15°C (solid)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page Sand A

NOTES

REVISED 1978

PDC	PENTADECANOL

Common Synonyms	Liquid Colorless Faint alcohol odor Floats on water
	Stop discharge [illegible] Call [illegible] [illegible] [illegible] [illegible]
Fire	Combustible Extinguish with foam, dry chemical or carbon dioxide Water may be [illegible] Cool exposed containers with water
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES hold eyes [illegible] and flush with plenty of water
Water Pollution	Harmful to fish and water fowl Fouling to shoreline May be dangerous if it enters water intakes Notify [illegible] health and pollution control officials Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 1 Pentadecanol
Pentadecyl alcohol

3 2 **Coast Guard Compatibility Classification**
Alcohol

3 3 **Chemical Formula:** $CH_3(CH_2)_{13}CH_2OH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Weak alcoholic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield

5 2 **Symptoms Following Exposure:** Low toxicity. Excessive exposure produces some central nervous system depression. Prolonged contact produces skin irritation

5 3 **Treatment for Exposure:** INHALATION if necessary, support respiration. INGESTION induce vomiting and call a doctor. SKIN OR EYES wash with copious amounts of water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity.** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Data not available

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

No bulk shipments

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 228.42

13 3 **Boiling Point at 1 atm:** 572°F = 300°C = 573°K

13 4 **Freezing Point:** 111°F = 44°C = 317°K

13 5 **Critical Temperature:** 824°F = 440°C = 713°K

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 0.829 at 50°C (liquid)

13 8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 50°C

13 9 **Liquid-Water Interfacial Tension.** (est.) 35 dynes/cm = 0.035 N/m at 50°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.024

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion.** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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PET	PENTAERYTHRITOL

Common Synonyms	
2,2-Bis(hydroxymethyl)-1,3-propanediol Pentaerythrite Tetrahydroxymethylmethane Mono PE Pentek	Solid White Odorless Sinks and mixes slowly with water

Fire	Combustible
Exposure	VAPOR OR DUST Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Mono PE, PE, Pentaerythrite, Pentek, Tetrahydroxymethylmethane, Tetrakis(hydroxymethyl)methane, Tetramethylol methane

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C(CH_2OH)_4$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles

5.2 **Symptoms Following Exposure:** Non toxic, no symptoms likely

5.3 **Treatment for Exposure:** None needed

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent (inert particulate)

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 0, LD_{50} > 15 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** water, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 842°F (dust cloud)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Celanese Chemical Company
   245 Park Avenue
   New York, N.Y. 10017
2. Commercial Solvents Corporation
   Terre Haute, Ind. 47808
3. Hercules Incorporated
   Coatings & Specialty Products Department
   910 Market Street
   Wilmington, Del. 19899

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 86 - 90% plus 10 - 14% dimer. Pure 98.4%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 136.2

13.3 **Boiling Point at 1 atm:** Not pertinent (sublimes)

13.4 **Freezing Point:** 502°F = 261°C = 534°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.39 at 25°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** −8,730 Btu/lb = −4,850 cal/g = −203 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

PTA	PENTANE

Common Synonyms	Liquid — Colorless — Gasoline odor Floats on water. Flammable vapor is produced. Boiling point is 97°F.
Fire	FLAMMABLE Flashback along vapor trail may occur Containers may explode when heated Vapor may explode if ignited in an enclosed area
Exposure	VAPOR If inhaled, will cause dizziness or difficult breathing LIQUID Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — high flammability
Restrict access
Evacuate area

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** No common synonyms
3.2 **Coast Guard Compatibility Classification** Paraffin
3.3 **Chemical Formula** $n\text{-}C_5H_{12}$
3.4 **IMCO/United Nations Numerical Designation:** 3.1/1265

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Low toxicity. Very high vapor concentrations produce narcosis; aspiration into lungs can produce chemical pneumonitis and pulmonary edema
5.3 **Treatment for Exposure:** INHALATION: remove from exposure, support respiration if needed. INGESTION: do NOT induce vomiting, call physician
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 500 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are mildly irritating to the eyes and throat
5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin
5.10 **Odor Threshold.** 10 ppm

6 FIRE HAZARDS

6.1 **Flash Point.** −57°F (−49°C)
6.2 **Flammable Limits in Air** 1.4 — 8.0% (by vol.)
6.3 **Fire Extinguishing Agents** Foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire** Containers may explode
6.7 **Ignition Temperature** 544°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate** Not applicable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction
7.2 **Reactivity with Common Materials** No reaction
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** >60ppm* (96 hr. LC50 for fresh water)
*Time period not specified
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Ashland Oil Inc
Petrochemicals Dept
Columbus, Ohio 43216
2. Marathon Oil Co
539 South Main St
Findlay, Ohio 45840
3. Phillips Petroleum Co
Bartlesville, Okla 74004

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure (99.2%), technical research (99.9%)
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere.** No requirement
10.4 **Venting:** Open flame arrester or pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

S I E X W

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	4
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	0
Aesthetics	1
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

*12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight.** 72.15
13.3 **Boiling Point at 1 atm** 97.0°F = 36.1°C = 309.1°K
13.4 **Freezing Point** −201.0°F = −129.4°C = 143.8°K
*13.5 **Critical Temperature** 385.7°F = 196.5°C = 469.7°K
*13.6 **Critical Pressure:** 4.7 atm = 71.1 psia = 4.8 MPa
13.7 **Specific Gravity** 0.626 @ 20°C (Liquid)
13.8 **Liquid Surface Tension** 16.0 dynes/cm = 0.016 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 50.2 dynes/cm = 0.0502 N/m at 20°C
13.10 **Vapor (Gas) Specific Gravity** 2.5
13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.075
13.12 **Latent Heat of Vaporization.** 154.7 Btu/lb = 85.9 cal/g = 3.59 × 10⁵ J/kg
13.13 **Heat of Combustion** −17,532 Btu/lb = −10,291 cal/g = −430.2 × 10⁵ J/kg
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

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PTE	1-PENTENE

Common synonyms: alpha-Amylene, Propylethylene	Liquid; Colorless; Gasoline odor Floats on water. Flammable vapor is produced. Boiling point is 86°F.
—	FLAMMABLE Flashback along vapor trail may occur Containers may explode when heated Vapor may explode if ignited in an enclosed area
Exposure	VAPOR If inhaled will cause dizziness LIQUID Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning: high flammability
Restrict access
Evacuate area

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** alpha-n-Amylene, Propylethylene

3.2 **Coast Guard Compatibility Classification:** Olefin

3.3 **Chemical Formula:** $CH_3CH_2CH{=}CH_2$

3.4 **IMCO United Nations Numerical Designation:** 3.1, 1108

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Like gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield (as for gasoline)

5.2 **Symptoms Following Exposure:** Acts as a simple asphyxiant or weak anesthetic in high vapor concentrations. Similar to effects caused by gasoline vapors.

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure. SKIN: wash with soap and water. EYES: flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not irritating

5.9 **Liquid or Solid Irritant Characteristics:** Not irritating

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** −40°F (C.C.), −0.4°C

6.2 **Flammable Limits in Air:** 1.5 – 8.7

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide. Stop flow of vapor.

6.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Containers may explode in fire

6.7 **Ignition Temperature:** 527°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] ppm, 48 hr sunfish lethal, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** [illegible] (theor.) 5 days, [illegible] (theor.) 1 day

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co., Houston, Tex. 77001
2. Phillips Petroleum, Bartlesville, Okla. [illegible]
3. Texaco Inc., 135 E. 42 St., New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Research 99.9 pure, 99.4+ technical [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open flame arrester or pressure-vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

A F L V W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 70.13

13.3 **Boding Point at 1 atm:** [illegible]°F = 29.9°C = [illegible] K

13.4 **Freezing Point:** −265°F = −165°C = 108 K

13.5 **Critical Temperature:** 376.9°F = 191°C = 464.5 K

13.6 **Critical Pressure:** [illegible] psia = 40 atm = 4.05 MN/m²

13.7 **Specific Gravity:** 0.641 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 16.5 dynes/cm = 0.0165 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** [illegible] dynes/cm = 0.0[illegible] N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** 2.4

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.053

13.12 **Latent Heat of Vaporization:** 154.6 Btu/lb = 85.87 cal/g = 3.595 × 10⁵ J/kg

13.13 **Heat of Combustion:** −19,[illegible] Btu/lb = −10,755 cal/g = −4.5[illegible] × 10⁷ J/kg

13.14 **Heat of Decomposition:** No pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

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PAA — PERACETIC ACID

Common Synonyms
Peroxyacetic acid
Acetyl hydroperoxide

Liquid | Colorless | Strong odor

Mixes with water. Flammable. Irritating vapor is produced.

Fire

Combustible
May cause fire on contact with combustibles
Containers may explode in fire

Exposure

VAPOR
Irritating to eyes, nose and throat

LIQUID
Irritating to skin and eyes.
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning. Oxidizing material
Water contaminant
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Acetyl hydroperoxide
Peroxyacetic acid

3.2 **Coast Guard Compatibility Classification**
Not applicable

3.3 **Chemical Formula:**
CH_3COOOH CH_3COOH

3.4 **IMCO/United Nations Numerical Designation.** 2.1332

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color.** Colorless

4.3 **Odor:** Pungent vinegar

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Self-contained breathing apparatus. Impervious clothing (goggles, rubber gloves, etc.)

5.2 **Symptoms Following Exposure** Inhalation causes severe irritation of nose and throat. Contact with liquid causes severe irritation of eyes and skin. Ingestion causes severe distress including burns of mouth and stomach.

5.3 **Treatment for Exposure.** INHALATION: remove victim to fresh air, check for breathing, apply artificial respiration and oxygen, call doctor. EYES: flush with water for at least 15 min, call doctor. SKIN: flush with water and treat burn. INGESTION: give plenty of water, call doctor.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion** Grade 3. Oral LD_{50} = [illegible] mg/kg in rat

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics** Data not available

5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** 104°F C.C.

6.2 **Flammable Limits in Air**
Data not available

6.3 **Fire Extinguishing Agents** Water

6.4 **Fire Extinguishing Agents Not to be Used**
Not pertinent

6.5 **Special Hazards of Combustion Products**
Not pertinent

6.6 **Behavior in Fire** Vapors are very flammable and explosive. Liquid will detonate if concentration is above 56% because of evaporation of acetic acid

6.7 **Ignition Temperature.** 392°F

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** May cause fire in contact with organics, cellulosics, such as wood, cotton or straw. Corrosive to most metals including aluminum

7.3 **Stability During Transport** Stable if properly cooled and not contaminated with metals. At 40°C concentration decreases about [illegible] each month

7.4 **Neutralizing Agents for Acids and Caustics** Flush with water

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)**
Data not available

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. FMC Corporation
Industrial Chemical Division
633 Third Avenue
New York, N.Y. 10017

2. High Point Chemical Corp.
[illegible] Taylor Street
High Point, N.C. 27261

3. Pfizer and Bayer Inc.
[illegible] Northern Boulevard
Flushing, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 40% peracetic acid
40% acetic acid, 6% hydrogen peroxide, balance water, 500 ppm stabilizer

10.2 **Storage Temperature** 60°F – 122°F

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

VPQ

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Organic Peroxide

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight** Not pertinent

*13.3 **Boiling point at 1 atm**
Not pertinent (max. dec.)

*13.4 **Freezing Point** (approx.)
−27°F = −40°C = 243°K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity** (at [illegible] Liquid)

13.8 **Liquid Surface Tension.** Data not available

13.9 **Liquid-Water Interfacial Tension**
Not pertinent

*13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13.12 **Latent Heat of Vaporization**
Data not available

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition** Data not available

*13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

*40% solution in acetic acid, H_2O

(Continued on pages 5 and 6)

NOTES

PCL	PERCHLORIC ACID

Common Synonyms			
Dioxonium perchlorate solution	Liquid	Colorless	Odorless
	Sinks and mixes with water		

Fire	Not flammable Will increase the intensity of a fire May cause fire on contact with combustibles Containers may explode in fire POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing LIQUID Will burn skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning: corrosive, oxidizing material
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dioxonium perchlorate solution; Perchloric acid solution

3.2 **Coast Guard Compatibility Classification** Not listed

3.3 **Chemical Formula** $HClO_4 \cdot H_2O$

3.4 **IMCO/United Nations Numerical Designation** [illegible] (50% and [illegible] (less than 50% acid)

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, face shield or vapor tight chemical type safety goggles, rubber apron, rubber boots or shoes

5.2 **Symptoms Following Exposure:** Inhalation of vapors or mist causes burning sensation of nose and throat and lung irritation with coughing; prolonged or excessive exposure could cause vomiting and severe cough. Ingestion causes blistering and burns of mouth and stomach. Contact with eyes or skin causes blistering and burns

5.3 **Treatment for Exposure:** *Get medical attention including all exposures to this compound.* INHALATION: move to fresh air, give oxygen if necessary. INGESTION: give large amounts of water. EYES: flush with water for [illegible] minutes. SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Data not available

5.9 **Liquid or Solid Irritant Characteristics** Data not available

5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable. Not may explode in fire

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents.** Water from protected area

6.4 **Fire Extinguishing Agents Not to be Used**

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire** Above 160°C (320°F) will react with combustible material and increase intensity of fire. Containers may explode

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Contact with most combustible materials may cause fires and explosions. Corrosive to most metals with formation of flammable hydrogen gas which may collect in confined spaces

7.3 **Stability During Transport** Unstable if heated

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water and rinse with dilute sodium bicarbonate or soda ash solution

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** None

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp
Specialty Chemicals Div
P O Box 1057R
Morristown, N J 07960

2. J T Baker Chemical Co
Phillipsburg, N J 08865

3. Hooker Chemical Corporation
Industrial Chemicals Division
Niagara Falls, N Y 14302

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** ACS 60 - 72 solution in water

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 445-3

VP

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Oxidizer

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	0
Reactivity (Yellow)	3
	OX

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 100.46 (solution in H2O)

13.3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13.4 **Freezing Point:** −170°F = −112°C = 161°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.6 - 1.7 at 25°C (liquid)

13.8 **Liquid Surface Tension** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion.** Not pertinent

13.14 **Heat of Decomposition.** Data not available

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

PCM	PERCHLOROMETHYL MERCAPTAN

Common Synonyms

Trichloromethyl sulfur chloride
Thiocarbonyl tetrachloride
Trichloromethyl sulfochloride
Trichloromethane sulfenyl chloride

Liquid — Yellow to orange red — Strong unpleasant odor

Sinks in water. Poisonous vapor is produced

Fire

Not flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes, nose and throat

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Irritating to eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning: poison, water contaminant, air contaminant
Restrict access
Disperse and flush

2 LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichloromethanesulfenyl chloride, Trichloromethane sulphenyl chloride, Trichloromethyl sulphochloride, Trichloromethylsulfur chloride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CCl_3SCl

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Bright yellow, pale yellow, orange red

4.3 **Odor:** In vessels unpleasant, strong; unbearable, strongly acrid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic and acid, self-contained breathing apparatus, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation may cause severe irritation of upper respiratory tract; brief exposure to low concentrations may produce central nervous system depression and lung, liver and heart congestion. Severe exposures may be fatal. Contact of liquid with eyes causes immediate eye irritation and severe burns. Eyes should promptly washed away; severe corneal damage may result. Liquid also causes severe skin irritation; may be absorbed through skin in quantities sufficient to produce systemic poisoning. Ingestion may cause damage to other membranes of the mouth, throat, and gastro-intestinal tract. Pain and burning of the mouth and throat, nausea, vomiting, cramps and diarrhea may occur. In severe cases, tissue ulceration and central nervous system depression may result.

5.3 **Treatment for Exposure:** Get medical attention at once following all exposures to this compound. INHALATION: remove victim to fresh air, give mouth to mouth resuscitation if needed. EYES: flush with water for 15 min or if physician is not available, flush with water for 15 min. SKIN: flush with water. INGESTION: give large amounts of water, then induce vomiting and vomitus is clear, give milk, eggs, strong tea, or coffee to stomach.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade [illegible] LD_{50} [illegible] mg/kg (rat)

5.7 **Late Toxicity:** Data not available

Continued on page 4

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Very irritating vapors formed from hot material. May form toxic phosgene gas, hydrogen chloride and sulfur dioxide

6.6 **Behavior in Fire:** At elevated temperatures will decompose to carbon tetrachloride, sulfur chloride and heavy oily polymer

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts only when hot to give carbon dioxide, hydrochloric acid and sulfur

7.2 **Reactivity with Common Materials:** Reacts with iron or steel evolving carbon tetrachloride. Corrosive to most metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with dilute sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Stauffer Chemical Co., 1200 South 47th Street, Richmond, Calif. 94804
2. Mobay Chemical Co., 940 West St. Paul Ave., Milwaukee, Wis. 53233
3. Pfaltz and Bauer, Inc., 126th Northern Boulevard, Flushing, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 97%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

XOX

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 185.9

13.3 **Boiling Point at 1 atm:** 300°F = 149°C = 422°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at [illegible] °C (liquid)

13.8 **Liquid Surface Tension:** 35.02 dynes/cm = 0.03502 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = 2.2 × 10[illegible] J/kg

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 4

5 HEALTH HAZARDS (Cont'd)

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

PTL	PETROLATUM

Common Synonyms	Thick liquid	Dark brown, green, amber or white	Odorless
Petroleum jelly	Floats on water		

Fire	Combustible
Exposure	LIQUID Irritating to eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, UG 446.4

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Petroleum jelly, Petroleum jelly, Vaseline, Yellow petrolatum

3.2 **Coast Guard Compatibility Classification.** Miscellaneous hydrocarbon mixtures

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless, amber, green, dark brown

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield

5.2 **Symptoms Following Exposure:** None

5.3 **Treatment for Exposure:** EYES wash with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits.** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 1 [illegible]

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** None

5.9 **Liquid or Solid Irritant Characteristics.** None

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point.** [illegible] F.C.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents.** Water, foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

[illegible] Corp.
North American Division
Paulsboro, N.J. [illegible]

2 [illegible]
[illegible]

[illegible] Quaker State Oil Refining Co.
Oil City, Pa. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** USP, NF, technical (these vary in color and in melting point)

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, UG 446.3

A T U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Grease

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm.** Very high

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** (est.) 0.865 at 60°C (liquid)

13.8 **Liquid Surface Tension.** Data not available

13.9 **Liquid-Water Interfacial Tension.** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

PTN	PETROLEUM NAPHTHA

Common Synonyms
Petroleum solvent

Liquid — Colorless — Gasoline odor

Floats on water. Flammable vapor is produced.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Not irritating to eyes, nose or throat.

LIQUID
Harmful if swallowed.

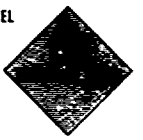
Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response to Methods Handbook (CG-446-4)

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
3.2 **Coast Guard Compatibility Classification:** Miscellaneous hydrocarbon mixtures
3.3 **Chemical Formula:** Not applicable
3.4 **IMCO United Nations Numerical Designation**

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:**
4.3 **Odor:**

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment**
5.2 **Symptoms Following Exposure:**
5.3 **Treatment for Exposure:** INHALATION: INGESTION: NOTE: EYES: SKIN:
5.4 **Toxicity by Inhalation (Threshold Limit Value)**
5.5 **Short-Term Inhalation Limits**
5.6 **Toxicity by Ingestion.**
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics.**
5.9 **Liquid or Solid Irritant Characteristics.**
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:**
6.2 **Flammable Limits in Air:**
6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Water, carbon tetrachloride
6.5 **Special Hazards of Combustion Products.** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:**
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:**

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive
7.2 **Reactivity with Common Materials:** Not reactive
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Atlantic Richfield
APCO Chemical Division
260 S. Broad St.
Philadelphia, Pa. 19101

Sinclair Oil
Kansas City, Mo. 64114

Texaco Oil Company
Attn: Division
1111 Meachan Rd.
Palatine, Ill. 60067

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester) or pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG-446-5)

N E L N W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Liquid
*13.2 **Molecular Weight:**
*13.3 **Boiling Point at 1 atm.**
13.4 **Freezing Point.**
*13.5 **Critical Temperature:** Not pertinent
*13.6 **Critical Pressure:** Not pertinent
*13.7 **Specific Gravity:**
13.8 **Liquid Surface Tension:**
*13.9 **Liquid-Water Interfacial Tension**
*13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
*13.11 **Ratio of Specific Heats of Vapor (Gas).**
*13.12 **Latent Heat of Vaporization:**
*13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on next page)

NOTES

PHN	PHENOL

Common Synonyms
Carbolic Acid
Hydroxybenzene

Solid crystals or waxy liquid — White solid or light tank liquid — Sweet tarry odor

May float or sink and mixes slowly with water

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

LIQUID OR SOLID
POISONOUS IF SWALLOWED
Will burn skin and eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intake

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, [illegible]

[illegible]

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Carbolic acid, Hydroxybenzene, Phenic acid, [illegible]

3.2 **Coast Guard Compatibility Classification:** [illegible]

3.3 **Chemical Formula:** C_6H_5OH

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid [illegible]

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible] and death

5.3 **Treatment for Exposure:** INHALATION: [illegible] and warm and avoid immediately breathing steps [illegible] INGESTION: [illegible] EYES: [illegible] SKIN: [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** Carcinogenic in laboratory animals

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Water fog, [illegible] carbon dioxide, [illegible]

6.4 **Fire Extinguishing Agents Not to be Used:** Not per water

6.5 **Special Hazards of Combustion Products:** [illegible]

6.6 **Behavior in Fire:** [illegible] when heated which will burn explosive [illegible]

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** [illegible]

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** [illegible]

7.3 **Stability During Transport:** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]

7.5 **Polymerization:** [illegible]

7.6 **Inhibitor of Polymerization:** [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] water [illegible] water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** [illegible]

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTUREPS

1. Allied Chemical Corp, Fibers Division, [illegible]
2. Dow Chemical, Midland, Mich. [illegible]
3. Monsanto Company, Monsanto Polymer & Petrochemical Co, [illegible] Lindbergh Blvd, St. Louis, Mo. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, Guide

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** [illegible] liquid, solid Class B

*12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	
Health	
[illegible]	2
[illegible]	[illegible]
[illegible]	[illegible]
Water Pollution	
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Reactivity	
[illegible]	2
Water	[illegible]
Self Reaction	[illegible]

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Solid [illegible]

13.2 **Molecular Weight:** [illegible]

*13.3 **Boiling Point at 1 atm:** [illegible] K

*13.4 **Freezing Point:** [illegible] K

*13.5 **Critical Temperature:** [illegible] K

13.6 **Critical Pressure:** [illegible]

*13.7 **Specific Gravity:** [illegible]

*13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

*13.10 **Vapor (Gas) Specific Gravity:** [illegible]

*13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

*13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** [illegible]

*13.15 **Heat of Solution:** [illegible]

*13.16 **Heat of Polymerization:** [illegible]

[illegible]

NOTES

REVISED 1978

PDL	PHENYLDICHLOROARSINE, LIQUID

Common Synonyms			
Phenylarsenic dichloride	Liquid	Colorless to yellow	Weak unpleasant odor
	Sinks in water		

Fire	Fire data not available POISONOUS GASES ARE PRODUCED WHEN HEATED
Exposure	LIQUID POISONOUS IF SWALLOWED Will burn skin and eyes.
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook (CG 446-4)

Issue warning: poison, water contaminant, [illegible]
Restrict access
Disperse and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Phenylarsenic dichloride
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** [illegible]
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to yellow
4.3 **Odor:** Weak, but very unpleasant

5 HEALTH HAZARDS

5 **Personal Protective Equipment:** [illegible]
5.2 **Symptoms Following Exposure:** [illegible]
5.3 **Treatment for Exposure:** [illegible]
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Data not available
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Water
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Highly toxic arsenic fumes are [illegible] when hot
6.6 **Behavior in Fire:** Data not available
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Very slow reaction [illegible] hazardous [illegible]
7.2 **Reactivity with Common Materials:** Corrodes metals because of acid formed
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Strem Chemicals Inc.
[illegible] Andover St.
Danvers, Mass. [illegible]

Ventron Corporation
Alfa Products Division
[illegible] Congress St.
Beverly, Mass. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG 446-3)

XOX

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poison, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 222.9
13.3 **Boiling Point at 1 atm:** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 20°C (liquid)
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

PHH	PHENYLHYDRAZINE HYDROCHLORIDE

Common Synonyms			
Phenylhydrazine chloride	Solid	White to tan	Weak odor
	Sinks and mixes with water		

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Health

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
POISONOUS IF SWALLOWED
If swallowed will cause nausea

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

[illegible]

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Phenylhydrazine chloride

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_6H_5NHNH_2HCl$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White to tan

4.3 **Odor:** Weak aromatic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator, rubber gloves, goggles

5.2 **Symptoms Following Exposure:** Inhalation of dust or contact of material may cause severe symptoms as follows: Phenylhydrazine is a chemical poison, needed carcinogenic, allergic, toxic and irritant effects, may cause severe anemia and liver injury. Contact with eyes causes irritation and may cause corneal damage and dermatitis.

5.3 **Treatment for Exposure:** INHALATION: If victim is conscious, get medical attention. DUST INGESTION: give large amount of water. Induce vomiting, get medical attention. EYES: flush with water for at least 15 min. Get medical attention. If swallowed or repeated, get medical attention. SKIN: flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Cancer, liver, [illegible]

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
[illegible]

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water fog, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:**

6.5 **Special Hazards of Combustion Products:** Irritating fumes, toxic nitrogen oxides and hydrogen chloride may form in fire

6.6 **Behavior in Fire:** The material melts, [illegible] and deposits on surfaces

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:** May be corrosive to metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Eastman Organic Chemicals
[illegible] Street
Rochester, N.Y. 14650

[illegible]
[illegible] Pau Ave
Milwaukee, Wis. [illegible]

Gallard Schlesinger Chemical Mfg. Co.
[illegible] Ave
[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial Pure

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-5

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous and Corrosive B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 144.6

13.3 **Boiling Point at 1 atm:** Not pertinent
decomposes

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (Solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

PHG	PHOSGENE

Common Synonyms Carbonyl chloride	Liquefied compressed gas — Colorless gas or light yellow liquid — Sweet or sharp odor Liquid sinks in water. Poisonous vapor is produced. Boiling point is 47°F
Fire	Not flammable POISONOUS GASES ARE PRODUCED WHEN HEATED
Exposure	VAPOR POISONOUS IF INHALED Irritating to eyes, nose, and throat Effects may be delayed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook [illegible]

[illegible]

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** [illegible]

3.2 **Coast Guard Compatibility Classification:** [illegible]

3.3 **Chemical Formula:** [illegible]

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Compressed gas

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** INHALATION [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]

6.5 **Special Hazards of Combustion Products:** [illegible]

6.6 **Behavior in Fire:** [illegible]

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** [illegible]

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** [illegible]

7.3 **Stability During Transport:** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]

7.5 **Polymerization:** [illegible]

7.6 **Inhibitor of Polymerization:** [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook [illegible]

A C I J O

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** [illegible]

12.2 **NAS Hazard Rating for Bulk Water Transportation:** [illegible]

12.3 **NFPA Hazard Classifications:**

Category	Classification
[illegible]	4
[illegible]	
[illegible]	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** [illegible]

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

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PAC	PHOSPHORIC ACID

Common Synonyms Orthophosphoric acid	Thick liquid Colorless Odorless Sinks and mixes with water
Fire	Not flammable Flammable gas is formed on contact with metals
Exposure	LIQUID Will burn skin and eyes If swallowed, will cause nausea, vomiting, or loss of consciousness
Water Pollution	Dangerous to aquatic life in high concentration May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning, corrosive
Restrict access
Disperse and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Orthophosphoric acid
3.2 **Coast Guard Compatibility Classification** Non-oxidizing mineral acid
3.3 **Chemical Formula** H_3PO_4
3.4 **IMCO/United Nations Numerical Designation** 9.0 1805

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Goggles or face shield, rubber gloves and protective clothing
5.2 **Symptoms Following Exposure.** Burns on mouth and lips, sour acid taste, severe gastrointestinal irritation, nausea, vomiting, bloody diarrhea, difficult swallowing, severe abdominal pains, thirst, torpor, difficult breathing, convulsions, collapse, shock, death
5.3 **Treatment for Exposure:** INGESTION: do NOT induce vomiting; give water, milk, or vegetable oil. SKIN OR EYE CONTACT: flush with water for at least 15 min.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 1.0 mg/m³
5.5 **Short-Term Inhalation Limits** Not pertinent
5.6 **Toxicity by Ingestion** Grade 3 LD_{50} 50 to 500 mg/kg
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics** Not volatile
5.9 **Liquid or Solid Irritant Characteristics** Fairly severe skin irritant; may cause pain and second degree burns after a few minutes contact
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air.** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire** Not pertinent
6.7 **Ignition Temperature** Not flammable
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate.** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Mild evolution of heat
7.2 **Reactivity with Common Materials** Reacts with metals to generate flammable hydrogen gas
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, neutralize with lime
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** 100 ppm/24 hr mosquito fish/Dam fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (60°)** None
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. CF Industries Inc
Bartow Phosphate Complex
Bartow, Fla 33830
2. Cities Service Co. Inc
North American Chemicals & Metals Group
60 Wall St
New York, N.Y. 10005
3. Freeport Minerals Co
Freeport Chemical Co. Division
161 East 42 St
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** NF, food fertilizer, commercial, all 75-85%, the balance being water
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See hazard Assessment Handbook CG 446-3)

A P

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Corrosive liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	0
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight** 98.00
13.3 **Boiling Point at 1 atm** >256°F = >130°C = >403°K
13.4 **Freezing Point** Not pertinent
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity:** 1.892 at 25°C (liquid)
13.8 **Liquid Surface Tension** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution** -52 Btu/lb = -29 cal/g = 1.2 × 10⁵ J/kg
13.16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

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PPO — PHOSPHORUS OXYCHLORIDE

Common Synonyms	Oily liquid — Colorless to light yellow — Musty odor Fumes in air, sinks and reacts with water. Poisonous gas is produced. Freezing point is 34°F
Fire	Not flammable
Explosion	VAPOR Irritating to eyes, nose, or throat Harmful if inhaled LIQUID Will burn skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning — corrosive
Restrict access
Disperse and flush with care

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Phosphoryl chloride
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula:** $POCl_3$
3.4 **IMCO-United Nations Numerical Designation.** 8.0 1810

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Pungent and musty, disagreeable and lingering

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical safety goggles, face shield, self contained or air line respirator, hard hat, foot protection, rubber gloves and clothing
5.2 **Symptoms Following Exposure:** Vapors burn eyes and respiratory tract. Liquid is very corrosive to body tissues because of reaction with water to form hydrochloric and phosphoric acids
5.3 **Treatment for Exposure.** *CAUTION: persons doing treatment should protect themselves against exposure.* INHALATION: remove victim from contaminated area. If once of breathing has stopped, start artificial respiration, call a doctor. INGESTION: give water or milk, do NOT induce vomiting. SKIN: remove contaminated clothing and flood exposed skin surfaces with water. EYES: retract eyelids and wash with water for at least 15 min., call a doctor
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 ppm
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion** Grade 3, oral rat LD_{50} = 380 mg/kg
5.7 **Late Toxicity** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes
5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air** Not flammable
6.3 **Fire Extinguishing Agents** Sand and carbon dioxide on adjacent fires
6.4 **Fire Extinguishing Agents Not to be Used** Water
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire** Poisonous corrosive irritating gases are generated when heated or when in contact with water
6.7 **Ignition Temperature.** Not flammable
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate.** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Vigorous reaction with evolution of hydrogen chloride fumes
7.2 **Reactivity with Common Materials** Corrosive to most metals except tinks and lead. Products of its reaction with water rapidly corrode steel and most metals with formation of flammable hydrogen gas
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Flush with water, neutralize acids mixed with lime or soda ash
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. FMC Corp
   Organic Chemicals Division
   633 Third Ave
   New York, N.Y. 10017
2. Monsanto Co
   Monsanto Industrial Chemicals Co
   800 North Lindbergh Blvd
   St. Louis, Mo. 63166
3. Stauffer Chemical Co
   Specialty Chemical Division
   Cold Creek, Ala. 36512

10 SHIPPING INFORMATION

10.1 **Grades or Purity** 99.99+
10.2 **Storage Temperature** Above 38°F
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Corrosive material
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular weight** 153.33
13.3 **Boiling Point at 1 atm** 225°F = 107°C = 380°K
13.4 **Freezing Point** 34°F = 1°C = 274°K
13.5 **Critical Temperature:** 630°F = 332°C = 605°K
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity.** 1.675 at °C (liquid)
13.8 **Liquid Surface Tension** Not pertinent
13.9 **Liquid-Water Interfacial Tension** Not pertinent
13.10 **Vapor (Gas) Specific Gravity** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** (see 11.200)
13.12 **Latent Heat of Vaporization:** 97 Btu/lb = 54 cal/g = 2.3×10^5 J/kg
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on page 2

NOTES

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PPP

PHOSPHORUS PENTASULFIDE

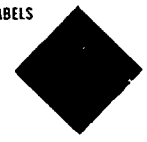
Common Synonyms	Solid flakes or powder — Yellow to green — Odorless or rotten egg odor Sinks and reacts with water. Poisonous gas is produced
Fire	FLAMMABLE MAY BE IGNITED BY SPARK, FRICTION, OR STATIC DISCHARGE Containers may explode in fire POISONOUS IRRITATING GASES ARE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning — high flammability, poison
Restrict access
Evacuate area
Should be removed

2. LABELS



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Phosphorus sulfide; Phosphorus persulfide; Thiophosphoric anhydride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** P_4S_{10}

3.4 **IMCO/United Nations Numerical Designation:** 4.1, 1340

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Light greenish yellow, greenish gray

4.3 **Odor:** Like rotten eggs. High (lethal) concentrations can paralyze the sense of smell

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Chemical safety goggles, plastic face shield, self-contained or air line respirator

5.2 **Symptoms Following Exposure.** Hydrogen sulfide gas formed by reaction with moisture can cause death by respiratory failure. The gas also irritates eyes and respiratory system. The solid irritates skin and eyes; the symptoms may be delayed several hours.

5.3 **Treatment for Exposure:** INHALATION: remove victim from contaminated area; if breathing has stopped, begin artificial respiration. INGESTION: induce vomiting; call physician. SKIN: remove contaminated clothing and wash areas with large amounts of water. EYES: flush with large amounts of water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm (hydrogen sulfide)

5.5 **Short-Term Inhalation Limits:** 20 ppm for 5 min (hydrogen sulfide)

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Hydrogen sulfide gas formed by reaction with moisture causes severe irritation of eyes and throat and can cause eye and lung injury; it cannot be tolerated even at low concentrations.

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause scarring and reddening of the skin.

5.10 **Odor Threshold:** 0.0047 ppm (hydrogen sulfide). See discussion, par. 4.3

6. FIRE HAZARDS

6.1 **Flash Point:** Flammable solid

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Sand and carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water

6.5 **Special Hazards of Combustion Products:** Products of combustion include sulfur dioxide and phosphorus pentoxide, which are irritating to eyes, nose, throat

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 527°F (liquid)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts with liquid water or atmospheric moisture to liberate toxic hydrogen sulfide gas

7.2 **Reactivity with Common Material:** No reaction

7.3 **Stability During Transport:** Can be ignited by friction

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Monsanto Co.
   Monsanto Industrial Chemicals Co.
   800 North Lindbergh Blvd.
   St. Louis, Mo. 63166
2. Occidental Petroleum Corp.
   Hooker Chemical Corp.
   Industrial Chemicals Div.
   Niagara Falls, N.Y. 14302
3. Stauffer Chemical Co.
   Specialty Chemical Division
   Morrisville, Pa. 19067

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Regular, low reactivity, reactive, thick reactor, distilled, undistilled, all 99+

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Sealed containers must be stored in a well-ventilated area

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

RRC

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable solid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications.**

Category	Classification*	
Health Hazard (Blue)	2	y
Flammability (Red)	1	1
Reactivity (Yellow)	3	2
		w

*First column refers to non-fire situation

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 222.27

13.3 **Boiling Point at 1 atm.** 995°F = 514°C = 787°K

13.4 **Freezing Point.** 527°F = 275°C = 548°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 2.03 at 26°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 184 Btu/lb = 102 cal/g = 4.27 × 10³ J/kg

13.13 **Heat of Combustion:** −10,900 Btu/lb = −6,050 cal/g = −253.3 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) −20 Btu/lb = −12 cal/g = −0.5 × 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5

NOTES

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PPR	PHOSPHORUS, RED

Common Synonyms			
Amorphous phosphorus	Solid powder Sinks in water	Reddish brown	Odorless

Fire	FLAMMABLE POISONOUS IRRITATING AND FLAMMABLE GASES ARE PRODUCED IN FIRE
Exposure	SOLID Will burn eyes Harmful if swallowed
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Amorphous phosphorus
3 2 **Coast Guard Compatibility Classification.** Phosphorus elemental
3 3 **Chemical Formula:** P
3 4 **IMCO United Nations Numerical Designation:** 4 1 1338

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** Reddish brown
4 3 **Odor:** Odorless

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask gloves of rubber or vinyl chemical safety glasses rubber shoes
5 2 **Symptoms Following Exposure:** Physically irritating to eyes otherwise essentially harmless and not toxic unless contaminated by highly toxic yellow phosphorus as an impurity
5 3 **Treatment for Exposure** EYES flush thoroughly with water and get medical attention SKIN flush with water and wash with soap and water CAUTION Avoid brushing as friction may ignite material on skin or clothing
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Nonvolatile
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Flammable solid
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents.** Water
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products:** Heat may cause reversion to yellow phosphorus which is toxic and spontaneously flammable upon contact with air Burning yields toxic oxides of phosphorus
6 6 **Behavior in Fire.** Refer to 6 5
6 7 **Ignition Temperature:** 395°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** Avoid uncontrolled contact with oxidizing agents (chlorates nitrates halogens etc) or with strong alkaline hydroxides Can react violently with oxidizing agent in presence of air and moisture liberating phosphorus acids and toxic spontaneously flammable phosphine gas
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 0 105 ppm 48 hr bluegill 11 m fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 FMC Corp
Inorganic Chemicals Division
633 Third Ave
New York N Y 10017

2 Monsanto Co
Monsanto Industrial Chemicals Co
800 North Lindbergh Blvd
St Louis Mo 63166

3 Stauffer Chemical Co
Industrial Chemical Division
Mt Pleasant Tenn 38474

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99 9% Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable solid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 12 99
13 3 **Boiling Point at 1 atm:** Catches fire
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2 20 at 20 C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

PBR	# PHOSPHORUS TRIBROMIDE

Common Synonyms			
Phosphorus bromide	Liquid	Colorless to pale yellow	Sharp, penetrating odor
	Sinks and mixes violently with water		

Fire	Not flammable Irritating gases may be produced when heated
Exposure	LIQUID Will burn skin and eyes. If swallowed will cause nausea
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning corrosive air contaminant water contaminant
Restrict access
Disperse and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Phosphorus bromide
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula** PBr_3
3 4 **IMCO/United Nations Numerical Designation** 1808

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless or slightly yellow
4 3 **Odor** Pungent sharp penetrating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Acid gas canister type mask (full face type for emergencies), chemical safety goggles, nylon gloves clothing and safety shoes all made from rubber
5 2 **Symptoms Following Exposure** Inhalation causes severe irritation of nose throat and lungs Ingestion causes burns of mouth and stomach Contact with eyes or skin causes severe burns
5 3 **Treatment for Exposure** INHALATION remove victim to clear air if necessary apply artificial respiration and or administer oxygen INGESTION dilute by drinking water then neutralize with milk of magnesia egg white etc do not use sodium bicarbonate EYES immediately flush with large amounts of water for at least 15 min SKIN immediately flush with large amounts of water remove contaminated clothing
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity** Data not available
5 8 **Vapor (Gas) Irritan. Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires
6 5 **Special Hazards of Combustion Products** Irritating hydrogen bromide and phosphoric acid vapors may form in fire
6 6 **Behavior in Fire** Acids formed by reaction with water will attack metals and generate flammable hydrogen gas which may form explosive mixtures in enclosed spaces
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently with water evolving hydrogen bromide an irritating and corrosive gas apparent as white fumes
7 2 **Reactivity with Common Materials.** In the presence of moisture highly corrosive to most metals except lead and nickel
7 3 **Stability During Transport** Unstable if heated
7 4 **Neutralizing Agents for Acids and Caustics** Flush with water and rinse with dilute aqueous sodium bicarbonate or soda ash
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Michigan Chemical Corp
351 East Ohio St
Chicago Ill 60611
2 White Chemical Corp
East 22 Street
Bayonne N J 07002
3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Purified 98 99%
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446)

X O

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Corrosive liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight** 270.73
13 3 **Boiling Point at 1 atm** 341°F = 173°C = 446 K
13 4 **Freezing Point** −42.9°F = −40.5°C = 232.7°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 2.852 at 30°C (liquid)
13 8 **Liquid Surface Tension** 45.8 dynes/cm = 0.0458 N/m at 24°C
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** 6.4 Btu/lb = 35.8 cal/g = 1.50 × 10⁵ J/kg
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution** −446 Btu/lb = −248 cal/g = −10.4 × 10⁵ J/kg
13 16 **Heat of Polymerization** Not pertinent

Continued in next column

NOTES

PPT

PHOSPHORUS TRICHLORIDE

Common Synonyms	Liquid — Colorless to slightly yellow — Sharp irritating odor Fumes in air, sinks and reacts with water. Harmful vapor is produced
Fire	Not flammable
Exposure	VAPOR Irritating to eyes, nose, and throat Harmful if inhaled LIQUID Will burn skin and eyes Poisonous if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning, corrosive
Restrict access
Disperse and flush with care

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula.** PCl_3

3.4 **IMCO/United Nations Numerical Designation.** NO 1809

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless to slightly yellow

4.3 **Odor:** Pungent, irritating, like hydrochloric acid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Chemical safety goggles, plastic face shield, self contained or air line respirator, safety hat, rubber gloves and protective clothing

5.2 **Symptoms Following Exposure:** Vapor causes severe irritation of eyes and respiratory tract. Liquid burns eyes and skin

5.3 **Treatment for Exposure:** *CAUTION: Persons doing treatment should protect themselves.* INHALATION: remove victim from contaminated area; if breathing has stopped, start artificial respiration, call a doctor. INGESTION: if victim is conscious, give large quantities of water, do NOT induce vomiting, call a doctor. EYES: retract eyelids and wash eye with water for at least 15 min., call a doctor. SKIN: remove contaminated clothing and wash exposed skin with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 ppm

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion** Grade 2, oral rat LD_{50} = 550 mg/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and nose and can cause eye and lung injury. They cannot be tolerated even at low concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air** Not flammable

6.3 **Fire Extinguishing Agents** Sand, carbon dioxide and dry chemicals on adjacent fires

6.4 **Fire Extinguishing Agents Not to be Used:** Water

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire.** Generates toxic irritating gases

6.7 **Ignition Temperature** Not flammable

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently and may cause flashes of fire. Hydrochloric acid fumes are formed in the reaction

7.2 **Reactivity with Common Materials:** Corrodes most common construction material. Reacts with water to form hydrochloric acid, which reacts with most metals to form flammable hydrogen gas

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water, neutralize acids formed with lime or soda ash

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** None

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. FMC Corp.
   Organic Chemicals Division
   633 Third Ave.
   New York, N.Y. 10017
2. Monsanto Co.
   Monsanto Industrial Chemicals Co.
   800 North Lindbergh Blvd.
   St. Louis, Mo. 63166
3. Stauffer Chemical Co.
   Specialty Chemical Division
   Cold Creek, Ala. 36512

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure [illegible]
technical 98.5+

10.2 **Storage Temperature.** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

VO

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Corrosive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	2
	W

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** 137.33

13.3 **Boiling Point at 1 atm**
169°F = 76°C = 349°K

13.4 **Freezing Point:**
−170°F = −112°C = [illegible]°K

13.5 **Critical Temperature.**
547°F = 286°C = 559°K

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 1.574 at 20°C (water)

13.8 **Liquid Surface Tension:** 25.6 dynes/cm
= 0.0256 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 4.7

13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.200

13.12 **Latent Heat of Vaporization**
98 Btu/lb = 54.4 cal/g = 2.3 × 10⁶ J/kg

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 2 and 4

NOTES

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PPW	PHOSPHORUS WHITE

Common synonyms Yellow phosphorus	Waxy solid Light yellow Garlic odor Fumes and burns in air, sinks in water
	FLAMMABLE May ignite on contact with air POISONOUS IRRITATING GASES ARE PRODUCED IN FIRE
	SOLID Will burn skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning, high flammability

Isolate area

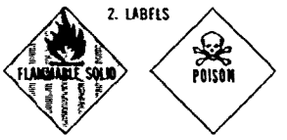
Prevent access

Evacuate

Shield, remove

Chemical and physical treatment

2. LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Yellow phosphorus

3.2 **Coast Guard Compatibility Classification** Phosphorus, elemental

3.3 **Chemical Formula** P

3.4 **IMCO United Nations Numerical Designation.** 4.2 1381

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid or waxy solid

4.2 **Color:** Pale yellow to deep straw

4.3 **Odor:** Distinctive disagreeable pungent sharp like garlic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Heavy rubber gloves and goggles or face shield

5.2 **Symptoms Following Exposure** Solid or liquid causes severe burns. Ingested causes nausea, vomiting, jaundice, low blood pressure, depression, delirium, coma, death. Symptoms after ingestion may be delayed for 12 to 24 hours or longer.

5.3 **Treatment for Exposure:** INGESTION: if ingested do NOT induce vomiting and administer emetic. SKIN OR EYE CONTACT: immediately flush with plenty of water for at least 15 min. Keep skin from drying out. Medical attention is obtained.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 0.1 mg/m³

5.5 **Short-Term Inhalation Limits** Not pertinent

5.6 **Toxicity by Ingestion** Grade 4. LD_{50} below 50 mg/kg

5.7 **Late Toxicity:** Severe attack of liver and bones

5.8 **Vapor (Gas) Irritant Characteristics.** Nonvolatile

5.9 **Liquid or Solid Irritant Characteristics.** Severe skin burns. Causes second and third degree burns on short contact and is very painful on the eyes.

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** Ignites spontaneously in air

6.2 **Flammable Limits in Air** Not pertinent

6.3 **Fire Extinguishing Agents** Water

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Fumes from burning phosphorus are highly irritating

6.6 **Behavior in Fire:** In case white [illegible] burned

6.7 **Ignition Temperature:** Not [illegible]

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** Ignites when exposed to air

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** 0.100 ppm 48hr TLm fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. FMC Corp
   Inorganic Chemicals Division
   633 Third Ave
   New York, N.Y. 10017
2. Monsanto Co
   Monsanto Industrial Chemicals Co
   800 North Lindbergh Blvd
   St. Louis, Mo. 63166
3. Stauffer Chemical Co
   Industrial Chemical Division
   Mt. Pleasant, Tenn. 38474

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99 [illegible]

10.2 **Storage Temperature** Elevated (molten)

10.3 **Inert Atmosphere:** Blanketed

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-5

II-RR

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable solid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	[illegible]
Health	
Vapor Irritant	NA
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reactivity	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight.** 123.89

13.3 **Boiling Point: at 1 atm.** [illegible] °F = 287.0 °C = 552.9 K

13.4 **Freezing Point:** 111.4°F = 44.1 °C = [illegible] K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.82 at 20°C (solid)

13.8 **Liquid Surface Tension.** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(See reverse side)

NOTES

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PAN	PHTHALIC ANHYDRIDE

Common Synonyms
Phthalic anhydride
PAN

Solid flakes or liquid (heated) — Colorless or pale yellow — Choking odor

Solid sinks in water. Liquid solidifies and sinks in water

Fire

Combustible

Exposure

DUST
Irritating to eyes, nose, and throat
If inhaled, will cause coughing

LIQUID OR SOLID
Will burn skin or eyes
Harmful if swallowed

Water Pollution

Effect of low concentration on aquatic life is unknown
May be danger ous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4

Dispose and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 2 Benzenedicarboxylic acid anhydride, 1 3 Dioxophthalan, PAN, Phthalandione, Phthalic acid anhydride

3 2 **Coast Guard Compatibility Classification:** Organic anhydride

3 3 **Chemical Formula:** $C_8H_4O_3$

3 4 **IMCO, United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid or liquid

4 2 **Color:** Colorless or pale yellow

4 3 **Odor:** Characteristic choking odor; characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Coveralls and or rubber apron, rubber shoes or boots, chemical goggles and/or face shield. Bureau of Mines organic vapor respirator (Type C) for gauntlet type leather or rubber gloves

5 2 **Symptoms Following Exposure:** Solid irritates skin and eyes, causing coughing and sneezing. Liquid causes severe thermal burns

5 3 **Treatment for Exposure:** INHALATION: gargle with water and use a sedative cough mixture. INGESTION: induce vomiting and give water, milk, or vegetable oil. SKIN OR EYE CONTACT: Flush with water for at least 5 min. If burned by molten material, remove as much solid as possible, wash off the remainder in cold water, and treat the burn

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 2 ppm

5 5 **Short-Term Inhalation Limits:** 4 ppm for 5 min

5 6 **Toxicity by Ingestion:** Grade 2 LD50 5 to 5 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the eyes and first degree burns on short exposure, may cause secondary burns on long exposure

5 10 **Odor Threshold:** 0 33 - 0 72 mg/m^3

6 FIRE HAZARDS

6 1 **Flash Point:** 329°F O C - 305°F C C

6 2 **Flammable Limits in Air:** 1 7 - 10 5 %

6 3 **Fire Extinguishing Agents:** Water fog, dry chemical, carbon dioxide, or foam

6 4 **Fire Extinguishing Agents Not to be Used:** Water may cause frothing

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 1050°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Solid has very slow reaction, not hazardous. Liquid spatters when in contact with water

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Water and sodium bicarbonate

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** > 30 ppm 96 hr fathead minnow TLm fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 1060 5 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
Plastics Division
Morristown, N J 07960

2 Koppers Co Inc
Organic Material Division
Koppers Bldg
Pittsburgh, Pa 15219

3 Monsanto Co
Monsanto Industrial Chemicals Co
800 North Lindbergh Blvd
St Louis, Mo 63166

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Flake, molten, commercial 99%

10 2 **Storage Temperature:** 268-320°F (liquid), Ambient (solid)

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

H or X X X

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxin	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	1
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	–
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 148 12

13 3 **Boiling Point at 1 atm.:** 584 3°F = 284 6°C = 557 8°K

13 4 **Freezing Point:** 268°F = 131°C = 4 85°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 20 at 135°C (liquid), 1 53 at 20°C (solid)

13 8 **Liquid Surface Tension:** 35 5 dynes/cm = 0 0355 N/m at 135°C

13 9 **Liquid-Water Interfacial Tension:** (est) 30 dynes/cm = 0 03 N/m at 135°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Unknown

13 12 **Latent Heat of Vaporization:** 194 Btu/lb = 108 cal/g = 4 40 × 10^5 J/kg

13 13 **Heat of Combustion:** −9473 Btu/lb = −5263 cal/g = −220 4 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** −27 Btu/lb = −70 5 cal/g = −2 96 × 10^5 J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

PPZ	PIPERAZINE

Common Synonyms		
Hexahydro-1,4-diazine Hexahydropyrazine Diethylenediamine Lumbrical Piperazidine Pyrazine hexahydride	Solid — White — Mild fishy odor Sinks and mixes with water	

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Will burn eyes Irritating to eyes. If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flash

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Diethylenediamine Hexahydro-1,4-diazine, Hexahydropyrazine Lumbrical Piperazidine, Pyrazine hexahydride

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula.** $NHCH_2CH_2NHCH_2CH$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Mild amine like

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Monogoggles or face shield rubber gloves dust mask

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat Ingestion causes irritation of mouth and stomach, has been known to cause severe allergic reaction Contact with eyes causes burns Repeated contact with skin may cause irritation and sensitization

5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amount of water induce vomiting get medical attent on EYES flush with plenty of water for at least 15 min get medical attention SKIN wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 0 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** [illegible] (molten solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents.** Water dry chemical alcohol foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may cause flashing

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** [illegible] F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** May be corrosive to aluminum magnesium and zinc

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Jefferson Chemical Co Inc
1776 Richmond Avenue
P O Box 51900
Houston Texas 77052

2 Union Carbide Corp
Chemicals and Plastics Div
270 Park Avenue
New York N Y 10017

3 Eastman Organic Chemicals
Rochester N Y 14650

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99+% may also be shipped as a solid hexahydrate whose hazardous properties are similar

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 86

13 3 **Boiling Point at 1 atm:** 299°F = 148°C = 421°K

13 4 **Freezing Point:** 221°F = 106°C = 379°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** −14 630 Btu/lb = −8 200 cal/g = −34 3 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** −34 9 Btu/lb = −19 4 cal/g = −0 812 × 10³ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

PLB	POLYBUTENE

Common Synonyms Butene resins Polyisobutylene waxes	Oily liquid — Colorless — Odorless Floats on water
Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Butene resins
Polyisobutylene plastics
Polyisobutylene resins
Polyisobutylene waxes

3.2 **Coast Guard Compatibility Classification.** Olefin

3.3 **Chemical Formula:** $-C(CH_3)_2CH_2-$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Data not available

4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield

5.2 **Symptoms Following Exposure:** Low toxicity. Vapor may act as a [illegible] high concentration

5.3 **Treatment for Exposure:** INHALATION [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion.** Grade 0.1 Dubois [illegible] kg (animals)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically [illegible]

5.10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] 470 F O.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents.** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials.** Not reactive

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

[illegible]
[illegible] Randolph Drive
Chicago, IL [illegible]

[illegible]
Industrial Chemicals Division
200 Bush St.
San Francisco, Calif. 94120

[illegible]
Houston, Tex. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Not required

10.4 **Venting:** Open. Cameras [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A I I

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.** Very high

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] (liquid)

13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension.** (est.) 50 dynes/cm = 0.05 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** (est.) −20,000 Btu/lb = −11,000 cal/g = −470 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** (est.) −9 Btu/lb = −5 cal/g = −0.2 × 10³ J/kg

13.16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

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PCB	POLYCHLORINATED BIPHENYL

Common Synonyms PCB Chlorinated biphenyl Aroclor	Oily liquid to solid powder — Light yellow liquid or white powder — Weak odor Sinks in water
Fire	Combustible
Exposure	LIQUID OR SOLID Irritating to skin and eyes
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

[illegible]

2. LABELS

No hazard label required [illegible]

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Aroclor, Chlorinated biphenyl, Halogenated aromatics, PCB, Pyranol, Santothern

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula:** $C_{12}H_{[illegible]}Cl_{[illegible]}$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid or solid

4.2 **Color:** Pale [illegible] liquid to [illegible] solid

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Gloves and protective garment

5.2 **Symptoms Following Exposure:** Acne, [illegible]

5.3 **Treatment for Exposure:** SKIN: wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 4990 mg/kg

5.7 **Late Toxicity:** Causes chromosomal abnormalities in rats, birth defects in birds

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and cause eye and lung injury. They cannot be tolerated even at low concentrations

5.9 **Liquid or Solid Irritant Characteristics.** Contact with skin may cause [illegible]

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]°F

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Water, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Irritating [illegible] generated

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials.** Not reactive

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
[illegible] ppm [illegible] fresh water
[illegible] ppm [illegible] salt water

8.2 **Waterfowl Toxicity:** LD_{50} [illegible] ppm [illegible]

8.3 **Biological Oxygen Demand (BOD).** None

8.4 **Food Chain Concentration Potential.** High

9 SELECTED MANUFACTURERS

Monsanto Industrial Chemicals Co.
[illegible]
St. Louis, Missouri

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical grade is a liquid [illegible] primarily the [illegible] isomer. Minimum weight [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-5

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid or liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** Not [illegible]

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C/[illegible]

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on page [illegible]

NOTES

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PPI — POLYMETHYLENE POLYPHENYL ISOCYANATE

Common Synonyms			
PAPI	Liquid Sinks in water	Dark brown	Mild odor

Fire

Combustible
Containers may explode in fire

Exposure

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning - poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** PAPI
3.2 **Coast Guard Compatibility Classification:** Isocyanate
3.3 **Chemical Formula:** $C_6H_4NCOCH_2C_6H_3NCO$ and polymer
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Dark brown
4.3 **Odor:** Very mild

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air-fed or organic vapor canister mask, goggles, face shield, rubber gloves and shoes, protective clothing to prevent any skin contact
5.2 **Symptoms Following Exposure:** Inhalation causes breathlessness, chest discomfort, and reduced pulmonary function, wheezing cough and sputum production. Contact with liquid irritates eyes and skin. Ingestion causes [illegible]
5.3 **Treatment for Exposure:** *Get medical aid immediately for all exposures to this compound.* INHALATION: remove victim to fresh air, give artificial respiration if breathing has stopped, oxygen can be given by qualified personnel. EYES: immediately wash with large amounts of water for at least 15 min. SKIN: flush immediately with water, wipe off excess material, wash with soap and water. INGESTION: induce vomiting at least 3 times by giving warm salt water or mustard solution, or salt per cap. Follow with liquid mix and mild cathartic such as milk of magnesia.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.02 ppm
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade I LD50 [illegible] mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor are considered irritating such that personnel will not usually tolerate moderate or high concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and [illegible] degree burns. Short exposure may cause second-degree burns [illegible] exposure
Odor Threshold: Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible] F (C)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Containers may explode
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly forming heavy solid and liberating carbon dioxide gas. Dangerous pressures can build up if container is sealed
7.2 **Reactivity with Common Materials:** No hazardous reactions with [illegible] mild steel
7.3 **Stability During Transport:** Stable if kept sealed and dry
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

The Upjohn Company
Polymer Chemicals Division
P.O. Box [illegible]
Dallas, Texas [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 50% methylenebis phenylisocyanate plus 50% polymer
10.2 **Storage Temperature:** [illegible] F
10.3 **Inert Atmosphere:** Low pressure dry nitrogen
10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

X O X Y

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	4
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	
Reactivity	
Other Chemicals	
Water	
Self Reaction	

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 400 (approx)
13.3 **Boiling Point at 1 atm:** 392°F = 200°C = 473°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.24 at 25°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] x 10^3 J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

PPA	POLYPHOSPHORIC ACID

Common Synonyms: Condensed phosphoric acid	Liquid — Colorless — Odorless Sinks and mixes with water

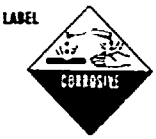
Fire	Not flammable Flammable gas may be produced on contact with metal
Exposure	LIQUID Will burn skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook (CG 446-4)

[illegible]

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Condensed phosphoric acid

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** [illegible]

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** INGESTION [illegible] SKIN OR EYES [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** [illegible]

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** Open or pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG 446-5)

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** [illegible]

12.2 **NAS Hazard Rating for Bulk Water Transportation:** [illegible]

12.3 **NFPA Hazard Classifications:** [illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

REVISED 1978

PLP	POLYPROPYLENE

Common Synonyms			
Propene polymer	Solid Floats on water	Tan to white	Odorless

Fire	Combustible
Exposure	DUST Not harmful SOLID Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response to Water Pollution, Section 5.6 and 5.7

Mechanical recovery

2 LABELS

No hazard label required by Coast Guard Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Propene polymer

3.2 **Coast Guard Compatibility Classification:** [illegible]

3.3 **Chemical Formula:** $(C_3H_6)_n$ where n is large

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Tan to white

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** No apparent [illegible]

5.3 **Treatment for Exposure:** None required

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Diamond Shamrock Corp
[illegible] Superior Avenue
Cleveland, Ohio 44[illegible]

[illegible]
[illegible] West [illegible] Street
Houston, Texas [illegible]

American Chemical Corp
[illegible] East Randolph Drive
Chicago, Illinois [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** Mixture

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.90 at 20°C (water)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

PGC	POLYPROPYLENE GLYCOL

Common Synonyms Polyoxypropylene glycol Polypropylene glycol Pluracol polyol	Liquid — Colorless — Odorless or mild sweet odor May float or sink in water
Fire	Combustible
Exposure	LIQUID Irritating to eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contaminant
Mechanical containment
Should be removed
Disperse and flush

2 LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Polyoxypropylene glycol, Polyoxypropylene ether, PPG, Pluracol polyol, Polypropylene glycols P400 to P4000, Thanol PPG

3.2 **Coast Guard Compatibility Classification** Alcohols (6)

3.3 **Chemical Formula**
$HOCH(CH_3)CH_2O[CH_2CH(CH_3)O]_nCH_2CH(CH_3)OH$
n averages 2–34

Continued on page 4

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquid

4.2 **Color:** Colorless, clear, lights colored

4.3 **Odor:** None, slight sweet, faint ether like

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety glasses or face shield, rubber gloves

5.2 **Symptoms Following Exposure** The compound has very low toxicity, few if any symptoms will be observed. Contact of liquid with eyes causes slight transient pain and irritation similar to that caused by a mild soap

5.3 **Treatment for Exposure:** EYES: flush with water until mild irritation is gone

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits** Not pertinent

5.6 **Toxicity by Ingestion** (depends on molecular wt.)
Grade 1 Oral LD_{50} 150 mg/kg (rat)
Grade 1 LD_{50} 1–5 g/kg
Grade 0 LD_{50} > 15 g/kg

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Data not available

5.9 **Liquid or Solid Irritant Characteristics** Data not available

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** 300–495 F O.C.

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents** Water, dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Union Carbide Corp
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2 BASF Wyandotte Corporation
Industrial Chemicals Group
1609 Biddle Avenue
Wyandotte, Mich. 48192

3 Dow Chemical Co.
Midland, Mich. 48640

10. SHIPPING INFORMATION

10.1 **Grades of Purity**
Low mol. wt. (miscible with water)
Medium mol. wt. (2% soluble in water)
High mol. wt. (insoluble in water)

10.2 **Storage Temperature:** Below 140 F

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

N-E-U-N-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Variable 200 to 2000

13.3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13.4 **Freezing Point** −22 to −58 F
= −30 to −50 C = 243 to 223 K

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity** 1.012 at 20 C (liquid)

13.8 **Liquid Surface Tension** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** −14,200 Btu/lb
= −7,800 cal/g = −330 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

3 CHEMICAL DESIGNATIONS (Cont'd.)

3.4 **IMCO/United Nations Numerical Designation:** Not listed

PGM	POLYPROPYLENE GLYCOL METHYL ETHER

Common Synonyms Polyoxypropylene glycol methyl ether Poly (propylene glycol) methyl ether	Liquid Colorless Odorless Mixes with water
Fire	Fire data not available
Exposure	LIQUID Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Polyoxypropylene glycol methyl ether
Poly (propylene glycol) methyl ether

3 2 **Coast Guard Compatibility Classification:** Glycol ether

3 3 **Chemical Formula:** $CH_3O(C_3H_6O)_nH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield

5 2 **Symptoms Following Exposure.** Low toxicity. In high concentrations may be mildly anesthetic. Direct eye contact produces slight irritation

5 3 **Treatment for Exposure** Remove victim from exposure

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Data not available

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas, Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Hazard to skin considered minor

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Data not available

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents** Data not available

6 4 **Fire Extinguishing Agents Not to be Used** Data not available

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature.** Data not available

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017
(No bulk shipment)

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight** Data not available

13 3 **Boiling Point at 1 atm.** Very high

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** (est.) 0.90 at 25°C (liquid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** (est.) 1.06

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** (est.) −12,500 Btu/lb = −6860 cal/g = −287 × 10³ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page 7 of 8

NOTES

REVISED 1978

PTM	POTASSIUM, METALLIC

Common Synonyms	Solid — Silver white — Odorless Reacts violently with water Flammable gas is produced
Fire	Combustible IGNITES WHEN EXPOSED TO WATER OR MOISTURE Flammable gas is produced on contact with water
Exposure	SOLID Will burn skin and eyes
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — high flammability, corrosive
Restrict access
Disperse and flush

2. LABELS

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula.** K
3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** Silvery white
4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Contact with eyes or skin causes severe burns
5 3 **Treatment for Exposure** EYES or SKIN flush with water, treat caustic burns
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion.** Not pertinent
5 7 **Late Toxicity** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point.** No pertinent (combustible solid)
6 2 **Flammable Limits in Air.** Not pertinent
6 3 **Fire Extinguishing Agents** Graphite, sand, sodium chloride
6 4 **Fire Extinguishing Agents Not to be Used** Water, foam, carbon dioxide, or halogenated hydrocarbons
6 5 **Special Hazards of Combustion Products**
6 6 **Behavior in Fire.** Reacts violently with water forming flammable and explosive hydrogen gas. May ignite spontaneously in air
6 7 **Ignition Temperature** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently to form flammable hydrogen gas and a strong caustic solution
7 2 **Reactivity with Common Materials:** May ignite combustible materials if they are dry
7 3 **Stability During Transport** Stable if protected from air and moisture
7 4 **Neutralizing Agents for Acids and Caustics** Caustic formed by reaction with water should be flushed with water, then area can be rinsed with dilute acetic acid
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 80 ppm/24 hr mosquito fish, 11 m fresh water
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Kawecki Berylco Industries Inc
220 East 42 St
New York, N Y 10017

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

3 Ventron Corp
P O Box 159
Beverly, Mass 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99.9+ (Shipped under oil)
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** Inerted
10 4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

RR

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Flammable solid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight** 39
13 3 **Boiling Point at 1 atm** 1425°F = 774°C = 1047° K
13 4 **Freezing Point** 145°F = 63°C = 336°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity** 0.86 at 20°C (solid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** −2 063 Btu/lb = −1 113 cal/g = −46 57 × 10³ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution.** −2 104 Btu/lb = −1 169 cal/g = −48 91 × 10³ J/kg
13 16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

PAS	POTASSIUM ARSENATE

Common Synonyms			
Macquer's Salt Potassium acid arsenate Potassium dihydrogen arsenate	Solid Mixes with water	White	Odorless

Fire	Not flammable
	DUST POISONOUS IF INHALED OR SWALLOWED Irritating to eyes, nose and throat SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4)

Issue warning, poison water contaminant
Restrict access
Disperse and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Macquer's salt, Potassium acid arsenate, Potassium dihydrogen arsenate

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** KH_2AsO_4

3 4 **IMCO/United Nations Numerical Designation:** 6 1 1677

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color.** White

4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Dust respirator, rubber gloves

5 2 **Symptoms Following Exposure:** Dust may irritate eyes. Ingestion or severe exposure by inhalation can cause burning of throat and mouth, abdominal pain, vomiting, diarrhea with hemorrhage, dehydration, jaundice, and collapse

5 3 **Treatment for Exposure** EYES flush with water to remove dust. INGESTION immediately induce evacuation of intestinal tract by inducing vomiting, using gastric lavage and saline cathartic, see physician at once, consider possible development of arsenic poisoning.

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 0.5 mg/m³ (as arsenic)

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Data not available

5 7 **Late Toxicity** May be carcinogenic, arsenic poisoning may develop

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 250 ppm as As 16 hr minnows survived

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

1 Pfaltz and Bauer Inc
126-04 Northern Boulevard
Flushing, N Y 11368

2 Ceras Inc
13460 W Silver Spring Rd
Menomonee Falls, Wis 53051

3 Fielding Chemical Co
Forrest and Halladay Street
Jersey City, N J 07305

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Commercial

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Poisonous Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight** 180.0

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point** 550°F = 288°C = 561 K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 2 8 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** 49 Btu/lb = 27 cal/g = 1 1 × 10³ J/kg

13 16 **Heat of Polymerization** Not pertinent

Continued on next page

NOTES

PBO	POTASSIUM BINOXALATE

Common Synonyms	Solid	White	Odorless
Potassium acid oxalate Salt of sorrel Sal acetosella	Sinks in water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing, difficult breathing, or loss of consciousness SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness
Water Pollution	Effect of low concentrations on aquatic life if unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning: poison, water contaminant
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Potassium acid oxalate, Sal acetosella, Salt of sorrel

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula:** KHC_2O_4

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color.** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes burning pain in throat, esophagus, and stomach, exposed areas of mucous membrane turn white, vomiting, severe purging, weak pulse, and cardiovascular collapse; if death is delayed neuromuscular symptoms develop. Contact with dust irritates eyes and may cause mild irritation of skin.

5 3 **Treatment for Exposure.** INHALATION: move to fresh air; if exposure to dust is severe, get medical attention. INGESTION: give immediately by mouth a dilute solution of any soluble calcium salt (calcium lactate in water, chalk solution or even milk). Large amounts of Ca are required; administer gastric lavage with distilled water; consult physician; watch for edema of the glottis and general constriction of esophagus. EYES: flash with water for at least 15 min. SKIN: wash well with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion** Grade 3 LD50 500 mg/kg

5 7 **Late Toxicity.** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water** Below 50 C dissolves in water and reacts to form the much less soluble potassium tetraoxalate which separates out

7 2 **Reactivity with Common Materials**

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 J T Baker Chemical Co
Phillipsburg, N J 08865

2 Fielding Chemical Co
P O Box 21
Jersey City, N J 07303

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

HSS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Poison, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight.** 128.11

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.11 at 20 C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension.** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued under Notes

NOTES

PCR	POTASSIUM CHLORATE

Common Synonyms	Solid	White	Odorless
Potarate Chlorate of potassium Chlorate of potash	Mixes with water		

Fire	Not flammable May cause fire on contact with combustibles POISONOUS GASES ARE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning on oxidizing material water contaminant
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Chlorate of potash
Chlorate of potassium potarate

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula.** $KClO_3$

3.4 **IMCO/United Nations Numerical Designation.** N.A. 1485

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid

4.2 **Color** White

4.3 **Odor** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Dust mask, rubber gloves, goggles, protective clothing to prevent contact with skin

5.2 **Symptoms Following Exposure** Inhalation of dust can irritate nose and throat. Contact with eyes or skin causes irritation. Ingestion causes abdominal pain, nausea, vomiting, anoxia, collapse

5.3 **Treatment for Exposure** EYES flush with water for at least 15 min. SKIN wash with soap and water. INGESTION dilute by drinking soaps or salt water to induce vomiting. Get physician

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion** Grade 2 LD50 [illegible] g/kg

5.7 **Late Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics** Data not available

5.10 **Odor Threshold** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point** Not flammable, but may cause fire upon contact with combustibles

6.2 **Flammable Limits in Air** Not pertinent

6.3 **Fire Extinguishing Agents** Water on adjacent fires

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products.** Toxic fumes are formed in fires

6.6 **Behavior in Fire** Decomposes when hot to form oxygen which increases severity of fire

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** Contact with combustible material may cause fire

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** None

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Pennwalt Corporation
Chemicals Division
Three Parkway
Philadelphia, Pa. 19102

2. Hooker Chemical Corporation
Specialty Chemicals Division
P.O. Box 344
Niagara Falls, N.Y. 14302

3. Mallinckrodt Chemical Works
Industrial Chemicals Division
Second and Mallinckrodt Streets
P.O. Box 5439
St. Louis, Mo. 63160

10. SHIPPING INFORMATION

10.1 **Grades or Purity** Commercial, 97%+
Reagent, Purified

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere.** No requirement

10.4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Oxidizing material

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]
	OXY

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight.** 122.6

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point**
660°F = 350°C = 623 K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity** 2.34 at 20°C (solid)

13.8 **Liquid Surface Tension.** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition:** −176 Btu/lb
= −98 cal/g = −4.1 × 10⁵ J/kg

13.15 **Heat of Solution** 147 Btu/lb
= 81.9 cal/g = 3.43 × 10⁵ J/kg

13.16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

PCH	POTASSIUM CHROMATE

Common Synonyms			
Potassium chromate (VI) Neutral potassium chromate	Solid	Bright yellow	Odorless
	Sinks and mixes with water		

Fire	Not flammable Will increase the intensity of a fire May cause fire on contact with combustibles
Exposure	DUST Irritating to eyes nose and throat If inhaled will cause coughing or difficult breathing SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes If swallowed will cause nausea vomiting or loss of consciousness
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Dispersal and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Neutral potassium chromate Potassium chromate (VI)

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula** K_2CrO_4

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Bright yellow

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Bureau of Mines approved filter type respirator close fitting safety goggles rubber boots and apron safety hat face shield

5 2 **Symptoms Following Exposure** Inhalation causes local irritation of mucous membranes continuing nose irritation can result in perforation of nasal septum Ingestion may cause violent gastroenteritis circulatory collapse vertigo coma and toxic nephritis ingestion of excessive quantities can be fatal Contact with eyes causes severe irritation and conjunctivitis Repeated or prolonged exposure to dust mist or solutions may cause dermatitis contact with broken skin may cause chrome sore appearing as slow healing hard raised lakes which leave the area susceptible to infection

5 3 **Treatment for Exposure** INHALATION move to fresh air INGESTION give large amounts of water induce vomiting treat peripheral vascular shock follow by get medical attention EYES flush with water for at least 15 min get medical attention SKIN flush with water if irritation persists get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 1 mg/m³ as Cr(VI)

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Grade 3 LD$_{50}$ 50-500 mg/kg

5 7 **Late Toxicity:** Lung cancer may occur

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable but may stimulate fire

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire** May increase intensity of fire if in contact with combustible materials Cool containers and spilled material with plenty of water

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** In contact with combustible materials may cause fire

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
48 ppm 96 hr fathead minnow LD_{50} soft water
1 ppm* silver salmon toxic salt water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential:** Plants can absorb compound from water and pass it on up the food chain Bioconcentrate up to 2 000 fold Not likely to be a problem in a spill situation

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
P O Box 1087R
Morristown N J 07960

2 J T Baker Chemical Co
Phillipsburg N J 08865

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent 99%
CP Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 194 20

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity** 2 73 at 15°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity.** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

(Continued on next page)

NOTES

PTC	POTASSIUM CYANIDE

Common Synonyms	Solid crystals — White — Almond odor Sinks and mixes with water
Fire	Not Flammable
Exposure	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to eyes
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Cyanide

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula** KCN

3.4 **IMCO United Nations Numerical Designation:** 1680

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid

4.2 **Color:** White

4.3 **Odor:** Like bitter almonds

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Wear clothing as needed. Use Respirator Mask provided and safety goggles when handling. Wash hands and face after handling.

5.2 **Symptoms Following Exposure** Ingestion: Dizziness, nausea, abdominal pain, diarrhea, difficulty breathing, coma, convulsions, death. Skin contact: Not applicable. Inhalation: Not applicable.

5.3 **Treatment for Exposure** INGESTION: Induce vomiting immediately. Give water. Give 1 to 2 tablespoons of activated charcoal in water. Give 1 to 2 tablespoons of Epsom salts in water. Give oxygen if breathing difficulty. Get medical attention. SKIN CONTACT: Remove contaminated clothing. Wash skin with soap and water. Get medical attention. NOT BREATHING: Give artificial respiration. Get medical attention. UNCONSCIOUS: Do not give anything by mouth. Get medical attention. BREATHING: Give oxygen if breathing difficulty. Get medical attention. Inhalation of cyanide gas causes immediate irritation of the nose and throat. Inhalation of 15 ppm causes irritation, headache, and nausea. Inhalation of 300 ppm causes death in 30 minutes. Inhalation of 2000 ppm causes death in 1 minute. Inhalation of 10,000 ppm causes death in seconds. Inhalation of cyanide gas causes death by stopping breathing, the respiratory center, and the heart.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not applicable

5.5 **Short-Term Inhalation Limits.** Not applicable

5.6 **Toxicity by Ingestion** Grade 4 (Extremely Toxic)

Continued on next page

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air** Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature** Not flammable

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** When potassium cyanide dissolves in water a mild reaction occurs and some poisonous hydrogen cyanide gas is released. This gas is not hazardous except in an enclosed space. If the water is acid, however, toxic amounts of the gas will form at once.

7.2 **Reactivity with Common Materials.** Contact with even weak acids causes formation of deadly hydrogen cyanide gas.

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** [illegible] ppm 48 hr [illegible] 0.49 ppm 48 hr [illegible] salt water

8.2 **Waterborne Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 0% of theoretical in 7 days

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

- Allied Chemical Corp, Specialty Chemicals Division, Baton Rouge, La 70821
- E. I. du Pont de Nemours & Co. Inc, Electrochemicals Dept, Wilmington, Del 19898
- Harshaw Chemical Corp, 1247 [illegible] St, Buffalo, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity** [illegible]

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting** Sealed containers must be stored in a well-ventilated area

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook Code [illegible]

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation.** Not rated

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid

13.2 **Molecular Weight** [illegible]

13.3 **Boiling Point at 1 atm** Not [illegible]

13.4 **Freezing Point:** [illegible] K

13.5 **Critical Temperature** Not applicable

13.6 **Critical Pressure.** Not applicable

13.7 **Specific Gravity** [illegible]

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on next page

5 HEALTH HAZARDS (Cont'd.)

5.7 **Late Toxicity** None

5.8 **Vapor (Gas) Irritant Characteristics** None. Dust may be irritating to eyes and skin. Inhalation of cyanide gas causes immediate lethal hazard.

5.9 **Liquid or Solid Irritant Characteristics.** Dust and solution cause caustic burns on eyes, skin and mucous membranes.

5.10 **Odor Threshold** Not pertinent

REVISED 1978

PDT	POTASSIUM DICHLORO-s-TRIAZINETRIONE

Common Synonyms			
Potassium dichloroisocyanurate	Solid	White	Chlorine-like odor
	Mixes with water		

Fire	Not flammable May cause fire on contact with combustibles POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning, oxidizing material as water contaminant
Restrict access
Dispose and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Potassium dichloroisocyanurate

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula:** $KCl_2N_3O_3$

3.4 **IMCO/United Nations Numerical Designation.** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Like chlorine

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, rubber gloves, rubber aprons, goggles, rubber gloves and other protective clothing to avoid contact with skin

5.2 **Symptoms Following Exposure** Dust causes sneezing and coughing, irritation to the eyes and skin, itching and redness of skin. Ingestion causes burning of mouth and stomach

5.3 **Treatment for Exposure:** INHALATION remove victim to fresh air. EYES irrigate with running water for 15 min. [illegible] SKIN [illegible] INGESTION induce vomiting and call physician

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** [illegible] available

5.6 **Toxicity by Ingestion:** Grade 2 [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable, but may cause fire upon contact with combustibles

6.2 **Flammable Limits in Air** Not pertinent

6.3 **Fire Extinguishing Agents.** Water

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products.** May form toxic chlorine and other gases in fire

6.6 **Behavior in Fire** Decomposition can be initiated with a heat source and can propagate through the mass with the evolution of dense fumes. Containers can explode when heated

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Forms a bleach solution, the reaction is not violent

7.2 **Reactivity with Common Materials.** Contact with most foreign materials, organic matter, or easily chlorinated or oxidized materials may result in fire. Avoid oil, grease, sawdust, floor sweepings, other easily oxidized organic compounds

7.3 **Stability During Transport:** Stable [illegible]

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** None

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

FMC Corporation
Industrial Chemical Division
633 Third Avenue
New York, N.Y. 100[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical [illegible] available chlorine

10.2 **Storage Temperature** [illegible] ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm.** Solid

*13.2 **Molecular Weight:** 216.1

*13.3 **Boiling Point at 1 atm:** Not pertinent, decomposes

*13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature.** Not pertinent

*13.6 **Critical Pressure** Not pertinent

*13.7 **Specific Gravity:** 0.96 at 20°C (solid)

*13.8 **Liquid Surface Tension** Not pertinent

*13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

*13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

*13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion.** Not pertinent

*13.14 **Heat of Decomposition** Data not available

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on page [illegible]

NOTES

PTD	POTASSIUM DICHROMATE

Common Synonyms Potassium bichromate Bichrome	Solid crystals Red to orange Odorless Sinks and mixes with water
Fire	Not flammable May cause fire on contact with combustibles
Exposure	DUST Irritating to eyes, nose, and throat If inhaled, will cause difficult breathing SOLIDS Will burn skin and eyes If swallowed, will cause nausea, vomiting, or loss of consciousness
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

[illegible]

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Potassium bichromate, Bichrome

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** K_2CrO_4

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Orange red

4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved dust [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** INGESTION [illegible] SKIN [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** [illegible] area with water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** [illegible]

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** [illegible]

7.3 **Stability During Transport:** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD):** [illegible]

8.4 **Food Chain Concentration Potential:** [illegible]

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, [illegible]

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-A

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	
	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.:** [illegible]

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** [illegible]

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** [illegible]

[illegible]

NOTES

REVISED 1978

PTH	POTASSIUM HYDROXIDE

Common Synonyms			
Caustic potash Lye	Solid crystals or waters liquid Solid sinks and mixes slowly with water. Liquid mixes with water	White solid or colorless liquid	Odorless

Fire	Not flammable Flammable gas may be produced on contact with metals May cause fire on contact with moisture and combustibles
Exposure	DUST OR MIST Irritating to eyes, nose and throat Harmful if inhaled SOLID OR LIQUID Will burn skin and eyes Harmful if swallowed
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

[illegible]

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible]

3.2 Coast Guard Compatibility Classification: [illegible]

3.3 Chemical Formula: KOH

3.4 IMCO United Nations Numerical Designation: [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): [illegible]

4.2 Color: [illegible]

4.3 Odor: [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]

5.2 Symptoms Following Exposure: [illegible]

5.3 Treatment for Exposure: [illegible] INGESTION [illegible] EYES [illegible] SKIN [illegible]

5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]

5.5 Short-Term Inhalation Limits: [illegible]

5.6 Toxicity by Ingestion: Grade 3, oral rat LD_{50} = 364 mg/kg

5.7 Late Toxicity: [illegible]

5.8 Vapor (Gas) Irritant Characteristics: [illegible]

5.9 Liquid or Solid Irritant Characteristics: [illegible]

5.10 Odor Threshold: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: Not flammable

6.2 Flammable Limits in Air: [illegible]

6.3 Fire Extinguishing Agents: [illegible]

6.4 Fire Extinguishing Agents Not to be Used: Not pertinent

6.5 Special Hazards of Combustion Products: [illegible]

6.6 Behavior in Fire: [illegible]

6.7 Ignition Temperature: [illegible]

6.8 Electrical Hazard: [illegible]

6.9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: [illegible]

7.2 Reactivity with Common Materials: [illegible]

7.3 Stability During Transport: [illegible]

7.4 Neutralizing Agents for Acids and Caustics: [illegible]

7.5 Polymerization: [illegible]

7.6 Inhibitor of Polymerization: [illegible]

8 WATER POLLUTION

8.1 Aquatic Toxicity: [illegible]

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD): None

8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 Grades or Purity: [illegible]

10.2 Storage Temperature: Ambient

10.3 Inert Atmosphere: [illegible]

10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Corrosive Material

12.2 NAS Hazard Rating for Bulk Water Transportation: [illegible]

12.3 NFPA Hazard Classifications.

Category	Classification
[illegible]	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: [illegible]

13.2 Molecular Weight: [illegible]

13.3 Boiling Point at 1 atm: [illegible]

13.4 Freezing Point: [illegible]

13.5 Critical Temperature: [illegible]

13.6 Critical Pressure: [illegible]

13.7 Specific Gravity: [illegible]

13.8 Liquid Surface Tension: [illegible]

13.9 Liquid-Water Interfacial Tension: [illegible]

13.10 Vapor (Gas) Specific Gravity: [illegible]

13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]

13.12 Latent Heat of Vaporization: [illegible]

13.13 Heat of Combustion: [illegible]

13.14 Heat of Decomposition: [illegible]

13.15 Heat of Solution: [illegible]

13.16 Heat of Polymerization: [illegible]

NOTES

REVISED 1978

PTI	POTASSIUM IODIDE

Common Synonyms	Solid crystals White Odorless Sinks and mixes with water
Fire	Not flammable
Exposure	SOLID Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

[illegible]

2 LABELS

[illegible]

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: [illegible]
3.2 Coast Guard Compatibility Classification [illegible]
3.3 Chemical Formula: KI
3.4 IMCO United Nations Numerical Designation: [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): [illegible]
4.2 Color: [illegible]
4.3 Odor: [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]
5.2 Symptoms Following Exposure: [illegible]
5.3 Treatment for Exposure: [illegible]
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: [illegible]
5.6 Toxicity by Ingestion: [illegible]
5.7 Late Toxicity: [illegible]
5.8 Vapor (Gas) Irritant Characteristics: [illegible]
5.9 Liquid or Solid Irritant Characteristics: [illegible]
5.10 Odor Threshold: [illegible]

6 FIRE HAZARDS

6.1 Flash Point: [illegible]
6.2 Flammable Limits in Air: [illegible]
6.3 Fire Extinguishing Agents: [illegible]
6.4 Fire Extinguishing Agents Not to be Used: [illegible]
6.5 Special Hazards of Combustion Products: [illegible]
6.6 Behavior in Fire: [illegible]
6.7 Ignition Temperature: [illegible]
6.8 Electrical Hazard: [illegible]
6.9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: [illegible]
7.2 Reactivity with Common Materials: [illegible]
7.3 Stability During Transport: [illegible]
7.4 Neutralizing Agents for Acids and Caustics: [illegible]
7.5 Polymerization: [illegible]
7.6 Inhibitor of Polymerization: [illegible]

8 WATER POLLUTION

8.1 Aquatic Toxicity: [illegible]
8.2 Waterfowl Toxicity: [illegible]
8.3 Biological Oxygen Demand (BOD): [illegible]
8.4 Food Chain Concentration Potential: [illegible]

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 Grades or Purity: [illegible]
10.2 Storage Temperature: [illegible]
10.3 Inert Atmosphere: [illegible]
10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

[illegible]

SS

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Not listed
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 166.01
13.3 Boiling Point at 1 atm: Very high
13.4 Freezing Point: 1258°F = 681°C = 954°K
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 3.13 at 15°C (solid)
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Not pertinent
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

[illegible]

NOTES

PTS

POTASSIUM OXALATE

Common Synonyms			
Potassium oxalate monohydrate	Solid	White	Odorless
	Sinks and mixes with water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning, [illegible]

Disperse and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Potassium oxalate monohydrate

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula:** $K_2C_2O_4 \cdot H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid

4.2 **Color:** Colorless

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved respirator, [illegible] plastic coated clothes

5.2 **Symptoms Following Exposure:** Inhalation: [illegible] Ingestion: [illegible] burning pain in throat, esophagus and stomach, exposed areas [illegible] membranes, white vomiting, [illegible] preceding weak pulse and cardiovascular [illegible] death, [illegible] neuromuscular symptoms develop [illegible]

5.3 **Treatment for Exposure:** Experimental: INHALATION: remove victim from high [illegible] exposure; [illegible] medical attention. INGESTION: [illegible] immediately [illegible] 3 liters calcium lactate in water. [illegible] large [illegible] are required administer gastric lavage with dilute [illegible] and [illegible] esophagus. EYES: [illegible] SKIN: [illegible] with water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion** [illegible] LD [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point** Not applicable

6.2 **Flammable Limits in Air** Not applicable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products.** [illegible]

6.6 **Behavior in Fire** [illegible]

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Not pertinent

7.2 **Reactivity with Common Materials** [illegible]

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Pfizer Chemicals Div.
[illegible] 42 St.
New York, N.Y. [illegible]

J. T. Baker Chemical Co.
Phillipsburg, N.J. [illegible]

Ganes Chemical Inc.
[illegible] Avenue
Cedar Place, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Reagent [illegible]

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** Not required

10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

NA

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not rated

12.3 **NFPA Hazard Classifications:** Not rated

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 184.24

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

NOTES

PTP	POTASSIUM PERMANGANATE

Common Synonyms	Solid crystals Dark purple Odorless Sinks and mixes slowly with water
Fire	Not flammable Containers may explode in fire May cause fire and explode on contact with combustibles
Exposure	SOLID Irritating to skin and eyes If swallowed, will cause nausea, vomiting, or loss of consciousness
	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning — water contaminant

Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $KMnO_4$

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** [illegible]

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** INGESTION [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** [illegible]

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Flood spill area with water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** May cause fire on contact with combustibles. Containers may explode

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Attacks rubber and most fibers. May cause ignition of wood. Some acid such as [illegible] may cause an explosion

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] bluegill [illegible] fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

[illegible]

2. [illegible] Chemical Corp.
347 Madison Ave.
New York, N.Y. [illegible]

3. Mallinckrodt Chemical Works
Industrial Chemicals Division
2nd and Mallinckrodt Sts.
St. Louis, Mo. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** USP, Reagent [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	
	[illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Decomposes

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 15°C solid

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(continued on page 7 and 8)

NOTES

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POP — POTASSIUM PEROXIDE

Common Synonyms			
Potassium superoxide	Solid (powder)	Yellow	Odorless
	Sinks and mixes violently with water		

Fire

Not flammable
Will increase the intensity of a fire
May cause fire on contact with combustibles

Exposure

CAUTION MEDICAL ADVICE
DUST
Irritating to eyes nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Will burn skin and eyes.
If swallowed will cause nausea

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning oxidizing material
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Potassium superoxide
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula.** K_2O_4
3 4 **IMCO/United Nations Numerical Designation:** 5 1, 1491

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Powder
4 2 **Color:** Yellow
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure.** Inhalation causes respiratory irritation Ingestion causes severe burns of mouth and stomach Contact with eyes or skin causes irritation and caustic burns
5 3 **Treatment for Exposure:** INHALATION remove from exposure support respiration
INGESTION give large amount of water do NOT induce vomiting get medical attention
EYES irrigate with large quantities of water for at least 15 min get medical attention for caustic burns SKIN flush with water, treat caustic burns
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not pertinent
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents:** Flood with water from a protected area
6 4 **Fire Extinguishing Agents Not to be Used.** A small amount of water may cause explosions
6 5 **Special Hazards of Combustion Products.**
6 6 **Behavior in Fire:** Increases intensity of fire and can start fires when in contact with organic combustibles
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** Reacts violently with liberation of heat and oxygen and the formation of caustic solution
7 2 **Reactivity with Common Materials:** Can form explosive and self igniting mixtures with wood or other combustible materials
7 3 **Stability During Transport:** Stable if kept dry
7 4 **Neutralizing Agents for Acids and Caustics:** Following reaction with water caustic formed can be flushed away with water and area rinsed with dilute acetic acid
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 80 ppm 24 hr mosquitofish 11 m fresh water
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902
2 Ventron, Inc
P O Box 159
Beverly Mass 01915
3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial Pure
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)

RR

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizing material solid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight** 110
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** 914°F = 490°C = 763°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** > 1 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution** Data not available
13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

PRP	PROPANE

Common Synonyms	Liquefied compressed gas. Colorless. Odorless—may have skunk odor added. Liquid floats and boils on water. Flammable visible vapor cloud is produced.
[illegible]	
Fire	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. [illegible]
Exposure	[illegible] VAPOR. Not irritating to eyes, nose or throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. [illegible] LIQUID. May cause frostbite. [illegible]
Water Pollution	Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability.
Restrict access.
Evacuate area.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dimethylmethane
3.2 **Coast Guard Compatibility Classification** Paraffin
3.3 **Chemical Formula** $CH_3CH_2CH_3$
3.4 **IMCO/United Nations Numerical Designation:** 2.0 [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied compressed gas
4.2 **Color:** Colorless
4.3 **Odor:** Faint gassy

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus for high concentrations of gas.
5.2 **Symptoms Following Exposure:** Vaporizing liquid may cause frostbite. Concentrations in air greater than 10% cause dizziness in a few minutes. [illegible] concentrations give the same effect in 10 min. High concentrations cause asphyxiation.
5.3 **Treatment for Exposure:** Remove to open air. If victim is overcome by gas, apply artificial respiration. Guard against self injury if confused.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 1000 ppm
5.5 **Short-Term Inhalation Limits.** Data not available
5.6 **Toxicity by Ingestion.** Not pertinent
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors are [illegible] irritating to the eyes and throat.
5.9 **Liquid or Solid Irritant Characteristics.** No appreciable hazard. Practically harmless to the skin because it evaporates quickly.
5.10 **Odor Threshold.** 5,000–20,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point** −156°F C.C.
6.2 **Flammable Limits in Air** 2.1 [illegible]
6.3 **Fire Extinguishing Agents** Stop flow of gas. For small fires use dry chemicals. Cool adjacent area with water spray.
6.4 **Fire Extinguishing Agents Not to be Used** Water
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire** Containers may explode. Vapor is heavier than air and may travel a long distance to a source of ignition and flash back.
6.7 **Ignition Temperature** 842°F
6.8 **Electrical Hazard** Class I, Group D
6.9 **Burning Rate** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction
7.2 **Reactivity with Common Materials** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity.** None
8.2 **Waterfowl Toxicity** None
8.3 **Biological Oxygen Demand (BOD).** None
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Atlantic Richfield
ARCO Chemical Co. Division
260 S. Broad St.
Philadelphia, Pa. 19101
2. Mobil Chemical Co.
North American Division
Beaumont, Texas 77704
3. Union Carbide Corp.
Linde Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity**

	Wt.
Research Instrument Pure	99.5+
Technical	97.50

10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B C D E F G

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	4
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Gas
13.2 **Molecular Weight** 44.09
13.3 **Boiling Point at 1 atm** −43.8°F = −42.1°C = 231.1°K
13.4 **Freezing Point:** −305.9°F = −187.7°C = 85.5°K
13.5 **Critical Temperature:** +142.01°F = +96.67°F = 176.53°K
13.6 **Critical Pressure:** 616.5 psia = 41.94 atm = 4.249 MN/m²
13.7 **Specific Gravity:** 0.496 at −50°C (liquid)
13.8 **Liquid Surface Tension** 16 dynes/cm = 0.016 N/m at −42°C
13.9 **Liquid-Water Interfacial Tension** (est.) 50 dynes/cm = 0.05 N/m at −50°C
13.10 **Vapor (Gas) Specific Gravity:** 1.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.130
13.12 **Latent Heat of Vaporization** 183.2 Btu/lb = 101.8 cal/g = 4.262 × 10⁵ J/kg
13.13 **Heat of Combustion:** −19,782 Btu/lb = −10,990 cal/g = −460.13 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

PLT	beta-PROPIOLACTONE

Common Synonyms			
beta Propiolactone Betaprone Propanolide 2 Oxetanone Hydracrylic acid beta-lactone	Liquid	Colorless	Irritating odor
	Mixes with water		

Fire	Combustible Containers may explode in fire
Exposure	LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes.
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook (CG 446-4)

Issue warning poison water contaminant
Restrict access
Disperse and flush

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Betaprone Hydracrylic acid, beta lactone 2 Oxetanone Propanolide, beta Propiolactone

3 2 **Coast Guard Compatibility Classification.** Monomers (14)

3 3 **Chemical Formula** (CH_2CH_2CO)

3 4 **IMCO/United Nations Numerical Designation:** 6 1

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pungent acrid irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air mask or organic canister mask goggles or face shield rubber gloves protective clothing to prevent all contact with skin

5 2 **Symptoms Following Exposure:** Inhalation causes irritation of nose throat and respiratory tract Contact of liquid with eyes causes irritation and tears Contact with skin causes irritation and blistering Ingestion causes burns of mouth and stomach

5 3 **Treatment for Exposure:** *Get medical attention following all exposures to this compound* INHALATION move victim to fresh air if breathing has stopped give artificial respiration EYES flush continuously with water for at least 15 min SKIN flush with water if blistering occurs alert physician to fact that fluid from blister will cause additional blistering of adjacent skin INGESTION give large amount of water and induce vomiting

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0 0 ppm Because of the high incidence of cancer either in man or animals no exposure or contact by any route respiratory oral or skin should be permitted

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 3 oral LD = 50 mg kg (rat)

5 7 **Late Toxicity:** Because of the high incidence of cancer either in man or animals no exposure or contact by any route respiratory oral or skin should be permitted

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant May cause pain and second degree burns after a few minutes contact

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 165 F C C

6 2 **Flammable Limits in Air** 2 9% (LEL)

6 3 **Fire Extinguishing Agents.** Water dry chemical foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products.** Vapors of unburned material are very toxic

6 6 **Behavior in Fire** Containers may explode

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Slow non hazardous reaction to form beta hydroxypropionic acid

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Can polymerize and rupture container especially at elevated temperatures At 22 C 0 04% polymerizes each day

7 6 **Inhibitor of Polymerization** None used

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Celanese Chemical Company
245 Park Avenue
New York N Y 10017

2 Diamond Shamrock Chemical Corp
Nopco Chemical Division
Morristown N J 07960

3 Eastman Kodak Co
Eastman Organic Chemicals
Rochester, N Y 14650

10. SHIPPING INFORMATION

10 1 **Grades or Purity** 97+%

10 2 **Storage Temperature:** Below 60°F

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous liquid Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemical	3
Water	0
Self Reaction	

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight** 72 1

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:**
−28 1 F = −33 4 C = 239 8 K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 1 15 at 20 C (liquid)

13 8 **Liquid Surface Tension** (est)
22 dynes cm = 0 022 N m at 20 C

13 9 **Liquid-Water Interfacial Tension** (est)
25 dynes cm = 0 025 N m at 20 C

13 10 **Vapor (Gas) Specific Gravity** 2 5

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 1089

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** 8 510 Btu lb
= 4 730 cal g = 1 98 × 10⁷ J kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Data not available

Continued on pages 5 and 6

NOTES

PAD — PROPIONALDEHYDE

Common Synonyms
Propionaldehyde
Propionic aldehyde
Methyl acetaldehyde
Propanal
Propylic aldehyde

Liquid — Colorless — Suffocating unpleasant odor

Floats and mixes slowly with water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause nausea or vomiting

LIQUID
Irritating to skin and eyes
Harmful if swallowed

EYES

Water Pollution

Effect of low concentrations on marine life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning — high flammability
Evacuate area

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Methylacetaldehyde, Propaldehyde, Propanal, Propionic aldehyde, Propylaldehyde

3.2 **Coast Guard Compatibility Classification** Alkylaldehyde

3.3 **Chemical Formula:** C_3H_6O

3.4 **IMCO United Nations Numerical Designation:** 3.2, 1275

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Pungent, unpleasant, suffocating

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask for high vapor concentrations, plastic gloves, goggles

5.2 **Symptoms Following Exposure:** Vapors will irritate eyes and throat and have a choking effect and cause nausea and vomiting. Liquid causes severe irritation.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; give oxygen if breathing is difficult; call a physician. EYES: flush with pints of water for at least 15 min and call a physician. SKIN: flush with water.

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion.** Oral LD_{50} 0.8 g/kg rat

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Vapors cause mucous membrane irritation, such that personnel will find high concentrations intolerable. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Hospitalization, scarring and all wounds remain painful and slow healing of the skin.

5.10 **Odor Threshold**

6. FIRE HAZARDS

6.1 **Flash Point** −22°F (−30°C)

6.2 **Flammable Limits in Air** 2.6 — 16.5

6.3 **Fire Extinguishing Agents** Carbon dioxide or dry chemical for small fires; alcohol type foam for larger fires

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to source of ignition and flashback

6.7 **Ignition Temperature** 405°F

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate.** 4.4 in./min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** May occur in presence of acids or caustics

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 95% of theoretical in 5 days

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1. Eastman Kodak Co.
   Texas Eastman Co. Division
   Longview, Tex. 75601
2. Union Carbide Corp.
   Chemicals and Plastics Division
   270 Park Ave.
   New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 97, 99+

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting.** Open vent, atmospheric pressure, vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A-P-Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Toxicity	2
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight.** 58.08

13.3 **Boiling Point at 1 atm:** 119.4°F = 48.6°C = 321.2°K

13.4 **Freezing Point.** −127°F = −88°C = 193°K

13.5 **Critical Temperature:** 433°F = 223°C = 496°K

13.6 **Critical Pressure:** 690 psia = 47 atm = 4.8 MN/m²

13.7 **Specific Gravity:** 0.805 at 20°C (liquid)

13.8 **Liquid Surface Tension** 23.4 dynes/cm = 0.0234 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension** 29 dynes/cm = 0.029 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:** 2.0

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.126

13.12 **Latent Heat of Vaporization** 315 Btu/lb = 175 cal/g = 4.90 × 10⁵ J/kg

13.13 **Heat of Combustion:** −12,470 Btu/lb = −6930 cal/g = −290.1 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) 9 Btu/lb = 5 cal/g = 0.2 × 10⁵ J/kg

13.16 **Heat of Polymerization:** Not pertinent

continued on pages 5 and 6

NOTES

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PNA	# PROPIONIC ACID

Common Synonyms	Liquid	Colorless	Sharp rancid odor
Propionic acid Ethanecarboxylic acid	Mixes with water. Irritating vapor is produced		

[illegible]

Fire	Combustible [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat [illegible] LIQUID Will burn skin and eyes Harmful if swallowed [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Dispersal and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Ethanecarboxylic acid
Methylacetic acid
Propanoic acid

3 2 **Coast Guard Compatibility Classification:** Organic acid

3 3 **Chemical Formula:** CH_3CH_2COOH

3 4 **IMCO United Nations Numerical Designation:** NO 1848

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Sharp irritating, slightly pungent rancid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air supplied mask for high vapor concentrations. Plastic gloves, goggles or face shield

5 2 **Symptoms Following Exposure:** Liquid causes skin and eye burns. Vapors may irritate eyes, nose and throat, but should not cause systemic illness

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. INGESTION: have victim drink water or milk, do NOT induce vomiting. SKIN OR EYE CONTACT: immediately flush with plenty of water for at least 15 minutes; get medical care for eyes; remove contaminated clothing

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 ppm

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral rat LD_{50} = 2.6 g/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that a normal healthy individual would be able to tolerate high concentrations for a short time. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics.** Liquid is severe skin irritant; may cause pain and second degree burns after a few minutes contact

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 133°F (56°C) [illegible]

6 2 **Flammable Limits in Air:** 2.9 (calc.) 14.8 (est.)

6 3 **Fire Extinguishing Agents:** Water, carbon dioxide, dry chemical or alcohol foam

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 1109°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** 2.2 in/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Corrodes ordinary steel and many other metals, but reaction is not hazardous

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Dilute with water, then neutralize with lime or soda ash

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** >1000 mg/L 48 hr values, sp. larvae, Ill. in fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** [illegible] 5 days

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Celanese Corp
Celanese Chemical Co
245 Park Ave
New York, N.Y. 10017

2 Eastman Kodak Co
Tennessee Eastman Co. Division
Kingsport, Tenn. 37662

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, [illegible])

V P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive Material

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	[illegible]
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 74.08

13 3 **Boiling Point at 1 atm:** 285.4°F = 140.8°C = 414 K

13 4 **Freezing Point:** -4.3°F = -20.7°C = 252.5°K

13 5 **Critical Temperature:** 642°F = 339°C = 612°K

13 6 **Critical Pressure:** [illegible] atm = 5.37 MN/m²

13 7 **Specific Gravity:** 0.995 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 26.2 dynes/cm = 0.0262 N/m at 25°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.101

13 12 **Latent Heat of Vaporization:** 248 Btu/lb = 138 cal/g = 5.78 × 10⁵ J/kg

13 13 **Heat of Combustion:** -8,883 Btu/lb = -4,935 cal/g = -206.6 × 10⁵ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

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PAH	PROPIONIC ANHYDRIDE

Common Synonyms		
Methylacetic anhydride Propanoic anhydride Propionyl oxide	Liquid	Colorless	Sharp odor
	Sinks and mixes slowly with water	

Fire	Combustible
Exposure	LIQUID Will burn skin and eyes. Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning corrosive
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Methylacetic anhydride
Propanoic anhydride Propionyl oxide

3 2 **Coast Guard Compatibility Classification:** Organic anhydride

3 3 **Chemical Formula:** $(CH_3CH_2CO)_2O$

3 4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Pungent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic canister mask goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure.** Inhalation causes irritation of eyes and respiratory tract Contact with liquid causes burns of eyes and skin Ingestion causes burns of mouth and stomach

5 3 **Treatment for Exposure:** INHALATION move victim to fresh air if breathing has stopped give artificial respiration EYES immediately flush with plenty of water for at least 15 min get medical attention SKIN immediately flush with plenty of water for at least 15 min INGESTION give large amount of water, do NOT induce vomiting

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD50 [illegible] mg/kg Grade 2 LD50 [illegible] mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting and stinging of skin and first degree burns on short exposure may cause second-degree burns on long exposure

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 156 F (O C) 145 F (C C)

6 2 **Flammable Limits in Air:** 1.46 [illegible] 11.9

6 3 **Fire Extinguishing Agents** Water dry chemical alcohol foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire** Not pertinent

6 7 **Ignition Temperature:** 545 F

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** 3.0 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts slowly to form weak propionic acid the reaction is not hazardous

7 2 **Reactivity with Common Materials.** Slowly corrosive if wet

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water rinse with sodium bicarbonate or lime solution

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
50 ppm 48 hr water fleas TLm fresh water
100 ppm 24 hr bluegill TLm fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)**
1.3 lb/lb 5 days

8 4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York N Y 10017

2 Eastman Chemical Products Inc
Kingsport Tenn 37662

3 Propil Inc
509 Madison Avenue
New York N Y 10022

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 97+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 2)

V O X-Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Corrosive liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	
Liquid or Solid Irritant	2
Poisons	
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	1
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 130.1

13 3 **Boiling Point at 1 atm:**
336°F = 169°C = 442°K

13 4 **Freezing Point:**
−45°F = −43°C = 230°K

13 5 **Critical Temperature:**
660°F = 349°C = 622°K

13 6 **Critical Pressure:**
490 psia = 33 atm = 3.3 MN/m²

13 7 **Specific Gravity:** 1.01 at 20°C (liquid)

13 8 **Liquid Surface Tension**
30 dynes/cm = 0.030 N/m at 25°C

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 4.5

13 11 **Ratio of Specific Heats of Vapor (Gas):**
1.0043

13 12 **Latent Heat of Vaporization** 149 Btu/lb
= 83 cal/g = 3.5 × 10⁵ J/kg

13 13 **Heat of Combustion:** (at 15°C)
−10,320 Btu/lb = −740 cal/g
= −2.40 × 10⁶ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** (at [illegible]) −36 Btu/lb
= −20 cal/g = −0.84 × 10⁶ J/kg

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 4 and 5

NOTES

PAT	n-PROPYL ACETATE

Common Synonyms			
Acetic acid n-propyl ester	Liquid	Colorless	Mild odor

Floats on water. Flammable. Irritating vapor is produced.

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea, vomiting, dizziness or loss of consciousness
[illegible]

LIQUID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability
Evacuate area

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Acetic acid propyl ester
3.2 **Coast Guard Compatibility Classification:** Ester
3.3 **Chemical Formula:** $CH_3COOCH_2CH_2CH_3$
3.4 **IMCO United Nations Numerical Designation:** 1.2.12%

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mild odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Air-supplied mask in high concentrations; oxygen mask; shield protective glasses
5.2 **Symptoms Following Exposure:** Contact with skin and eyes causes irritation. High vapor concentrations will be irritating and will cause nausea, vomiting and dizziness, with loss of consciousness
5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air; give artificial respiration if breathing has stopped; give oxygen if breathing is difficult. SKIN AND EYES: flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm
5.5 **Short-Term Inhalation Limits.** 200 ppm for 60 min
5.6 **Toxicity by Ingestion:** Grade 3 LD50 [illegible] g/kg
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes, nose and respiratory system if present in high concentrations. The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5.10 **Odor Threshold:** 70 mg/m^3

6 FIRE HAZARDS

6.1 **Flash Point.** [illegible] TOC
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, or alcohol foam; water spray or foam for large fires
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be [illegible]
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** [illegible]
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** [illegible]
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 520 ppm/24 hr/brine shrimp/TL_m
8.2 **Waterfowl Toxicity:** [illegible]
8.3 **Biological Oxygen Demand (BOD)** 62% of theoretical in 5 days/freshwater
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Celanese Corp.
Celanese Chemicals Div.
245 Park Ave.
New York, N.Y. 10017
2. Eastman Kodak Co.
Tennessee Eastman Co. Div.
Kingsport, Tenn. 37662
3. Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.0%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open vent; [illegible] pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-2)

A P Q-T-U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 102.13
13.3 **Boiling Point at 1 atm:** 214.9°F = 101.6°C = 374.7 K
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** 549°F = 276°C = 549 K
13.6 **Critical Pressure:** [illegible] atm = [illegible] MPa
13.7 **Specific Gravity:** [illegible] at 20°C/4°C
13.8 **Liquid Surface Tension.** 24 dynes/cm = 0.024 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.071
13.12 **Latent Heat of Vaporization** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg
13.13 **Heat of Combustion.** Data not available
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on back side)

NOTES

REVISED 1978

PAL	n-PROPYL ALCOHOL

Common Synonyms	
Propyl alcohol 1-Propanol	Liquid — colorless — Alcohol odor Mixes with water. Flammable. Irritating vapor is produced.

[illegible]

Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose, and throat If inhaled, will cause nausea, dizziness, or headache [illegible] LIQUID Will burn eyes Harmful if swallowed [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-6)

Issue warning. high flammability
Dispersed and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Propyl alcohol
1-Propanol
Propyl alcohol

3.2 **Coast Guard Compatibility Classification:** Alcohol

3.3 **Chemical Formula:** $CH_3CH_2CH_2OH$

3.4 **IMCO United Nations Numerical Designation:** 1.2 1274

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Resembles that of ethyl alcohol

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air-supplied respirator in high concentrations, goggles or face shield, plastic gloves

5.2 **Symptoms Following Exposure:** Contact with eyes will cause irritation and may cause burns. Vapor irritates nose and throat. In high concentrations, may cause nausea, dizziness, headache, and stupor

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air; administer oxygen. SKIN CONTACT: flash at once with plenty of water; get medical care for eyes

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5.5 **Short-Term Inhalation Limits.** 400 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 2. LD50 [illegible] g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor causes [illegible] irritation. Human response [illegible] 100 ppm for short periods. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Probably harmless [illegible]

5.10 **Odor Threshold:** 30 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 81°F (O.C.) 77°F (C.C.)

6.2 **Flammable Limits in Air:** 2.1 – 13.5

6.3 **Fire Extinguishing Agents.** Carbon dioxide or dry chemical for small fires; alcohol foam for large fires

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 700°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate.** 2.9 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 500 ppm, 24 hr, goldfish, dried, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD).** 0.47 [illegible] lb/lb/day

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Celanese Chemical Co.
245 Park Ave
New York, N.Y. 10017
2. Eastman Kodak Co.
Texas Eastman Co. Division
Longview, Tex. 75601
3. Union Carbide Corp.
Chemicals & Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.5%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirements

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P Q

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications.** Not used

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 60.10

13.3 **Boiling Point at 1 atm:** 207.0°F = 97.2°C = 370.4°K

13.4 **Freezing Point:** −195.2°F = −126.2°C = 147.0°K

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** 750 psia = [illegible] atm = [illegible] MN/m²

13.7 **Specific Gravity:** 0.803 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 2.1

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.07

13.12 **Latent Heat of Vaporization:** 292.7 Btu/lb = 162 cal/g = 6.88 × 10⁵ J/kg

13.13 **Heat of Combustion:** −14,130 Btu/lb = −7,850 cal/g = −30.9 × 10⁶ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible] Btu/lb = [illegible] cal/g = −0.2 × 10⁶ J/kg

13.16 **Heat of Polymerization.** Not pertinent

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NOTES

REVISED 1978

PPL	PROPYLENE

Common Synonyms	
Propene Methylethylene	Liquefied compressed gas Colorless Mild odor Floats and boils on water. Flammable visible vapor cloud is produced

Fire	FLAMMABLE Container may explode in fire Flashback along vapor trail may occur May explode if ignited in an enclosed area
Exposure	VAPOR If inhaled will cause dizziness or loss of consciousness LIQUID Will cause frostbite
Water Pollution	Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Isolate warn of high flammability. Evacuate area

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Methylethylene
Propene

3.2 **Coast Guard Compatibility Classification:** Gas

3.3 **Chemical Formula:** $CH_3CH=CH_2$

3.4 **IMCO United Nations Numerical Designation:** 2.0 1077

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquefied gas

4.2 **Color:** Colorless

4.3 **Odor:** Mild odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister or air supply respirator. Face shield for liquid protection. Rubber gloves.

5.2 **Symptoms Following Exposure:** Moderate concentrations cause dizziness, loss of balance and unconsciousness. Contact with liquid causes frostbite.

5.3 **Treatment for Exposure:** INHALATION: Remove victim from exposure. If breathing has ceased or is irregular or has stopped start resuscitation, give oxygen as indicated.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 500 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are irritating to the eyes and throat.

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Prolonged contact may be harmful because of vapor quantity.

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** −162.2°C

6.2 **Flammable Limits in Air:** 2.0 – 11

6.3 **Fire Extinguishing Agents:** Stop flow of gas

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Container may explode. Vapor is heavier than air and can travel considerable distance to source of ignition and flashback.

6.7 **Ignition Temperature:** 497°F

6.8 **Electrical Hazard:** Class I, Group D

6.9 **Burning Rate:** Not applicable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Mich. 48640

Exxon Chemical Co.
Houston, Tex. 77001

Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Chemical 92+ polymerization 99+ research 99+ propylene concentrate 50+

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Not required

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

A B C D E F G

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	4
Health	
Vapor Toxicity	[illegible]
Liquid or Solid Toxicity	[illegible]
Poisons	
Water Pollution	
Human Toxicity	[illegible]
Aquatic Toxicity	[illegible]
Aquatic Effect	[illegible]
Reactivity	
Other Chemicals	
Water	[illegible]
Self Reactivity	[illegible]

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard Rating	[illegible]
Flammability Rating	4
Reactivity Rating	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 42.08

13.3 **Boiling Point at 1 atm:** −53.9°F = −47.7°C = 225.5 K

13.4 **Freezing Point:** −301.4°F = −185.2°C = 88.0 K

13.5 **Critical Temperature:** 197.2°F = 91.8°C = 365.0 K

13.6 **Critical Pressure:** 670 psia = 45.6 atm = 4.62 MN/m²

13.7 **Specific Gravity:** 0.5053 @ −47°C (liquid)

13.8 **Liquid Surface Tension:** 6.7 dyne/cm @ 0.1 atm = −47°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 1.4

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.152

13.12 **Latent Heat of Vaporization:** 187 Btu/lb = 435 cal/g = 1.82 kJ/kg

13.13 **Heat of Combustion:** −19,682 Btu/lb = −10,940 cal/g = −45.8 MJ/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

PBP	PROPYLENE BUTYLENE POLYMER

Common Synonyms	Liquid
Fire	Fire data not available
Exposure	Exposure data not available
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Data not available

2. LABELS

No hazard label required by [illegible] Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** [illegible]

3.2 **Coast Guard Compatibility Classification:** Olefin

3.3 **Chemical Formula:** Not applicable

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color.** Data not available

4.3 **Odor.** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Data not available

5.2 **Symptoms Following Exposure:** Data not available

5.3 **Treatment for Exposure:** Data not available

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Data not available

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents** Data not available

6.4 **Fire Extinguishing Agents Not to be Used:** Data not available

6.5 **Special Hazards of Combustion Products.** Data not available

6.6 **Behavior in Fire:** Data not available

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** [illegible]

7.2 **Reactivity with Common Materials.** [illegible]

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** [illegible]

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** Data not available

13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** (est.) [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

REVISED 1978

PPG	PROPYLENE GLYCOL

Common Synonyms
1,2-Propanediol
1,2-Dihydroxypropane

Thick liquid — Colorless — Odorless

Mixes with water

Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula:
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure:
5.4 Toxicity by Inhalation (Threshold Limit Value):
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to Be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 2.2% of theoretical in 5 days
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

NFQ

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating

12.3 NFPA Hazard Classification:

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

NOTES

REVISED 1978

PME	PROPYLENE GLYCOL METHYL ETHER

Common Synonyms 1 Methoxy 2 propanol Dowanol PM Dowanol 33B	Liquid Colorless Mild odor Mixes with water. Irritating vapor is produced
Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes, nose and throat LIQUID Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

[illegible]

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dowanol 33B, Dowanol PM, Methoxy 2 propanol

3.2 **Coast Guard Compatibility Classification:** [illegible]

3.3 **Chemical Formula:** [illegible]

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Safety goggles, protective [illegible]

5.2 **Symptoms Following Exposure:** Liquid [illegible] eyes and skin

5.3 **Treatment for Exposure:** EYES: wash with water [illegible] SKIN: [illegible] contaminated clothing and wash skin with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate [illegible] will find high concentrations unpleasant. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. [illegible] to remain may cause smarting and reddening of the skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]

6.5 **Special Hazards of Combustion Products:** [illegible]

6.6 **Behavior in Fire:** [illegible]

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** [illegible]

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** [illegible]

7.3 **Stability During Transport:** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]

7.5 **Polymerization:** [illegible]

7.6 **Inhibitor of Polymerization:** [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD):** [illegible]

8.4 **Food Chain Concentration Potential:** [illegible]

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** Not [illegible]

13.10 **Vapor (Gas) Specific Gravity:** Not [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not [illegible]

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** Not [illegible]

[illegible]

NOTES

REVISED 1978

POX

PROPYLENE OXIDE

Common Synonyms
Methyloxirane
1,2 Epoxypropane
Propeneoxide

Liquid | Colorless | Sweet, alcohol odor

Mixes with water. Flammable, irritant vapors produced

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CALIFORNIA PROPOSITION 65

VAPOR
Irritating to eyes, nose, and throat
If inhaled, will cause headache, nausea, vomiting, or loss of consciousness

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Restrict access
Evacuate area

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** 1,2 Epoxypropane
Methyloxirane
Propeneoxide

3.2 **Coast Guard Compatibility Classification** Alkylene oxide

3.3 **Chemical Formula** CH_3CHCH_2O

3.4 **IMCO/United Nations Numerical Designation.** 3.1 1280

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Ethereal characteristic, sweet alcoholic, like natural gas

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Air supplied mask, rubber or plastic gloves, vapor proof goggles

5.2 **Symptoms Following Exposure:** Inhalation may produce headache, nausea, vomiting, and unconsciousness, mild depression of central nervous system, lung irritation. Slightly irritating to skin but covered contact may cause burn. Very irritating to eyes

5.3 **Treatment for Exposure:** INHALATION: remove person to fresh air immediately, keep quiet and warm, call a physician, if breathing stops, start artificial respiration. SKIN OR EYE CONTACT: immediately flush with plenty of water for at least 15 min, immediately remove contaminated clothing, watch hands, e.g., etc. to prevent confining product to skin, for eyes get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 100 ppm

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 to 5 g/kg (rat)

5.7 **Late Toxicity.** Data not available

5.8 **Vapor (Gas) Irritant Characteristics.** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure, may cause secondary burns on long exposure

5.10 **Odor Threshold** 200 ppm

5. FIRE HAZARDS

6.1 **Flash Point** 38.1°C (< −20°F) CC

6.2 **Flammable Limits in Air:** 2.1 – 38.5

6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, alcohol or polymer foam for large fires

6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** Container may explode. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature** 869°F

6.8 **Electrical Hazard** Class I, Group B

6.9 **Burning Rate** 4.3 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** May occur due to high temperatures, contamination with alkalies, aqueous acid, amines, and acidic alcohols

7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. BASF Wyandotte Corp
Wyandotte, Mich 48192
2. Dow Chemical Co
Midland, Mich 48640
3. Olin Corp
120 Alexander St
Princeton, N.J. 08540

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.99 (must contain no acetylene)

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** Inerted

10.4 **Venting.** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q R-S

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	1
Self Reaction	3

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 58.08

13.3 **Boiling Point at 1 atm** 93.7°F = 34.3°C = 307.5°K

13.4 **Freezing Point.** −169.4°F = −111.9°C = 161.3°K

13.5 **Critical Temperature** 408.4°F = 209.1°C = 482.3°K

13.6 **Critical Pressure** 714 psia = 48.6 atm = 4.92 MN/m²

13.7 **Specific Gravity:** 0.830 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 24.5 dynes/cm = 0.0245 N/m at 15°C

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** 2.0

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.133

13.12 **Latent Heat of Vaporization** 208 Btu/lb = 114 cal/g = 4.77 × 10⁵ J/kg

13.13 **Heat of Combustion.** −13,000 Btu/lb = −7,221 cal/g = −302.3 × 10⁵ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** (est.) 19 Btu/lb = 11 cal/g = 0.45 × 10⁵ J/kg

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

PTT — PROPYLENE TETRAMER

Common Synonyms		
Dodecene (nonlinear) Tetrapropylene	Liquid Floats on water	Colorless

Fire	Combustible
Exposure	FOR Methods **LIQUID** Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Dodecene (nonlinear)
Tetrapropylene

3 2 **Coast Guard Compatibility Classification**
Olefin

3 3 **Chemical Formula** $C_{12}H_{24}$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Data not available

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield

5 2 **Symptoms Following Exposure.** No inhalation hazard expected. Aspiration hazard if ingested. Low skin and eye irritation

5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air. INGESTION do NOT lavage or induce vomiting give respirable oil and demulcent, call physician. EYES flush with water for 15 min. SKIN wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 200 ppm

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Grade 0 LD above 15 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 120 F C (134 F O C)

6 2 **Flammable Limits in Air** Data not available

6 3 **Fire Extinguishing Agents:** Water fog foam carbon dioxide or dry chemical

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature.** 490 F (est)

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Atlantic Richfield Co
ARCO Chemical Co Division
260 S Broad St
Philadelphia Pa 19101

2 Continental Oil Co
Conoco Chemicals Division
Park 80 Plaza Five
Saddle Brook N J 07662

3 Sun Oil Co
St Davids Pa 19087

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98 %

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T-U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
Combustible Liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight.** 168.31

13 3 **Boiling Point at 1 atm:**
365 385 F = 185 196 C = 458 469 K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity:** 0.2937 at 20°C (liquid)

13 8 **Liquid Surface Tension** 23.9 dynes/cm = 0.0239 N/m at 24°C

13 9 **Liquid-Water Interfacial Tension** 44.5 dynes/cm = 0.0445 N/m at 22.7°C

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization** (est) 154 Btu/lb = 58.6 cal/g = 2.45×10^5 J/kg

13 13 **Heat Combustion.** -19,100 Btu/lb = -10 600 cal/g = -444 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

PII PROPYLENEIMINE, INHIBITED

Common Synonyms

Propyleneimine
2 Methylaziridine
2 Methylethyleneimine

Liquid | Colorless | Strong ammonia like odor

Mixes with water. Flammable, irritating vapor is produced

[illegible]

Fire

FLAMMABLE
Irritating gases are produced when heated
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause nausea, vomiting or difficult breathing
[illegible]

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes.
[illegible]
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning: high flammability, water contaminant, air contaminant
Restrict access
Evacuate area
Disperse and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2 Methylaziridine, 2 Methylethylenimine, Propylenimine
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula:** CH_3CHCH_2NH
3 4 **IMCO/United Nations Numerical Designation.** 3 2/1921

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Strong ammonia like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Self-contained breathing apparatus, goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure.** Inhalation causes vomiting, breathing difficulty, and irritation of eyes, nose, and throat; on prolonged exposure vapors tend to redden the whites of the eyes. Contact with liquid causes eye irritation, like that caused by strong ammonia. Liquid causes skin burns, which are slow to heal. Ingestion causes burns of mouth and stomach.
5 3 **Treatment for Exposure.** INHALATION: move victim to fresh air, if he is not breathing, apply artificial respiration, oxygen if breathing is difficult, administer oxygen, call physician. EYES: flush with plenty of water for at least 30 min and obtain prompt medical attention. SKIN: remove all contaminated clothing and flush with water, rinse with vinegar and water. INGESTION: drink large amounts of milk or water, get prompt medical attention.
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 2 ppm
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 19 mg/kg (rat)
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 2°F (-16°C)
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents** Dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may be ineffective
6 5 **Special Hazards of Combustion Products:** Irritating nitrogen oxides are produced
6 6 **Behavior in Fire:** Containers may explode
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard** Data not available
6 9 **Burning Rate:** 4 1 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts slowly to form propanolamine. The reaction is not hazardous
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport.** Stable if kept in contact with solid caustic soda (sodium hydroxide)
7 4 **Neutralizing Agents for Acids and Caustics:** Dilute with water, rinse with vinegar
7 5 **Polymerization** Polymerizes explosively when in contact with any acid
7 6 **Inhibitor of Polymerization:** Solid sodium hydroxide (caustic soda)

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Arsynco Incorporated
P O Box 8
Carlstadt N J 07072

2 Polysciences Inc
Paul Valley Industrial Park
Warrington Pa 18976

3 Pfaltz and Bauer Inc
126-04 Northern Boulevard
Flushing N Y 11368

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Exclude air
10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A O P Q R-S-Z

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight:** 57 1
13 3 **Boiling Point at 1 atm:** 151°F = 66°C = 339°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 0 802 at 25°C (liquid)
13 8 **Liquid Surface Tension:** (est) 25 dynes/cm = 0 025 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** 2
13 11 **Ratio of Specific Heats of Vapor (Gas)** Data not available
13 12 **Latent Heat of Vaporization.** 250 Btu/lb = 139 cal/g = 5 82 × 10^5 J/kg
13 13 **Heat of Combustion:** (est) −15,500 Btu/lb = −8 600 cal/g = −360 × 10^5 J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** −140 Btu/lb = −78 cal/g = −3 3 × 10^5 J/kg
13 16 **Heat of Polymerization:** (est) −720 Btu/lb = −400 cal/g = −17 × 10^5 J/kg

Continued on pages 5 and 6

NOTES

PMN	n-PROPYL MERCAPTAN

Common Synonyms

1 Propanethiol
Propane-1 thiol

Liquid Colorless Skunk like odor

Floats on water Flammable irritating vapor is produced

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
If inhaled will cause difficult breathing

LIQUID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning high flammability water contaminant air contaminant restrict access evacuate area mechanical containment should be removed chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 Propanethiol
Propane-1 thiol

3 2 **Coast Guard Compatibility Classification.**
Not applicable

3 3 **Chemical Formula:**
$CH_3CH_2CH_2SH$

3 4 **IMCO/United Nations Numerical Designation:** 3 1 1228

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless

4 3 **Odor** Skunky

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield, rubber gloves self contained breathing apparatus or organic canister mask

5 2 **Symptoms Following Exposure.** Inhalation causes muscular weakness convulsions and respiratory paralysis high concentrations may cause pulmonary irritation Contact with liquid causes irritation of eyes and skin Ingestion causes irritation of mouth and stomach

5 3 **Treatment for Exposure:** INHALATION remove victim into uncontaminated atmosphere give artificial respiration and oxygen if needed observe for premonitory signs of pulmonary edema EYES flush with water for 15 min if irritation persists see a physician SKIN flush with water wash with soap and water INGESTION induce vomiting and follow with gastric lavage

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 1 790 mg kg (rat)

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold** 0 000 75 ppm

6 FIRE HAZARDS

6 1 **Flash Point** 5 1 O C

6 2 **Flammable Limits in Air**
Data not available

6 3 **Fire Extinguishing Agents:** Dry chemical foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used**
Water may be ineffective

6 5 **Special Hazards of Combustion Products**
Toxic sulfur dioxide is generated

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard.** Data not available

6 9 **Burning Rate.** 5 1 mm min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1 Pennwalt Corporation
Chemicals Division
Three Parkway
Philadelphia Pa 19102

2 Phillips Petroleum Company
Chemical Department
Special Products Division
Bartlesville Okla 74004

3 Aldrich Chemical Co
940 West St Paul Avenue
Milwaukee Wis 53233

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 98+%

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A T-U-V-W

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Flammable liquid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 76 2

13 3 **Boiling Point at 1 atm:**
153°F = 67 C = 340°K

13 4 **Freezing Point:**
−171°F = −113°C = 160 K

13 5 **Critical Temperature:** (est)
495°F = 257°C = 530°K

13 6 **Critical Pressure.** (est)
667 psia = 45 3 atm = 4 60 MN m

13 7 **Specific Gravity:** 0 841 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
24 7 dynes/cm = 0 0247 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est)
18 dynes cm = 0 018 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity** 2 6

13 11 **Ratio of Specific Heats of Vapor (Gas)**
1 0984

13 12 **Latent Heat of Vaporization:** 179 Btu lb
= 99 cal/g = 4 16 × 10³ J kg

13 13 **Heat of Combustion:** 15 990 Btu lb
= 8 890 cal g = 3 72 × 10⁴ J kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

PRD	PYRIDINE

Common Synonyms

Liquid Colorless to yellow Sharp nauseating odor

Mixes with water. Poisonous flammable vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CAUTION POISONOUS

VAPOR
Poisonous if inhaled or if skin is exposed
Irritating to eyes, nose and throat

LIQUID
Poisonous if swallowed or if skin is exposed
Will burn eyes

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warnings high flammability
Restrict access
Evacuate area
Dispose and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms

3.2 **Coast Guard Compatibility Classification** Aromatic amine

3.3 **Chemical Formula** C_5H_5N

3.4 **IMCO United Nations Numerical Designation:** 3.2 1282

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Yellow to colorless

4.3 **Odor:** Distinctive strong unpleasant characteristic unpleasant sharp penetrating unpleasant

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Air supplied mask or organic vapor mask vapor proof goggles rubber gloves and protective clothing

5.2 **Symptoms Following Exposure:** Vapor irritates eyes and nose. Liquid irritates skin and is absorbed through the skin. Overexposure causes nausea headache nervousness pains increased urinary frequency

5.3 **Treatment for Exposure** INHALATION [illegible] INGESTION induce vomiting and allow with gastric lavage SKIN wash thoroughly with large amounts [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion** Group 2 LD50 [illegible]

5.7 **Late Toxicity:** Liver and kidney damage after ingestion

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate [illegible] and high concentrations impede [illegible] The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics** Causes stinging of the skin and first degree burns on short exposure [illegible] Severe burns on long exposure

5.10 **Odor Threshold** 0.02 ppm

6 FIRE HAZARDS

6.1 **Flash Point** 68°F CC

6.2 **Flammable Limits in Air.** 1.8% – 12.4%

6.3 **Fire Extinguishing Agents** Alcohol foam dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** Vapor is heavier than air and may travel considerable distance to source of ignition and flash back

6.7 **Ignition Temperature.** 900°F

6.8 **Electrical Hazard.** Class I Group D

6.9 **Burning Rate.** 4.3 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** None

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Flush with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
1380 mg/l 96 hr TLm fresh water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD):**
1.18 – 1.42 lb/lb/day

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Koppers Co. Inc.
Organic Materials Division
Pittsburgh Pa. 15219
2. Reilly Tar and Chemical Corp.
1615 Merchants Bank Bldg.
Indianapolis Ind. 46204
Warner Lambert Co.
Nepera Chemical Co. Division
Harriman N.Y. 10926

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Technical Pure

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

V P Q R S

12. HAZARD CLASSIFICATIONS

12.1 ***Code of Federal Regulations:*** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** 79.10

13.3 **Boiling Point at 1 atm**
239.5°F = 115°C = 388°K

13.4 **Freezing Point:** −44°F = −42°C = 231°K

13.5 **Critical Temperature:**
686.2°F = 346.8°C = 620°K

13.6 **Critical Pressure**
837.3 psia = 55.6 atm = 5.63 MN/m²

13.7 **Specific Gravity:** 0.983 at 20°C (liquid)

13.8 **Liquid Surface Tension**
38.0 dynes/cm = 0.038 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 2.73

13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.123

13.12 **Latent Heat of Vaporization** 193 Btu/lb = 107 cal/g = 4.48 × 10⁵ J/kg

13.13 **Heat of Combustion:** −14,300 Btu/lb = −7992 cal/g = −334.6 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution** (est.) −13 Btu/lb = −7 cal/g = −0.3 × 10⁵ J/kg

13.16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

PGA — PYROGALLIC ACID

Common Synonyms
Pyrogallol
1,2,3-Benzenetriol
1,2,3-Trihydroxybenzene

Solid — White to Gray — Odorless

Sinks and mixes with water

[illegible]

Fire

Combustible

[illegible]

Exposure

[illegible]

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause nausea, vomiting or loss of consciousness

[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2,3-Benzenetriol
Pyrogallol, 1,2,3-Trihydroxybenzene

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula** $1,2,3\text{-}C_6H_3(OH)_3$

3.4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid

4.2 **Color:** White to gray

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, safety goggles, dust mask

5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion may cause severe gastrointestinal irritation, convulsions, circulatory collapse, and death. Contact with eyes causes irritation. Skin contact can cause local discoloration, irritation, eczema, and death; repeated contact can cause sensitization.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. INGESTION: give large amounts of water, induce vomiting immediately, consult a physician. EYES: flush with water for at least 15 min., consult a physician. SKIN: wash immediately with soap and water, consult a physician if exposure has been severe.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion.** Grade 2, oral LD_{50} = 750 mg/kg (rats)

5.7 **Late Toxicity:** Depresses growth in chicks

5.8 **Vapor (Gas) Irritant Characteristics.** Data not available

5.9 **Liquid or Solid Irritant Characteristics** Data not available

5.10 **Odor Threshold** Odorless

6 FIRE HAZARDS

6.1 **Flash Point.** Not pertinent (combustible solids)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Water, foam, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used**

6.5 **Special Hazards of Combustion Products**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature.** Data not available

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 18 ppm/48 hr/goldfish/11 m/fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 1.63 5 days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. The Harshaw Chemical Co
1945 East 97 St
Cleveland, Ohio 44106
2. Aldrich Chemical Co
940 W. Saint Paul Ave
Milwaukee, Wis. 53233
3. Eastman Organic Chemicals
Rochester, N.Y. 14650

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** N.F., Reagent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid

13.2 **Molecular Weight:** 126

13.3 **Boiling Point at 1 atm.** 388°F = 309°C = 582°K

13.4 **Freezing Point:** 268°F = 131°C = 404°K

13.5 **Critical Temperature.** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.45 at 20°C (solid)

13.8 **Liquid Surface Tension.** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** −9,140 Btu/lb = −5,070 cal/g = −212 × 10³ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

Continued on page 5 and 6

NOTES

QNL	QUINOLINE

Common Synonyms			
1 Benzazine Benzo[b]pyridine Chinoline 1 Azanaphthalene	Liquid	Colorless to brown	Strong unpleasant odor
	Sinks in water		

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE.
Exposure	LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4

Issue warning - water contaminant
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 Azanaphthalene
1 Benzazine Benzo[b]pyridine
Chinoline Leucol

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** C_9H_7N

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid

4 2 **Color:** Colorless to brown

4 3 **Odor:** Strong unpleasant

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** U S Bureau of Mines approved vapor and chemical safety goggles face shield rubber gloves coveralls and or rubber apron rubber shoes and boots

5 2 **Symptoms Following Exposure:** Vapors are irritating to nose and throat and may cause headaches dizziness, and nausea if inhaled Ingestion causes irritation of mouth and stomach vomiting may occur Contact with eyes or skin causes irritation

5 3 **Treatment for Exposure.** INHALATION remove victim to fresh air INGESTION give large amount of water induce vomiting get medical attention EYES flush immediately with plenty of water for at least 15 min call physician SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 460 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold.** 71 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** 225 F C C

6 2 **Flammable Limits in Air**
Data not available

6 3 **Fire Extinguishing Agents** Water dry chemical foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used**

6 5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires

6 6 **Behavior in Fire:** Heat exposure may cause pressure build up in closed containers

6 7 **Ignition Temperature:** 896 F

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate** 4 06 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
52-56 ppm 96 hr sunfish/TL_m fresh water
5 ppm 96 hr trout/TL_m fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 1 75 5 5 day

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Koppers Co Inc
Organic Materials Div
Koppers Bldg
Pittsburgh Pa 15219

2 Eastman Organic Chemicals
Rochester N Y 14650

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent
Technical

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

A T U X Y

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight.** 129

13 3 **Boiling Point at 1 atm:** 459°F = 237°C = 510 K

13 4 **Freezing Point** 5 F = -15°C = 258°K

13 5 **Critical Temperature.** 948°F = 509°C = 782°K

13 6 **Critical Pressure:** Data not available

13 7 **Specific Gravity:** 1 095 at 20 C (liquid)

13 8 **Liquid Surface Tension.** 48 0 dynes/cm = 0 0480 N/m at 20 C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 4 5

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** 1st 1 188 Btu/lb = 56 cal/g = 3 [illegible] × 10³ J/kg

13 13 **Heat of Combustion:** -15 700 Btu/lb = -8 710 cal/g = -36 × 10³ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

RSC

RESORCINOL

Common Synonyms			
1,3 Benzenediol m-Dihydroxybenzene Resorcin 1,3-Dihydroxybenzene Dihydroxybenzol	Solid	White or off white	Faint odor
	Sinks and mixes with water		

Fire

Combustible
CONTAINERS MAY EXPLODE IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea or loss of consciousness

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1,3 Benzenediol m Dihydroxybenzene, 1 3 Dihydroxybenzene Dihydroxybenzol Resorcin

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula:** 1 3 $C_6H_4(OH)_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White or nearly white

4 3 **Odor:** Faint characteristic aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** U S Bu Mines approved respirator rubber gloves safety glasses with side shields or chemical goggles coveralls or rubber apron

5 2 **Symptoms Following Exposure:** Inhalation of vapors or dust causes irritation of respiratory tract Ingestion causes burns of mucous membranes severe diarrhea pallor sweating weakness headache dizziness tinnitus shock and severe convulsions may also cause siderosis of the spleen and tubular injury to the kidney Contact with eyes causes irritation Can be absorbed from wounds or through unbroken skin producing severe dermatitis methemoglobinemia cyanosis convulsions tachycardia dyspnea and death

5 3 **Treatment for Exposure.** INHALATION remove victim to fresh air if he is not breathing give artificial respiration preferably mouth-to-mouth if breathing is difficult give oxygen, call a physician INGESTION give activated charcoal adm mover gastric lavage with water consult physician EYES flush with water for 15 min SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] g/kg

5 7 **Late Toxicity:** Produces goiters in rats

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may cause frothing

6 5 **Special Hazards of Combustion Products.**

6 6 **Behavior in Fire:** Containers may explode

6 7 **Ignition Temperature:** [illegible]125 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
35 ppm * bleak and carp toxic threshold fresh water
96 4 ppm 48 hr daphnia TLm fresh water
* Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** 61% 5 days

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Koppers Company Inc
Koppers Building
Pittsburgh Pa 15219

2 Eastman Organic Chemicals
Rochester N Y 14650

3 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** USP 99 5+
Technical 99%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight:** 110 11

13 3 **Boiling Point at 1 atm.** (sublimes) 531°F = 277°C = 550°K

13 4 **Freezing Point:** 229°F = 109°C = 382°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 1 2 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** −11 200 Btu/lb = −6 200 cal/g = −259 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on next page)

NOTES

SLA	SALICYLIC ACID

Common Synonyms	Solid	White to light tan	Odorless
o-Hydroxybenzoic acid Retarder W	Sinks and mixes slowly with water		

Fire	Combustible Dust cloud may explode if ignited in an enclosed area Irritating gases may be produced when heated
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes. If swallowed will cause vomiting
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** o-Hydroxybenzoic acid
Retarder W

3 2 **Coast Guard Compatibility Classification**
Not listed

3 3 **Chemical Formula:**
$C_6H_4(OH)COOH$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** White to very light tan

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Gloves, goggles, respirator for dust, clean body covering clothing

5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Vomiting may occur spontaneously if large amounts are swallowed. Contact with eyes causes irritation, marked pain and corneal injury which should heal. Prolonged or repeated skin contact may cause marked irritation or even a mild burn

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: induce vomiting and get medical attention promptly. EYES: promptly flush with water for 15 min. and get medical attention. SKIN: wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 2 LD50 [illegible] g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause [illegible]ing

6 5 **Special Hazards of Combustion Products:** Irritating vapors of unburned material and phenol may form in fire

6 6 **Behavior in Fire:** Sublimes and forms vapor or dust that may explode

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
1 450 ppm/48 hr daphnia threshold for immob./fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).**
141% 5 days

8 4 **Food Chain Concentration Potential**
None

9. SELECTED MANUFACTURERS

1 Tennecco Chemicals, Inc.
Intermediates D
Turner Place
P. O. Box 42
Piscataway, N. J. 08854

2 Monsanto Company
800 North Lindbergh Blvd.
St. Louis, Mo. 63166

3 Dow Chemical Co.
Midland, Mich. 48640

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 99+%
Pure, 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Solid

13 2 **Molecular Weight:** 138 13

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:**
315°F = 157°C = 430°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 44 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization.**
Not pertinent

13 13 **Heat of Combustion:** −9 420 Btu/lb
= −5 230 cal/g = −219 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

SLD	SELENIUM DIOXIDE

Common Synonyms			
Selenium oxide Selenious anhydride	Solid	White	Sour odor
	Sinks and mixes with water		

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes. If swallowed will cause coughing, nausea or vomiting
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant
Restrict access
Disperse and flush

2 LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Selenious anhydride, Selenium oxide
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** SeO_2
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** Pungent sour

5 HEALTH HAZARDS

This compound is highly toxic if inhaled or ingested

5.1 **Personal Protective Equipment:** Dust mask, rubber gloves, protective clothing
5.2 **Symptoms Following Exposure:** Absorption of selenium may be demonstrated by presence of the element in the urine and by a garlic-like odor of the breath. Inhalation of dust can cause bronchial spasms, symptoms of asphyxiation and pneumonitis. Acute symptoms of poisoning include sternal pain, cough, nausea, pallor, coated tongue, gastrointestinal disorders, dizziness and convulsions. Contact with eyes causes irritation.
5.3 **Treatment for Exposure:** Consult physician after all exposures to this compound. INHALATION: remove victim to fresh air, give oxygen if needed. INGESTION: induce vomiting, follow with gastric lavage and saline cathartic. EYES: flush immediately and thoroughly with water. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ (as selenium)
5.5 **Short-Term Inhalation Limits:** 0.3 mg/m³, 30 min (as selenium)
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** [illegible] mg/m³

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:**
6.4 **Fire Extinguishing Agents Not to be Used:**
6.5 **Special Hazards of Combustion Products:** Sublimes and forms toxic vapors when heated in fire
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** In presence of acid or with corrodable metals
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 12 ppm 7-day goldfish [illegible]
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. American Hoechst Corp, Somerville, N.J. 08876
2. Ventron Div, P.O. Box [illegible], Beverly, Mass. 01915
3. Gallard-Schlesinger Chemical Mfg. Co, 584 Mineola Ave, Carle Place, N.Y. 11514

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 99.[illegible]
10.2 **Storage Temperature:** Cool ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** Sublimes 900°F = 482°C = 682°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** [illegible] Btu/lb = [illegible] cal/g = [illegible] kJ/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

STO	SELENIUM TRIOXIDE

Common Synonyms		
Selenic anhydride	Solid	White

Fire	Not flammable
Exposure	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause coughing, nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning, contact water system plant
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Selenic anhydride
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** SeO_3
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** Data not available

5 HEALTH HAZARDS

This compound is highly toxic if ingested or inhaled

5.1 **Personal Protective Equipment:** Dust mask, goggles, or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Absorption of selenium may be determined by presence of the element in the urine and by a garlic breath odor of breath. Inhalation causes chemical pneumonitis, symptoms of gas inhalation and pneumonitis. Acute symptoms of ingestion include sternal pain, cough, nausea, pallor, coated tongue, gastrointestinal disorders, nervousness and convulsions. Contact with eyes, skin causes irritation.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give oxygen if necessary. INGESTION: induce vomiting, follow with gastric lavage and salt cathartics. EYES: flush immediately and thoroughly with water. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ (as selenium)
5.5 **Short-Term Inhalation Limits:** 0.1 mg/m³, 30 min (as selenium)
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously with water to form selenic acid (solution)
7.2 **Reactivity with Common Materials:** Corrodes all metals when moisture is present
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; rinse with dilute solution of sodium bicarbonate (soda ash)
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Gallard-Schlesinger Chemical Mfg. Co.
   [illegible] Mineola Ave.
   Carle Place, N.Y. [illegible]
2. Platz and Bauer, Inc.
   [illegible] Official Ave.
   Stamford, Conn. 06902

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, also shipped as a 40% solution in water (selenic acid)
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

RR

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive solid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 127
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** 244°F = 118°C = 391°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(Continued on page [illegible])

NOTES

STC

SILICON TETRACHLORIDE

Common Synonyms

Silicon chloride

Liquid | Colorless to light yellow | Suffocating odor

Reacts violently with water. Irritating gas is produced on contact with water

Fire

Not flammable

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause difficult breathing

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning - corrosive air contaminant
Restrict access
Evacuate area
Disperse and flush with water

2. LABEL

CORROSIVE

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Silicon chloride
3.2 **Coast Guard Compatibility Classification:** To be developed
3.3 **Chemical Formula:** $SiCl_4$
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Suffocating acid

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid canister type gas mask or self-contained breathing apparatus, goggles or face shield, rubber gloves, other protective clothing to prevent contact with skin

5.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory tract resulting in coughing, choking, and a feeling of suffocation; continued inhalation may produce ulceration of the nose, throat, and larynx; if inhaled deeply, edema of the lungs may ensue. Contact of liquid with eyes causes severe irritation and painful burns, may cause permanent visual impairment. Liquid may cause severe burns of skin. Repeated skin contact with dilute solutions or concentrated vapors may cause dermatitis. Ingestion causes severe internal burns with pain in the throat and abdomen, difficulty in swallowing, nausea, vomiting and diarrhea. In severe cases, collapse and shock or coma may result.

5.3 **Treatment for Exposure:** [illegible] INHALATION: remove victim from contaminated atmosphere. If breathing has ceased, start mouth-to-mouth resuscitation. Oxygen should only be administered by an experienced person when authorized by a physician. Keep patient warm and comfortable. EYES: immediately flush with large quantities of running water for a minimum of 15 min; continue irrigation for an additional 15 min if physician is not available. SKIN: immediately flush affected area with water. Severe or extensive burns may be caused by silicon tetrachloride, producing shock. Symptoms: rapid pulse, sweating and collapse; keep patient comfortably warm. INGESTION: If patient is conscious, give large amounts of fine water or milk. Magnesia, plain water should be given. If antidote is available, do NOT give soda bicarbonate or make no attempt to induce vomiting; if patient is unconscious, do not give anything but ensure there is no obstruction to breathing; tongue should be kept forward and false teeth removed; he will be less likely to aspirate vomitus if placed in a face-down and prone position.

Continued on next page

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam on adjacent fires
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Contact with water or foam applied to adjacent fires will produce irritating fumes of hydrogen chloride
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently with water to evolve hydrogen chloride (hydrochloric acid)
7.2 **Reactivity with Common Materials:** In presence of moisture at room temperature, the reaction is not violent
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Stauffer Chemical Company
Industrial Chemical Division
Westport, Connecticut
2. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017
3. Dynamit Nobel of America, Inc.
105 Nobel Court
Northvale, N.J. 07647

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
Technical 98% +
C.P. 99.9% +
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Dry air
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A-43

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicants	3
Aquatic Toxicants	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 169.9
13.3 **Boiling Point at 1 atm.:** 57.6°F = 57.6°C = 330.6°K
13.4 **Freezing Point:** -94°F = -70°C = 203°K
13.5 **Critical Temperature:** 472°F = 233.6°C = 506.6°K
13.6 **Critical Pressure:** 542 psia = 36.9 atm = 3.74 MN/m²
13.7 **Specific Gravity:** 1.48 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 19.6 dynes/cm = 0.019 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 5.86
13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13.12 **Latent Heat of Vaporization:** 74.2 Btu/lb = 41.2 cal/g = 1.73 × 10⁵ J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** -342 Btu/lb = -412 cal/g = -1.73 × 10⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

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5 HEALTH HAZARDS (Cont'd.)

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 4 LD₅₀ <50 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. Does cannot be tolerated even at low concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

SVA	SILVER ACETATE

Common Synonyms	Solid	White to gray	Odorless
	Sinks in water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

[illegible] water contaminant
Rest of access
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** CH_3COO^-Ag
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White to gray
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5.2 **Symptoms Following Exposure:** Inhalation of dust [illegible] nose and throat. Contact with eyes or skin causes irritation. If [illegible] for a long period, ingestion or inhalation of silver compounds can cause permanent incoloration of skin (argyria)
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water. Induce vomiting. EYES: flush with water for [illegible] SKIN: flush with water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m³
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** [illegible]
6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]
6.5 **Special Hazards of Combustion Products**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** [illegible]
6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** [illegible]
7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]
7.5 **Polymerization:** [illegible]
7.6 **Inhibitor of Polymerization:** [illegible]

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]
8.2 **Waterfowl Toxicity:** [illegible]
8.3 **Biological Oxygen Demand (BOD):** [illegible]
8.4 **Food Chain Concentration Potential:** [illegible]

9. SELECTED MANUFACTURERS

[illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, Purified
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** [illegible]
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 7 and 8

NOTES

SVC	SILVER CARBONATE

Common Synonyms	Solid	Yellow to brown	Odorless
	Sinks in water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** [illegible]
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Yellow to brown
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** mask, goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Contact with eyes causes irritation. If continued for a long period ingestion or inhalation of silver compounds can cause permanent discolouration of the skin (argyria)
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting. EYES: flush with water [illegible] at least 15 min. SKIN: flush with water, wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.01 mg/m³
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Decomposes [illegible] oxide, silver, and carbon dioxide; the reaction is not hazardous
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

- R.S.A. Corporation
  [illegible] Mill River Rd
  Ardsley, N.Y. 10502
- J. T. Baker Chemical Co.
  Phillipsburg, N.J. 08865
- Gallard Schlesinger Chemical Mfg. Co.
  584 Mineola Ave
  Carle Place, N.Y. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **Fire Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on Page 7 and 8

NOTES

SVF	SILVER FLUORIDE

Common Synonyms			
Argentous fluoride Silver monofluoride	Solid	Yellow to gray	Odorless
	Sinks and mixes with water		

Fire	Not flammable
Exposure	**DUST** Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing **SOLID** Irritating to skin and eyes If swallowed will cause nausea vomiting or loss of consciousness
Water Pollution	Effect of low concentration on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Argentous fluoride
Silver monofluoride

3 2 **Coast Guard Compatibility Classification**
Not listed

3 3 **Chemical Formula** AgF

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color** Yellow to gray

4 3 **Odor.** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Dust mask goggles or face shield protective gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat Ingestion may cause vomiting salty taste abdominal pain diarrhea convulsions collapse thirst disturbed vision and renal toxic nephritis Contact with eyes causes irritation Skin may be blackened on prolonged exposure

5 3 **Treatment for Exposure** INHALATION move to fresh air INGESTION get medical attention at once give large amount of water and induce vomiting EYES flush with water for at least 15 min SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.01 mg/m

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity.** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:**
Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products**
Not pertinent

6 6 **Behavior in Fire**

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials**

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Water Wildlife Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential.**
None

9. SELECTED MANUFACTURERS

1 Ozark Mahoning Co
1876 South Boulder
Tulsa Okla 74119

2 Ventron Inc
P O Box 159
Beverly, Mass 01915

3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
Pure 99.9% ?

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

H SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:**
Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:**
Solid

13 2 **Molecular Weight.** 126.9

13 3 **Boiling Point at 1 atm.**
2,118°F = 1,159°C = 1,432°K

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 5.82 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization.**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

SVI	SILVER IODATE

Common Synonyms	Solid	White	Odorless
	Sinks in water		

[illegible]

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula** $AgIO_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Dust mask goggles or face shield protective gloves
5 2 **Symptoms Following Exposure** Contact with eyes causes irritation If continued for a long period ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria)
5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amount of water induce vomiting EYES flush with water for at least 15 min SKIN flush with water wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.01 mg/m³
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity.** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire**
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 R[illegible] Corporation
690 Saw Mill River Rd
Ardsley N Y 10502
2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514
3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99+%
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight:** 282 1
13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 5.53 at 0°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

SVN	SILVER NITRATE

Common Synonyms Lunar caustic	Solid crystals Colorless to grayish black Odorless Sinks and mixes with water
[illegible]	
Fire	Not flammable
Exposure	[illegible] SOLIDS Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Should be removed

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Lunar caustic
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula** AgNO
3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color** Colorless
4.3 **Odor** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Goggles or face shield rubber gloves
5.2 **Symptoms Following Exposure** Concentrated solutions will produce irritation ulceration and discoloration of the skin also causes severe irritation of the eyes Ingestion will produce violent abdominal pain and other gastrointestinal symptoms
5.3 **Treatment for Exposure** INGESTION Gastric lavage with dilute solution of sodium chloride followed by cathartics and demulcents Other treatment is symptomatic SKIN wash promptly
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits** Not pertinent
5.6 **Toxicity by Ingestion** Grade 3 [illegible]
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics** Non volatile
5.9 **Liquid or Solid Irritant Characteristics.** Burns skin on prolonged contact
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire** Increases flammability of combustibles
6.7 **Ignition Temperature.** Not flammable
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate.** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction
7.2 **Reactivity with Common Materials** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
0.44 mg/l 48 hr salmon fry decidedly toxic/fresh water
0.01-0.1 ppm */parace itrotus inhibit egg develop salt water
*Time period not specified
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD).** None
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Eastman Kodak Co
Eastman Organic Chemicals Division
Rochester N Y 14650
2 Engelhard Minerals and Chemicals Corp
Silver Products Dept
231 New Jersey Railroad Ave
Menlo Park N J 08817
3 Mallinckrodt Chemical Works
Industrial Chemicals Division
2nd and Mallinckrodt Sts
St Louis Mo 63160

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent 99.8%
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0
	oxy

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid
13.2 **Molecular Weight** 169.87
13.3 **Boiling Point at 1 atm** Decomposes
13.4 **Freezing Point.** 414°F = 212°C = 485°K
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure.** Not pertinent
13.7 **Specific Gravity:** 4.35 at 19°C (solid)
13.8 **Liquid Surface Tension** Not pertinent
13.9 **Liquid-Water Interfacial Tension.** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on pages 7 and 8

NOTES

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SVO	SILVER OXIDE

Common Synonyms			
Argentous oxide	Solid	Brown black	Odorless
	Sinks in water		

[illegible]

Fire	Not flammable
Exposure	[illegible] **DUST** Irritating to eyes nose and throat If inhaled will cause coughing or difficult breathing [illegible] **SOLID** Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Argentous oxide
3.2 **Coast Guard Compatibility Classification** Not listed
3.3 **Chemical Formula:** Ag_2O
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Brownish black
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask goggles or face shield protective gloves
5.2 **Symptoms Following Exposure:** Contact with eyes causes mild irritation. If continued for a long period ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria)
5.3 **Treatment for Exposure** EYES flush with water SKIN flush with water wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value)** 0.01 mg/m
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion.** Grade 2 LD50 5 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics** Data not available
5.10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products.** Not pertinent
6.6 **Behavior in Fire:** Decomposes into metallic silver and oxygen. If large quantities are involved the oxygen might increase the intensity of the fire
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction
7.2 **Reactivity with Common Materials**
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902
2 Gallard-Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514
3 Fisher Scientific Co
711 Forbes Ave
Pittsburgh Pa 15219

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight.** 231.8
13.3 **Boiling Point at 1 atm** Not pertinent (decomposes)
13.4 **Freezing Point** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 7.14 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion.** Not pertinent
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

SVS	SILVER SULFATE

Common Synonyms	Solid	White to gray	Odorless
	Sinks and mixes with water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula:** Ag_2SO_4
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** White to gray
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure.** Contact with eyes causes irritation. If continued for a long period ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria)
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.01 mg/m
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.4 ppm/48 hr barnacles lethal/90% salt water
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 R S A Corporation
690 Saw Mill River Rd
Ardsley, N Y 10502
2 J T Baker Chemical Co
Phillipsburg, N J 08865
3 Ventron Inc
P O Box 159
Beverly, Mass 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent, Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

HSS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight.** 311.80
13 3 **Boiling Point at 1 atm:** Not pertinent
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 5.45 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

SDU	SODIUM

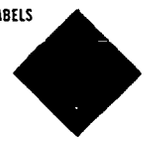
Common Synonyms	Soft solid under kerosene Silver to grayish white Odorless Floats and reacts violently with water. Flammable gas is produced
AVOID CONTACT WITH SOLID [illegible]	
Fire	FLAMMABLE FIRE MAY START ON CONTACT WITH AIR Flammable gas formed on contact with water or moisture [illegible]
Exposure	ALL FORMS ARE ALSO SOLID Will burn skin and eyes [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Section 4 of Methods Handbook CG-446-4

Issue warning – high flammability
Restrict access
Evacuate area
Chemical and physical treatment

2 LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula:** Na
3.4 **IMCO United Nations Numerical Designation:** 4.3 1428

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Soft solid or liquid
4.2 **Color.** Silvery white changing to [illegible] exposure to air
4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Maximum protective clothing, goggles and face shield
5.2 **Symptoms Following Exposure** Severe burns caused by burning metal or by caustic soda formed by reaction with moisture on skin
5.3 **Treatment for Exposure** SKIN: [illegible] Neutralize with [illegible] treat as heat burn + caustic burn + call a doctor
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion** Not pertinent
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics** None solution
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and severe injurious to eyes
5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** Not pertinent
6.2 **Flammable Limits in Air** Not pertinent
6.3 **Fire Extinguishing Agents** Dry soda ash, graphite, salt or other approved dry powder such as dry limestone
6.4 **Fire Extinguishing Agents Not to be Used** Water, carbon dioxide, or halogenated extinguishing agents
6.5 **Special Hazards of Combustion Products:** Fumes of burning Na are highly irritating to skin, eyes and mucous membranes
6.6 **Behavior in Fire** Not pertinent
6.7 **Ignition Temperature** 250°F
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently with formation of flammable hydrogen gas and caustic soda solution. A fire often occurs
7.2 **Reactivity with Common Materials** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** After reaction with water caustic soda formed can be diluted with water and neutralized with acetic acid
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Not pertinent
8.2 **Waterfowl Toxicity.** Not pertinent
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. E. I. duPont de Nemours
   Electrochemical Dept
   Wilmington, Del. 19898
2. Ethyl Corp
   Industrial Chemicals Division
   451 Florida
   Baton Rouge, La. 70801
3. RMI Company
   State Rd
   Ashtabula, Ohio 44004

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial grade, 99.9%
10.2 **Storage Temperature:** 240 – 250°F (liquid); ambient (solid)
10.3 **Inert Atmosphere.** Dry nitrogen or argon (for liquid); under kerosene (for solid)
10.4 **Venting.** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

RR C

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable solid
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid
13.2 **Molecular Weight** 22.99
13.3 **Boiling Point at 1 atm** 1621°F = 883°C = 1156°K
13.4 **Freezing Point** 207.8°F = 97.7°C = 370.8°K
13.5 **Critical Temperature.** 3632°F = 2000°C = 2273°K
13.6 **Critical Pressure** 5180 psia = 352 atm = 35.6 MN/m²
13.7 **Specific Gravity** 0.97 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity.** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued under [illegible]

NOTES

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SAB	SODIUM ALKYLBENZENESULFONATES

Common Synonyms
Sulfonated alkylbenzene sodium salt
Alkylbenzenesulfonic acid, sodium salt

Thick liquid or solid Pale yellow Faint detergent odor

Mixes with water. Soap bubbles may be produced

Fire

Not flammable

Exposure

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea or vomiting

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Alkylbenzenesulfonic acid sodium salt
Sulfonated alkylbenzene sodium salt

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_nH_{n+1}C_6H_4SO_3Na$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Powder or thick liquid

4 2 **Color:** Pale yellow

4 3 **Odor:** Faint detergent

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** In general these chemicals have a moderate order of toxicity. Repeated skin contact with concentrated solutions may cause dermatitis. Ingestion may cause gastrointestinal irritation vomiting and diarrhea

5 3 **Treatment for Exposure:** INGESTION induce vomiting and call a doctor EYES OR SKIN flush with copious amounts of water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits.** Not pertinent

5 6 **Toxicity by Ingestion** Grade 2 LD50 5 to 5 g/kg

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics:** Non volatile

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:** Irritating vapors may be generated

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
5 6 p.p.m (100% SAB)/96 hr/bluegill/TL_m/fresh water
8 2 ppm/96 hr/winter flounder/TL_m/salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 4%, 5 days

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Colgate Palmolive Co
300 Park Ave
New York, N Y 10022

2 Lever Bros Co
390 Park Ave
New York, N Y 10022

3 Witco Chemical Corp
Organic Division
1914 S Kilbourn Ave
Chicago Ill 60623

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Vary with each manufacturer and with intended use Some is shipped as a thick, concentrated water solution some as a solid often mixed with other solids such as sodium phosphate Ordinary household detergents are good examples of this substance

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** Not required

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid or solid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 0 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

SAS — SODIUM ALKYL SULFATES

Common Synonyms
Sodium hydrogen alkyl sulfate

Solid or thick liquid — Pale yellow — Faint detergent odor

Mixes with water. Soap bubbles may be produced

[illegible]

Fire

Not flammable

Exposure

CAUTION MEDICAL AID
LIQUID OR SOLID
Irritating to skin and eyes
If swallowed will cause nausea or vomiting

[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446 4

Issue warning — water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Sodium hydrogen alkyl sulfate
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula.** $C_nH_{2n+1}ONO_2SNa$
3 4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid or solid
4 2 **Color:** Colorless to pale yellow
4 3 **Odor:** Weak detergent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure:** In general these chemicals have a mild irritant effect. Repeated skin contact with concentrated solutions may cause dermatitis. Ingestion may cause gastrointestinal irritation vomiting and diarrhea
5 3 **Treatment for Exposure:** INGESTION induce vomiting and follow with gastric lavage. SKIN wash with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5 5 **Short-Term Inhalation Limits.** Not pertinent
5 6 **Toxicity by Ingestion.** Grade 2 LD50 [illegible] mg/kg
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics.** Non volatile
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. Depilatory solution, and if allowed to remain may cause smarting and reddening of the skin
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire:** May produce irritating vapors
6 7 **Ignition Temperature** Not flammable
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
[illegible] ppm [illegible] lethal fresh water
*Incipient [illegible] limit
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** [illegible] mg/l
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 E I DuPont de Nemours & Co Inc
Dyestuff Chemical Division
Wilmington Del 19898

2 Mallinckrodt Chemical Co
Dyes Chemical Division
100 Warren St
Jersey City N J 07302

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Varies with each manufacturer and with intended use. Some are shipped as a thick concentrated water solution or sometimes as a solid mixture with basic solids such as sodium phosphate. Ordinary household detergents are good examples of this substance
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446 3

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid or solid
13 2 **Molecular Weight.** Not pertinent
13 3 **Boiling Point at 1 atm.** Decomposes
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** Data not available
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

SAM	SODIUM AMIDE

Common Synonyms Sodamide	Solid Colorless Odorless Sinks and reacts violently with water

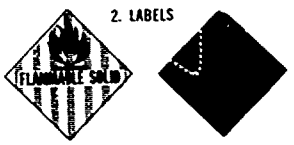
Fire	FLAMMABLE POISONOUS GAS IS PRODUCED IN FIRE
Exposure	SOLID Will burn skin and eyes
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning corrosive flammable
Restrict access
Should be removed
Disperse and flush

2. LABELS



3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Sodamide
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula.** NaNH
3 4 **IMCO/United Nations Numerical Designation:** 4 3 1425

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** Gray
4 3 **Odor** Like ammonia

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, dust respirator, rubber gloves and shoes
5 2 **Symptoms Following Exposure:** Ammonia gas formed by reaction of solid with moisture in tissues, eyes and skin. Solid causes caustic burns of eyes and skin. Ingestion burns [illegible] in same way as caustic soda and may cause perforation of tissue
5 3 **Treatment for Exposure:** INGESTION give water [illegible] do NOT induce vomiting [illegible] SKIN OR EYES [illegible] copious amounts of water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion** Data not available
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Only that of ammonia formed by reaction of solid with moisture in air
5 9 **Liquid or Solid Irritant Characteristics** Burns skin and eyes [illegible]
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** Flammable solid
6 2 **Flammable Limits in Air** Not pertinent
6 3 **Fire Extinguishing Agents** Dry soda [illegible] graphite, salt or other recommended dry powder [illegible]
6 4 **Fire Extinguishing Agents Not to be Used** Water
6 5 **Special Hazards of Combustion Products** Toxic and [illegible] may be formed
6 6 **Behavior in Fire** Data not available
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently and frequently [illegible] Forms caustic soda solution
7 2 **Reactivity with Common Materials.** Data not available
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Caustic solution formed by reaction with water can be diluted with water and/or neutralized by acetic acid
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Farchar Research Laboratories, Inc.
4702 East [illegible]
Willoughby, Ohio
2 Fike Chemical, Inc.
P.O. Box [illegible]
[illegible] W. Va. 25143
3 Ventron Corp.
Alfa Products Division
Beverly, Mass. 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure, Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere.** Must be dry
10 4 **Venting** Sealed containers must be stored in well ventilated area

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

RK

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Flammable solid
12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 39 [illegible]
13 3 **Boiling Point at 1 atm** [illegible]
13 4 **Freezing Point:** 410 F = 210 C = [illegible] K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.39 at 20 C [illegible]
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

SDA	SODIUM ARSENATE

Common Synonyms			
Sodium arsenate, dibasic Disodium arsenate heptahydrate	Solid	White	Odorless
	Sinks and mixes with water		

	[illegible]
Fire	Not flammable
Exposure	[illegible] DUST Irritating to eyes, nose and throat If inhaled will cause difficult breathing [illegible] SOLID Irritating to skin and eyes If swallowed will cause coughing, nausea, vomiting or loss of consciousness [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant
Restrict access
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Disodium arsenate heptahydrate, Sodium arsenate, dibasic

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $Na_2HAsO_4 \cdot 7H_2O$

3 4 **IMCO/United Nations Numerical Designation:** 6 1 1685

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** Inhalation of massive doses can cause laryngitis, bronchitis. Ingestion causes constriction in throat and difficulty in swallowing, also causes burning and pain, vomiting, profuse diarrhea, dehydration, cyanosis, coma, convulsions, and death. Contact with eyes causes irritation. Contact with skin causes various skin eruptions, more often as a late manifestation or chronic poisoning

5 3 **Treatment for Exposure:** INHALATION: remove victim from exposure, support respiration. INGESTION: gastric lavage with water followed by 1 glass of milk, consult physician. EYES: flush with water for at least 15 min. SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ (as arsenic)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4 LD₅₀ <50 mg/kg

5 7 **Late Toxicity:** Possible carcinogenic effects on skin and lungs

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
234 ppm *minnows lethal conc. fresh water
32 ppm 7 days goldfish 11 gm fresh water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:**
Bioconcentration only 80 fold, not likely to be a problem in spill situation

9. SELECTED MANUFACTURERS

1 J T Baker Chemical Co
Phillipsburg, N J 08865

2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

3 Fisher Scientific Co
711 Forbes Ave
Pittsburgh, Pa 15219

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent, Technical 98+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SN

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Poisonous solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 312

13 3 **Boiling Point at 1 atm:** (decomposes) 356°F = 120°C = 453°K

13 4 **Freezing Point.** 135°F = 57°C = 330°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.87 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

SAR

SODIUM ARSENITE

Common Synonyms

Sodium meta arsenite
Sodium ortho arsenite

Solid — White to gray — Odorless

Mixes with water

[illegible]

Fire

Not Flammable
POISONOUS GASES MAY BE PRODUCED WHEN HEATED

Exposure

[illegible]

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

[illegible]

RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — poison, water contamination
Restrict access
Disperse and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Sodium metaarsenite
Sodium orthoarsenite

3 2 **Coast Guard Compatibility Classification.** Not applicable

3 3 **Chemical Formula:** $NaAsO_2$ Na_3AsO_3

3 4 **IMCO/United Nations Numerical Designation:** Solid 6 1/2027
Aq soln 6 1 1686

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White to gray

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, rubber gloves, goggles or face shield

5 2 **Symptoms Following Exposure:** Dust may irritate eyes. Ingestion or excessive inhalation of dust causes irritation of stomach and intestines with nausea, vomiting and diarrhea, bloody stools, shock, rapid pulse, coma

5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min. SKIN: wash with large amounts of water. INGESTION: immediately induce evacuation of intestinal tract by gastric lavage and saline cathartic, see physician immediately, consider possible development of arsenic poisoning

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.5 mg/m³ (as arsenic)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 4 oral LD_{50} = 42 mg/kg (rat)

5 7 **Late Toxicity:** May be carcinogenic. Arsenic poisoning may develop

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not Flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents**
Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:**
Not pertinent

6 5 **Special Hazards of Combustion Products:**
Toxic arsenic fumes may be formed in fires. Self-contained breathing apparatus should be used

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**
No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
[illegible] mg/L 48 hr rainbow trout TLm fresh water

8 2 **Waterfowl Toxicity:** [illegible] mg/kg LD_{50}

8 3 **Biological Oxygen Demand (BOD)**
Data not available

8 4 **Food Chain Concentration Potential.**
Data not available

9. SELECTED MANUFACTURERS

1 Mallinckrodt Chemical Works
Industrial Chemicals Division
Second and Mallinckrodt Streets
P O Box 5439
St Louis Mo 63160

2 Chevron Chemical Co
940 Hensley St
Richmond Calif 94804

3 J T Baker Chemical Co
Phillipsburg N J 08865

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Pure
Technical (55 - 98%)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:**
Poisonous Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** Not pertinent

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:**
1 139°F = 615°C = [illegible] K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.87 at 20°C (solid)

13 8 **Liquid Surface Tension:**
Not pertinent

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13 12 **Latent Heat of Vaporization:**
Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

SAZ	SODIUM AZIDE

Common Synonyms	Solid	White	Odorless
	Mixes with water		

	[illegible]
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED Containers may explode in fire
Exposure	DUST POISONOUS IF INHALED SOLID POISONOUS IF SWALLOWED
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning to non-water contaminant
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Hydrazoic acid, sodium salt
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** NaN_3
3.4 **IMCO/United Nations Numerical Designation:** 6.1 1687

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, protective clothing, goggles
5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes dizziness, weakness, blurred vision, slight chest tightness, difficult breath, and feeling of going to faint, moderate reduction of blood pressure and headward flux. Contact with eyes or skin causes irritation
5.3 **Treatment for Exposure:** Give oxygen if weakness, pallor, or low blood pressure is observed. INHALATION: remove victim to fresh air, enforce rest, call a doctor. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. INGESTION: if a large amount of water is available, vomiting at once, get medical attention
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = 27 mg/kg (rat)
5.7 **Late Toxicity:** Potent mutagen of salmon sperm DNA
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** May form toxic hydrazoic acid fumes in fire
6.6 **Behavior in Fire:** Containers may explode
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves to form an alkaline solution. The reaction is not hazardous
7.2 **Reactivity with Common Materials:** Forms explosion sensitive materials with some metals such as lead, silver, mercury, and copper
7.3 **Stability During Transport:** Stable unless in contact with acids
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] ppm 24 hr bluegill [illegible] fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Fairmount Chemical Co., Inc.
   117 Blanchard Street
   Newark, N.J. 07105
2. Eastman Kodak Co.
   Eastman Organic Chemicals
   Rochester, N.Y. 14650
3. PCR, Inc.
   P.O. Box 1466
   Gainesville, Fla. 32602

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Pure 99+%, Practical grade
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

NS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
Molecular Weight: NS
Boiling Point at 1 atm: Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.85 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

SBS	SODIUM BISULFITE

Common Synonyms	
Sodium acid sulfite Sodium metabisulfite	Solid powder or granules White Odorless to irritating odor Sinks and mixes with water

[illegible]

Fire	Not flammable
Exposure	[illegible] DUST Harmful if inhaled [illegible] SOLID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

[illegible]
Disperse and flush

2. LABELS

[illegible]

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Sodium acid sulfite
Sodium metabisulfite
Sodium pyrosulfite

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** NaHSO – [illegible]

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** [illegible] when moist

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask; goggles [illegible]

5.2 **Symptoms Following Exposure:** [illegible] Ingestion may cause irritation of stomach. [illegible] depression, and death.

5.3 **Treatment for Exposure:** INHALATION OR INGESTION: [illegible] SKIN: wash with plenty of water. EYES: flush with plenty of water for at least 15 min. and get medical attention [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Non-volatile

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
[illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Reacts chemically with dissolved oxygen even in absence of seeded organisms

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp.
Industrial Chemicals Division
Morristown, N.J. [illegible]
2. Monsanto Co.
Monsanto Industrial Chemicals Co.
800 North Lindbergh Blvd.
St. Louis, Mo. [illegible]
3. Virginia Chemicals, Inc.
3340 West Norfolk Rd.
Portsmouth, Va. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 104.06

13.3 **Boiling Point at 1 atm:** Decomposes

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.48 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

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SDB	SODIUM BORATE

Common Synonyms			
Sodium tetraborate anhydrous Borax anhydrous Sodium biborate Sodium peroborate	Solid	White	Odorless
	Sinks and mixes slowly with water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat SOLID Irritating to skin and eyes If swallowed will cause headache, dizziness, nausea or vomiting
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-5

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Borax anhydrous, Sodium biborate, Sodium peroborate, Sodium tetraborate anhydrous

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $Na_2B_4O_7$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask and goggles or face shield

5.2 **Symptoms Following Exposure:** No adverse effects from inhaling borax have been reported. Ingestion may cause acute or chronic effects. Initial symptoms are nausea, vomiting, and diarrhea; these may be followed by weakness, depression, headaches, skin rashes, drying skin, cracked lips and loss of hair. Shock may follow ingestion of large doses and may interfere with breathing. For contact with powder or solution, may cause irritation; no chronic effects have been recognized, but continued contact should be avoided. Dermal irritation may result from contact with powder or strong solutions. The latter may cause skin dermatitis on prolonged contact, and if taken in brown enough borax may be absorbed to cause boron poisoning (symptoms are similar to those for ingestion).

5.3 **Treatment for Exposure:** INHALATION: move victim to fresh air, call physician immediately, give mouth-to-mouth resuscitation if breathing has stopped, give oxygen if available and by physician, keep victim warm. INGESTION: get medical attention quickly. If victim is conscious, give warm salts or soapy water to induce vomiting, repeat until vomiting is clear. Additional water may be given to wash out stomach. EYES: get medical attention quickly, flush with copious amounts of water for at least 15 min. (30 min. if physician is not available), sunglasses and contacts apply. SKIN: flush with water, remove contaminated clothing under shower, do not use chemical neutralizer, get medical attention, process burn if minor.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] mg/kg

Continued on page 2

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not applicable

6.3 **Fire Extinguishing Agents:** Not applicable

6.4 **Fire Extinguishing Agents Not to be Used:** Not applicable

6.5 **Special Hazards of Combustion Products:** Not applicable

6.6 **Behavior in Fire:** Decomposed into glass, water, and [illegible] at temperatures above [illegible] elsewhere

6.7 **Ignition Temperature:** Not applicable

6.8 **Electrical Hazard:** Not applicable

6.9 **Burning Rate:** Not applicable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
[illegible] ppm [illegible] after [illegible] hours
[illegible] ppm [illegible] hours
*Time period is [illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

*10.1 **Grades or Purity:** In addition to anhydrous sodium borax, sodium pentaborate and decahydrate are commercially available [illegible]
a Reagent and USP grades

*10.2 **Storage Temperature:** Ambient

*10.3 **Inert Atmosphere:** Not required

*10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

NN

12. HAZARD CLASSIFICATIONS

*12.1 **Code of Federal Regulations:** Not listed

*12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

*12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

*13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

*13.3 **Boiling Point at 1 atm:** Not applicable (decomposes)

*13.4 **Freezing Point:** Not applicable

*13.5 **Critical Temperature:** Not applicable

*13.6 **Critical Pressure:** Not applicable

*13.7 **Specific Gravity:** [illegible]

*13.8 **Liquid Surface Tension:** Not applicable

*13.9 **Liquid-Water Interfacial Tension:** Not applicable

*13.10 **Vapor (Gas) Specific Gravity:** Not applicable

*13.11 **Ratio of Specific Heats of Vapor (Gas):** Not applicable

13.12 **Latent Heat of Vaporization:** Not applicable

*13.13 **Heat of Combustion:** Not applicable

*13.14 **Heat of Decomposition:** Not applicable

*13.15 **Heat of Solution:** [illegible]

*13.16 **Heat of Polymerization:** Not applicable

Continued on page [illegible]

5 HEALTH HAZARDS (Cont'd.)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

SBH — SODIUM BOROHYDRIDE

Common Synonyms
Borohydride

Solid powder or pellets — White — Odorless

Sinks and mixes with water. Flammable gas is produced

Fire

Combustible
Flammable, explosive gas may be produced on contact with metals, acids or when heated

Exposure

DUST
Harmful if inhaled

SOLID
Irritating to skin and eyes
Harmful if swallowed or if skin is exposed

Water Pollution

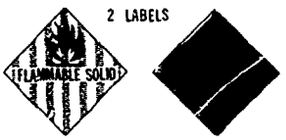
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: flammable
corrosive
Restrict access
Should be removed

2 LABELS



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula** $NaBH_4$
3.4 **IMCO/United Nations Numerical Designation** 4.3/1426

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or solution in caustic soda
4.2 **Color** White
4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Goggles, rubber gloves and protective clothing
5.2 **Symptoms Following Exposure** Solid irritates skin. If ingested, can form large volume of gas and lead to a gas embolism
5.3 **Treatment for Exposure** INGESTION: do NOT induce vomiting, give dilute vinegar, lemon juice, milk or olive oil, call a doctor. SKIN AND EYES: flood with large amount of water
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5.5 **Short-Term Inhalation Limits** Not pertinent
5.6 **Toxicity by Ingestion** Violent reaction with acid in stomach. Considered toxic because of boron content
5.7 **Late Toxicity.** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** None available
5.9 **Liquid or Solid Irritant Characteristics** Irritates skin
5.10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** Flammable solid
6.2 **Flammable Limits in Air** Not pertinent
6.3 **Fire Extinguishing Agents** Graphite, limestone, soda ash, sodium chloride powders
6.4 **Fire Extinguishing Agents Not to Be Used** Water, carbon dioxide, or halogenated extinguishing agents
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Decomposes and produces highly flammable hydrogen gas
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts to form flammable hydrogen gas
7.2 **Reactivity with Common Materials** Reacts with acids to form toxic flammable diborane gas. Slowly corrodes glass
7.3 **Stability During Transport** Stable unless mixed with acids or overheated when flammable hydrogen gas is formed
7.4 **Neutralizing Agents for Acids and Caustics:** Caustic formed by reaction with water can be diluted and/or neutralized with acetic acid
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Callery Chemical Co
   Callery, Pa 16024
2. Ventron Corp
   Alfa Products Division
   Beverly, Mass 01915

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.9% commercial purity dry powder, pellets, 12% solution in 40% aqueous sodium hydroxide
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere.** No requirement
10.4 **Venting:** Sealed containers must be stored in well ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

RRC

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Flammable solid
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Solid
13.2 **Molecular Weight:** 37.83
13.3 **Boiling Point at 1 atm** Decomposes
13.4 **Freezing Point** Not pertinent
13.5 **Critical Temperature** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity.** 1.074 at 20°C (solid)
13.8 **Liquid Surface Tension** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization.** Not pertinent
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

SCD	SODIUM CACODYLATE

Common Synonyms			
Sodium dimethylarsenate Arsecodile Arsicodile Arsycodile Phytar	Solid or solution Mixes with water	White solid or colorless to light yellow solution	Odorless

[illegible]

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	[illegible] VAPOR OR DUST POISONOUS IF INHALED Irritating to eyes [illegible] LIQUID OR SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning poison water contaminant
Restrict access
Disperse and flush

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Arsecodile Arsicodile Arsycodile, Phytar 160, Phytar 560 Sodium dimethylarsonate

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $(CH_3)_2AsOONa$

3 4 **IMCO/United Nations Numerical Designation:** 6 1/1688

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid or water solutions

4 2 **Color:** Colorless to light yellow

4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield dust mask rubber gloves

5 2 **Symptoms Following Exposure:** Dust may irritate eyes Ingestion or excessive inhalation causes irritation of stomach and intestines with nausea, vomiting, diarrhea shock, rapid pulse, coma

5 3 **Treatment for Exposure:** INHALATION remove victim from exposure call physician EYES flush with water SKIN flush with water and wash well with soap and water INGESTION call physician, induce evacuation of intestinal tract by inducing vomiting giving gastric lavage and a saline cathartic Do NOT use BAL as an antidote

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 2,600 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Arsenic-containing fumes are emitted

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Corrodes common metals, but reaction is not hazardous

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential.** Data not available

9 SELECTED MANUFACTURERS

The Ansul Company
One Stanton Street
Marinette Wis 54143

10. SHIPPING INFORMATION

10 1 **Grades or Purity:**
22 28% sodium cacodylate
3 5% cacodylic acid, balance inert solid (or water)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 160 0

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (est) >1 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

SOC	SODIUM CHLORATE

Common Synonyms Chlorate of soda	Solid crystals or powder Colorless to pale yellow Odorless Sinks and mixes with water
Fire	Not flammable CONTAINERS MAY EXPLODE IN FIRE May cause fire on contact with combustibles
Exposure	SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See F 300-Series Methods Handbook CG-446-4)

Issue warning — high flammability
Should be removed
Disperse and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Chlorate of soda

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $NaClO_3$

3 4 **IMCO/United Nations Numerical Designation** N 1495

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Pale yellow to white

4 3 **Odor** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Clean work clothing (must be washed well with water after each exposure) rubber gloves and shoes, safety goggles and an approved dust respirator. Do NOT use oils, greases or protective creams on skin

5 2 **Symptoms Following Exposure:** Ingestion of a toxic dose (at least 1 2 oz) leads to severe gastroenteritis, pain, vomiting and diarrhea. Possible respiratory difficulties, including failure of respiration. Kidney and liver injury may also be produced. The lethal oral dose for an adult is approximately 15 gm. Contact with eyes causes irritation

5 3 **Treatment for Exposure** INGESTION induce vomiting and follow with gastric lavage, saline cathartics, fluid therapy and oxygen. EYES wash thoroughly with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion** Grade 4 LD 50 to 500 mg/kg

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Not applicable

5 9 **Liquid or Solid Irritant Characteristics** Prolonged exposure to solid or dust causes irritation skin

5 10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable but supports combustion

6 2 **Flammable Limits in Air.** Not pertinent

6 3 **Fire Extinguishing Agents.** Water

6 4 **Fire Extinguishing Agents Not to be Used.** Fire blankets

6 5 **Special Hazards of Combustion Products** In fire situations oxygen may be liberated and increase the intensity of the fire

6 6 **Behavior in Fire:** Melts then decomposes to give oxygen gas that increases the intensity of fire. Reacts explosively either as a solid or a liquid with all organic matter and some metals

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** Chlorates are powerful oxidizing agents. They can cause explosions when heated or rubbed with wood, organic matter, sulfur and many metals. Even water solutions react in this way if stronger than 30%, especially when warm

7 3 **Stability During Transport:** Starts at 572°F with evolution of oxygen gas. Decomposition may be self sustaining. Oxygen increases intensity of fires

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent.

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
11 000 ppm perch threshold toxicity fresh water
65 ppm sunfish threshold toxicity fresh water

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Kerr McGee Chemical Corp
Kerr McGee Bldg
Oklahoma City, Okla 73102

2 Occidental Petroleum Corp
Hooker Chemical Co
Industrial Chemicals Division
Niagara Falls, N Y 14302

3 Penn Olin Chemical Co
Calvert City, Ky 42029

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical (99 5% minimum) Treated (99 0% minimum)

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Oxidizing material

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	0	
Flammability (Red)	0	0
Reactivity (Yellow)	2	2
	OXY	OXY

*First column refers to non fire situation

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight.** 106 45

13 3 **Boiling Point at 1 atm** Decomposes

13 4 **Freezing Point:** 478°F = 248°C = 521°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 2 49 at 15°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

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SCH

SODIUM CHROMATE

Common Synonyms
Sodium chromate (VI)
Neutral sodium chromate anhydrous

Solid | Yellow | Odorless

Sinks and mixes with water

Fire

Not flammable
Will increase the intensity of a fire
May cause fire on contact with combustibles

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause nausea or loss of consciousness

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Neutral sodium chromate anhydrous, Sodium chromate (VI)

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula.** Na_2CrO_4

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Yellow

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** U S Bu Mines approved respirator, rubber gloves, chemical safety goggles, rubber apron and sleeves, face shield, rubber shoes, protective clothing

5 2 **Symptoms Following Exposure:** Inhalation causes irritation and may ulcerate mucous membranes, continued irritation of the nose may lead to perforation of the septum. Ingestion causes severe circulatory collapse and toxic nephritis, may be fatal. Contact with eyes causes severe irritation and possible conjunctivitis. Irritates skin and can cause ulcers if skin is broken, prolonged contact may cause "chrome sores" (slow healing, hard rimmed ulcers), which leave the area vulnerable to infection as a secondary effect

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, get medical attention. INGESTION: get immediate medical help, if vomiting is not spontaneous give an emetic such as soapy water followed by copious water intake. EYES: immediately flush with plenty of water for at least 15 min., consult physician promptly. SKIN: immediately flush with plenty of water for at least 15 min., persistent dermatitis should be referred to physician, wash contaminated skin or clothing until chromate color disappears

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 0.1 mg/m³ (as chromic acid)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade VI Dose 50 - 500 mg/kg

5 7 **Late Toxicity:** Possible lung cancer

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Toxic chromium oxide fumes may form in fire

6 6 **Behavior in Fire** May increase intensity of fire when in contact with combustible material

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials** In contact with combustible materials may cause fire

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
300 mg/l 24 hr bluegill 22 m (fresh water)
40 - 60 ppm 288 hr shore crab (toxic salt water)

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential** Bioconcentrative to 2,000 fold but not likely to be a problem in a spill situation

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
Industrial Chemicals Div
P O Box 1139R
Morristown N J 07960

2 PPG Industries Inc
One Gateway Center
Pittsburgh Pa 15222

3 J T Baker Chemical Co
Phillipsburg N J 08865

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent, Commercial, Tetrahydrate grade

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 162

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.723 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** −24.5 Btu/lb = −13.6 cal/g = −2.57 × 10⁴ J/kg

13 16 **Heat of Polymerization** Not pertinent

(Continued on page 5 of 6)

NOTES

SCN	SODIUM CYANIDE

Common Synonyms	Solid granules, flakes or lumps — White — Almond odor Sinks and mixes with water
[illegible]	
Fire	Not flammable
Exposure	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Will burn eyes [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook (CG 446-4)

Isolate, warning, power
Restrict access
Evacuate area
Chemical and physical treatment

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Hydrocyanic acid, sodium salt
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula** NaCN
3.4 **IMCO United Nations Numerical Designation:** (1) 1689

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color:** White
4.3 **Odor:** Odorless when dry. When moist it has a slight odor of hydrocyanic acid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Protective gloves when handling solid sodium cyanide, rubber gloves when handling cyanide solutions (wash hands and rubber gloves thoroughly with running water after handling cyanides). U.S. Bureau of Mines approved dust respirator, approved chemical safety goggles.

5.2 **Symptoms Following Exposure** A fatal dose (150 milligrams) is a rapidly fatal poison if ingested. Non-lethal doses may cause toxic symptoms. Strong water solutions or the solid itself can be absorbed by the skin and cause deep ulcers which heal slowly.

5.3 **Treatment for Exposure.** INGESTION: Treatment immediately. Call a physician. Carry victim to fresh air, have him lie down, keep him quiet and warm until physician arrives.
- If victim is conscious and breathing, induce vomiting by giving emetic or warm salt water (1 tablespoon salt/cup water) repeatedly until fluid is clear. Then have victim drink one pint of 1% solution of sodium thiosulfate (to be repeated in 1 min).
- If victim has stopped breathing, give artificial respiration until breathing starts.
- If victim is unconscious but breathing, give oxygen from an inhalator.

In all cases, recognize that victim breathes an antidote. Break nitrite pearls in a cloth and hold lightly under victim's nose for 15 sec., repeating 5 times at about 15 sec. intervals. If necessary, repeat this procedure every 5 min. with fresh pearls until four 4 have been given. (Pearls must not be over 2 years old. Avoid breathing amyl nitrite while administering to a victim.)

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5.5 **Short-Term Inhalation Limits** Not pertinent
5.6 **Toxicity by Ingestion:** Oral LD50 below 50 mg/kg

6. FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air.** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire.** Not pertinent
6.7 **Ignition Temperature.** Not flammable
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** When sodium cyanide dissolves in water, a mild reaction occurs and some poisonous hydrogen cyanide gas is released. This gas is not hazardous except in an enclosed space. If the water is acidic, however, toxic amounts of the gas will form at once.
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.15 ppm/96 hr bluegill, 11 m fresh water
0.28 ppm/48 hr prawn, 1.0 m salt water
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD).** (theor.) [illegible] 7 days
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. E. I. duPont de Nemours & Co., Inc.
Electrochemicals Dept.
Wilmington, Del. 19898
2. Mallinckrodt Chemical Works
Industrial Chemical Division
2nd and Mallinckrodt Sts.
St. Louis, Mo. 63160

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere** No requirement
10.4 **Venting** Sealed containers must be stored in well ventilated area

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG 446-2)

SN

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Poisonous liquid or solid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 49.01
13.3 **Boiling Point at 1 atm** Very high
13.4 **Freezing Point:**
1047 K = 564°C = 1043°F
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure** Not pertinent
13.7 **Specific Gravity:** 1.60 at 25°C (solid)
3.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

5 HEALTH HAZARDS (Cont'd)

5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics** Non-volatile but moisture in air can liberate some lethal hydrogen cyanide gas
5.9 **Liquid or Solid Irritant Characteristics.** Fluid is severe skin irritant; may cause pain and second degree burns after a few minutes contact
5.10 **Odor Threshold** Not pertinent

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SDT	SODIUM DICHLORO-s-TRIAZINETRIONE

Common Synonyms			
Sodium dichloroisocyanurate	Solid	White	Bleach like odor
	Mixes with water		

	[illegible]
Fire	Not flammable May cause fire on contact with combustibles. POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes. Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous, if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Isolate [illegible] oxidizing material [illegible] water contaminant
Restrict access
Disperse and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Sodium dichloroisocyanurate
3 2 **Coast Guard Compatibility Classification.** Not applicable
3 3 **Chemical Formula:** $NaCl_2N_3O_3$
3 4 **IMCO/United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid
4 2 **Color:** White
4 3 **Odor:** Like chlorine

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask or chlorine canister mask, goggles, rubber gloves and other protective clothing to prevent contact with skin
5 2 **Symptoms Following Exposure:** Dust causes sneezing and coughing, moderate irritation of the eyes and itchiness and redness of the skin. Ingestion causes burns of mouth and stomach
5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air EYES flush with water for 15 min, call a physician SKIN flush with water INGESTION induce vomiting, call physician
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = [illegible] mg/kg (rat)
5 7 **Late Toxicity:** Effects unknown in experimental animals
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable but contact with ordinary combustibles may cause fire
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Water
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products.** May form toxic chlorine and other gases in fire
6 6 **Behavior in Fire:** Decomposition can be initiated with a heat source and can propagate throughout the mass with the evolution of dense fumes. Containers may explode when heated
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Forms a bleach solution, the reaction is not violent
7 2 **Reactivity with Common Materials:** Contact with most foreign materials, organic matter, or easily chlorinated or oxidized materials may result in fire. Avoid contact with oil, grease, sawdust, floor sweepings, easily oxidized organics
7 3 **Stability During Transport:** Stable if dry
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

FMC Corporation
Industrial Chemical Division
633 Third Avenue
New York, N.Y. 10017

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 39 60% available chlorine
10 2 **Storage Temperature:** Cool ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Oxidizing material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	0
Reactivity (Yellow)	2
	OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 220.0
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.96 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition:** Data not available
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

SCR	SODIUM DICHROMATE

Common Synonyms	
Sodium bichromate	Solid crystals — Red to orange — Odorless Sinks and mixes with water

Fire	Not flammable May cause fire on contact with combustibles
Exposure	DUST Irritating to eyes, nose, and throat If inhaled, will cause difficult breathing SOLID Will burn skin and eyes If swallowed, will cause nausea and vomiting
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Hazardous Materials Handbook, CG 446-4)

Issue warning — water contaminant
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** No common synonyms
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula.** Na_2CrO_4
3.4 **IMCO-United Nations Numerical Designation:** 9.0 1439

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid
4.2 **Color:** Bright orange-red
4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Approved dust mask, protective gloves, goggles or face shield
5.2 **Symptoms Following Exposure:** Inhalation of dust or mist causes respiratory irritation sometimes resembling asthma, nasal septal perforation may occur. Ingestion causes vomiting, diarrhea, and burns stomach and causes complications. Contact with eyes or skin produces local irritation; repeated skin exposure causes dermatitis
5.3 **Treatment for Exposure:** INGESTION: have victim drink water or milk, do NOT induce vomiting, call a doctor. SKIN OR EYE CONTACT: treat like acid burns, flush eyes with water for at least 15 min; external lesions can be scrubbed with a 2% solution of sodium thiosulfate
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent
5.5 **Short-Term Inhalation Limits** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 LD50 = 50-500 mg/kg
5.7 **Late Toxicity:** Some suggestion of lung cancer
5.8 **Vapor (Gas) Irritant Characteristics:** Dust or mist causes severe irritation of eyes and throat and can cause ulcers and lung injury. They cannot be tolerated at any concentrations
5.9 **Liquid or Solid Irritant Characteristics.** Severe irritant. Causes second and third degree burns with short contact and severe injury with longer contact
5.10 **Odor Threshold:** Odorless

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents** Flood with water
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire:** Decomposes to produce oxygen when heated. May ignite other combustibles upon contact
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** In contact with finely divided combustibles such as sawdust ignition may occur
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 145 ppm 24 hr bluegill TLm fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Diamond Shamrock Corp
Soda Products Division
Belleville Plant
Kearny, N.J. 07032

2 Hercules Inc
Coatings and Specialty Products Dept
910 Market St
Wilmington, Del. 19899

3 PPG Industries Inc
Industrial Chemical Division
1 Gateway Center
Pittsburgh, Pa. 15222

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical grades 99.8% to 99.9%, high purity grades 99.3%, 99.9%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** ORM-A
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0
	OXY

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 262.01
13.3 **Boiling Point at 1 atm:** Decomposes
13.4 **Freezing Point.** 678°F = 357°C = 630°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 2.35 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

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SFC	SODIUM FERROCYANIDE

Common Synonyms	Solid Yellow Odorless Sinks and mixes with water

Fire	Not flammable
Exposure	SOLID Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $Na_4Fe(CN)_6$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Yellow

4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible] Bureau of Mines [illegible] goggles

5.2 **Symptoms Following Exposure:** None [illegible]

5.3 **Treatment for Exposure:** None [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade [illegible]

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** None

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
540 mg/l * daphnia magna toxic conc. fresh water
*Time period not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)**
0 lb/lb

8.4 **Food Chain Concentration Potential**
None

9 SELECTED MANUFACTURERS

1. American Cyanamid Co.
Industrial Chemicals & Plastics Division
Wayne, N. J. 07470

2. Fifo Color and Chemical Corp.
347 Madison Av.
New York, N. Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

NN

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 484.04

13.3 **Boiling Point at 1 atm:** Decomposes

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] (solids)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible] and [illegible]

NOTES

SDF	SODIUM FLUORIDE

Common Synonyms	Solid crystals or powder — White or tinted blue — Odorless Sinks in water
Fire	Not flammable
Exposure	SOLID Poisonous if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

[illegible]

2. LABELS

[illegible]

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** [illegible]

3.2 **Coast Guard Compatibility Classification** [illegible]

3.3 **Chemical Formula.** NaF

3.4 **IMCO United Nations Numerical Designation** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** [illegible]

4.2 **Color.** [illegible]

4.3 **Odor** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure** [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire** [illegible]

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** [illegible]

6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** [illegible]

7.3 **Stability During Transport:** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]

7.5 **Polymerization** [illegible]

7.6 **Inhibitor of Polymerization:** [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD)** None

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-5

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 *Code of Federal Regulations.* ORM-B

12.2 **NAS Hazard Rating for Bulk Water Transportation** [illegible]

12.3 **NFPA Hazard Classifications.**

Category	Classification
[illegible]	

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** [illegible]

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion** [illegible]

13.14 **Heat of Decomposition** [illegible]

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization.** [illegible]

[illegible]

NOTES

SDH	SODIUM HYDRIDE

Common Synonyms	Powder or oil — Gray — Kerosene odor Reacts violently with water. Flammable gas is produced
Fire	FLAMMABLE MAY EXPLODE ON CONTACT WITH WATER
Exposure	SOLID Will burn skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning if high flammability
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** None common synonym
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** NaH
3.4 **IMCO United Nations Numerical Designation:** 4.3 1427

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Solid
4.2 **Color.** Gray
4.3 **Odor:** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Eye shield, rubber gloves
5.2 **Symptoms Following Exposure:** Material is toxic
5.3 **Treatment for Exposure:** INGESTION: Induce vomiting immediately if conscious. SKIN CONTACT: Wash with plenty of water and soap. Get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value)** None
5.5 **Short-Term Inhalation Limits:** None present
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics** None
5.9 **Liquid or Solid Irritant Characteristics.** Corrosive to skin and eyes
5.10 **Odor Threshold:** None present

6 FIRE HAZARDS

6.1 **Flash Point** Not applicable
6.2 **Flammable Limits in Air:** Not applicable
6.3 **Fire Extinguishing Agents** Dry powder, dry sand, dry powder
6.4 **Fire Extinguishing Agents Not to be Used:** Water and other aqueous solutions
6.5 **Special Hazards of Combustion Products** None
6.6 **Behavior in Fire.** Reacts violently with water
6.7 **Ignition Temperature.** Data not available
6.8 **Electrical Hazard** None
6.9 **Burning Rate:** Not applicable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** Reacts violently with water
7.2 **Reactivity with Common Materials.** None
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Not applicable
7.5 **Polymerization** None
7.6 **Inhibitor of Polymerization** None

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Not applicable
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere:** May be desirable
10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-5

RR

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable solid
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** Not applicable
13.3 **Boiling Point at 1 atm:** Not applicable
13.4 **Freezing Point:** Not applicable
13.5 **Critical Temperature.** Not applicable
13.6 **Critical Pressure.** Not applicable
13.7 **Specific Gravity:** Data not available
13.8 **Liquid Surface Tension:** Not applicable
13.9 **Liquid-Water Interfacial Tension.** Not applicable
13.10 **Vapor (Gas) Specific Gravity:** Not applicable
13.11 **Ratio of Specific Heats of Vapor (Gas)** Not applicable
13.12 **Latent Heat of Vaporization** Not applicable
13.13 **Heat of Combustion:** Not applicable
13.14 **Heat of Decomposition** Not applicable
13.15 **Heat of Solution:** Not applicable
13.16 **Heat of Polymerization** Not applicable

Continued under Notes

NOTES

REVISED 1978

SHS	SODIUM HYDROSULFIDE SOLUTION

Common Synonyms			
Sodium bisulfide Sodium sulfhydrate Sodium hydrogen sulfide	Liquid Mixes with water	Light yellow to red	Rotten egg odor

Fire	Not flammable
Exposure	LIQUID Irritating to skin and eyes If swallowed will cause nausea, vomiting, or loss of consciousness
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Phase Handbook CG-446-4

Issue warning – water soluble and corrosive
Restrict access
Dape up and flush

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Sodium bisulfide
Sodium hydrogen sulfide, Sodium sulfhydrate

3.2 **Coast Guard Compatibility Classification:** To be developed

3.3 **Chemical Formula:** $NaSH \cdot H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid water solution

4.2 **Color:** Light lemon yellow, amber to dark red

4.3 **Odor:** Rotten eggs

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber protective equipment such as apron, boots, splash proof goggles, gloves, rubber tape, respirator, hose, hard hat, breathing apparatus

5.2 **Symptoms Following Exposure:** Inhalation – Mist causes irritation of respiratory tract and possible systemic poisoning. Hydrogen sulfide gas which forms begins [illegible] and prevent causes headache, dizziness, nausea, vomiting. Continued exposure can cause [illegible], pulmonary edema, respiratory failure and death.
Liquid causes marked eye irritation, itching, watering, or swelling. Eye and [illegible] causing burning of skin are the most common effects. Exposure [illegible] may increase the potential effects. Contact of liquid with skin causes irritation and [illegible]. Tissue continued exposure may cause dermatitis. Ingestion causes severe burning and [illegible]. Full portions of the gastrointestinal tract, pain in the throat and abdomen, nausea and vomiting followed by diarrhea. In severe cases collapse, unconsciousness and partial or complete respiration may be expected.

5.3 **Treatment for Exposure:** INHALATION – move victim from contaminated atmosphere. If breathing has ceased, start mouth to mouth resuscitation. EYES – immediately flush with large quantities. Flushing water [illegible] obtain medical attention as soon as possible. While awaiting instructions from personnel, patient may be kept in a dark room and ice compresses applied to the eyes and forehead. SKIN – immediately flush affected areas with water, obtain medical attention. Irritation persists. INGESTION – obtain medical attention as soon as possible. If patient is conscious, induce vomiting by giving large amounts of water or warm salty water (2 tables[illegible] of table salt to a pint of water). If this measure is unsuccessful, vomiting may be induced by tickling the back of patient's throat with a finger. Vomiting should be encouraged until the vomitus is clear.

Continued on page 4

6 FIRE HAZARDS

6.1 **Flash Point.** Not flammable

6.2 **Flammable Limits in Air** Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Not reactive

7.2 **Reactivity with Common Materials:** Corrodes most metals but reaction is not hazardous

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Dilute with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** 206 mg/L [illegible] fish, [illegible] fresh water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Stauffer Chemical Company
Industrial Chemical Division
Westport, Conn. 06880

2. PPG Industries, Incorporated
Industrial Chemical Division
One Gateway Center
Pittsburgh, Pa. 15222

3. Chemical Products Corporation
King Philip Rd.
East Providence, R.I. 02914

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 40–70% solution in water

10.2 **Storage Temperature** >60°F

10.3 **Inert Atmosphere:** Not required

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

AP

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	-
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	[illegible]
Poisons	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	
Reactivity	
Other Chemicals	[illegible]
Water	[illegible]
Self Reactivity	[illegible]

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm.** Approx. 217°F = [illegible] °C = [illegible] K

13.4 **Freezing Point:** Approx. 65°F = [illegible] °C = 291 K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity:** [illegible] Grams

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 4

5 HEALTH HAZARDS (Con't)

If patient is unconscious, do not give anything but ensure there is no obstruction to breathing. The tongue should be kept forward and false teeth removed. He will be less likely to aspirate vomitus if he is placed in a face-down position.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50 [illegible] g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant. May cause pain and second degree burn after a few minutes contact.

5.10 **Odor Threshold:** [illegible] ppm

SHD

SODIUM HYDROXIDE

Common Synonyms
Caustic soda
Lye

Solid flakes or pellets — White — Odorless

Sinks and mixes with water

Fire

Not flammable
May cause fire on contact with combustibles
Flammable gas may be produced on contact with metals

Exposure

DUST
Irritating to eyes, nose and throat

SOLID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 Synonyms
3.2 Coast Guard Compatibility Classification
3.3 Chemical Formula: NaOH
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped)
4.2 Color: White
4.3 Odor: None

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure: INHALATION INGESTION CONTACT
5.3 Treatment for Exposure: INHALATION INGESTION SKIN EYES
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion: (10% solution) oral rabbit LD_{50} = 500 mg/kg
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations
Corrosive Material
12.2 NAS Hazard Rating for Bulk Water Transportation:
12.3 NFPA Hazard Classifications

Category	Classification

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

REVISED 1978

SHC	SODIUM HYPOCHLORITE

Common Synonyms Clorox Liquid bleach	Watery liquid Green to yellow Bleaching liquid odor Sinks and mixes with water
Fire	Not flammable
Exposure	LIQUID Irritating to skin and eye. Harmful if swallowed
Water Pollution	Harmful to aquatic life in very low concentrations May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook [illegible]

Issue warning [illegible]
Dispose and flush

2 LABELS

No [illegible] labels required by [illegible] Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** [illegible] Liquid bleach
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** [illegible]
3.4 **IMCO United Nations Numerical Designation.** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** [illegible]
4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]
5.2 **Symptoms Following Exposure:** [illegible]
5.3 **Treatment for Exposure:** INGESTION [illegible] SKIN [illegible] EYES [illegible]
5.4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible]
5.5 **Short-Term Inhalation Limits.** [illegible]
5.6 **Toxicity by Ingestion:** Grade 1, oral rat LD_{50} = 8.91 g/kg
5.7 **Late Toxicity:** [illegible]
5.8 **Vapor (Gas) Irritant Characteristics.** [illegible]
5.9 **Liquid or Solid Irritant Characteristics.** [illegible]
5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents.** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire:** May decompose [illegible]
6.7 **Ignition Temperature.** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook [illegible]

VP

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not Listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight.** Not applicable
13.3 **Boiling Point at 1 atm.** Decomposes
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution.** [illegible]
13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

REVISED 1978

SML	SODIUM METHYLATE

Common Synonyms			
Sodium methoxide	Solid	White	Odorless
	Mixes with water		

Fire	FLAMMABLE
Exposure	DUST Irritating to eyes, nose and throat SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

Issue warning. Keep fire extinguisher ready.
Restrict access.
Disperse and flush.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Sodium methoxide

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CH_3ONa

3.4 **IMCO/United Nations Numerical Designation:** 3-14+

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber gloves and apron, goggles or face shield

5.2 **Symptoms Following Exposure:** Inhalation: Irritation of nose and throat. Contact with eyes causes severe irritation and burns. Ingestion causes irritation of mouth and throat.

5.3 **Treatment for Exposure:** Give medical treatment only if symptoms of exposure develop or persist. INHALATION: Remove victim to fresh air. Administer artificial respiration if breathing is stopped and oxygen if breathing is difficult. Keep victim quiet and warm. Do not administer anything by mouth if victim is unconscious. Have victim drink water if conscious and able to swallow. Seek medical attention. EYES: Immediately flush with water for 15 minutes. Seek medical attention. SKIN: Wash with plenty of water. Remove contaminated clothing. Seek medical attention. INGESTION: Do not induce vomiting. Administer large quantities of water. Do not administer anything by mouth if victim is unconscious or convulsing. Seek medical attention. Do not give anything by mouth if victim is unconscious or convulsing. Keep victim quiet and warm. Do not leave victim unattended. Do not permit victim to walk. Keep victim under observation until all medical authorities have determined that there is no possibility of delayed injurious effects.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (not flammable solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Dry chemical, not products such as sand, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Contact with water or moisture applied. Sodium hydroxide and methanol

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Produces caustic sodium hydroxide and methanol. Heat is evolved. The reaction is violent.

7.2 **Reactivity with Common Materials:** Causes corrosion of metals such as aluminum and zinc

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Water followed by dilute acetic acid or vinegar

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Hal Sun Chemical Company
Industrial Chemicals Department
[illegible]
Cincinnati, Ohio [illegible]

Dow Corporation
[illegible] Building
Midland, Michigan [illegible]

Diamond Shamrock Chemical Company
Eastern Chemical Division
P. O. Box [illegible]
Deer Park, Texas [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Padded with nitrogen

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable solid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 54.0

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

SNT — SODIUM NITRITE

Common Synonyms
Erinitrit
Filmerine

Solid — White — Odorless

Sinks and mixes with water

[illegible]

Fire

Not flammable
Will increase the intensity of a fire
May cause fire on contact with combustibles
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

CAUTION REDDISH AMP

DUST
Irritating to eyes, nose and throat
If inhaled will cause headache, difficult breathing, or loss of consciousness
[illegible]

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause headache, nausea, vomiting or loss of consciousness
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — oxidizing material
Restrict access
Disperse and flush

2 LABEL

OXIDIZER

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Erinitrit Filmerine
3 2 **Coast Guard Compatibility Classification** Not listed
3 3 **Chemical Formula** $NaNO_2$
3 4 **IMCO/United Nations Numerical Designation.** 5 1, 1500

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Ingestion (or inhalation of excessive amounts of dust) causes rapid drop in blood pressure, persistent and throbbing headache, vertigo, palpitations and visual disturbances, skin becomes flushed and sweaty, later cold and cyanotic, other symptoms include, nausea, vomiting, diarrhea (sometimes), fainting, methemoglobinemia. Contact with eyes causes irritation
5 3 **Treatment for Exposure:** INHALATION: move to fresh air, if exposure is severe, get medical attention. INGESTION: keep patient recumbent in a shock position and comfortable, warm, administer gastric lavage, consult a physician. EYES or SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Grade 3 LD50 50 - 500 mg/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable but may intensify fire
6 2 **Flammable Limits in Air** Not flammable
6 3 **Fire Extinguishing Agents.** Apply plenty of water to adjacent fires. Cool exposed containers with water
6 4 **Fire Extinguishing Agents Not to be Used**
6 5 **Special Hazards of Combustion Products** Toxic oxides of nitrogen may form in fires
6 6 **Behavior in Fire** May increase intensity of fire if in contact with combustible material. May melt and flow at elevated temperatures
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate.** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
17 1 ppm, 24 hr, minnow, no effect, fresh water
7 5 ppm, 48 hr, mosquitofish, TL_m, fresh water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown N J 07960
2 J T Baker Chemical Co
Phillipsburg N J 08865
3 Fisher Scientific Co
711 Forbes Ave
Pittsburgh Pa 15219

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** USP Reagent
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Solid oxidizing material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight:** 69
13 3 **Boiling Point at 1 atm** (decompose) >608°F = >320°C = >593°K
13 4 **Freezing Point:** 520°F = 271°C = 544°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 2 17 at 20°C (solid)
13 8 **Liquid Surface Tension.** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on page 5 and 6)

NOTES

SOX	SODIUM OXALATE

Common Synonyms			
Ethanedioic acid disodium salt	Solid	White	Odorless
	Sinks and mixes slowly with water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause difficult breathing or loss of consciousness SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Ethanedioic acid disodium salt

3.2 **Coast Guard Compatibility Classification.** Not listed

3.3 **Chemical Formula.** $Na_2C_2O_4$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Dust mask, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation or ingestion causes pain in throat, esophagus, and stomach, mucous membranes turn white, other symptoms include vomiting, severe purging, weak pulse, cardiovascular collapse, neuromuscular symptoms, and kidney damage. Contact with eyes or skin causes irritation

5.3 **Treatment for Exposure:** *Act promptly!* INHALATION: move to fresh air if exposure to dust is severe, get medical attention. INGESTION: give dilute calcium lactate, lime water, or milk, administer gastric lavage, consult physician, watch for edema of the glottis and delayed constriction of esophagus. EYES or SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion** Grade 3 LD_{50} 500 mg/kg

5.7 **Late Toxicity.** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire**

6.7 **Ignition Temperature** Not pertinent

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 1,350 ppm/48 hr/mosquitofish, TL_m fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 1.9%, 5 days

8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. J. T. Baker Chemical Co.
   Phillipsburg, N. J. 08865
2. Fisher Scientific Co.
   711 Forbes Ave.
   Pittsburgh, Pa. 15219
3. Gallard-Schlesinger Chemical Mfg. Co.
   584 Mineola Ave.
   Carle Place, N. Y. 11514

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent
Primary standard grade

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II-SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight** 134.0

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point.** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.27 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

SPP — SODIUM PHOSPHATE

Common Synonyms	Solid (powder or granules) White Odorless Sinks and mixes with water
Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** "Sodium phosphate" is generic term and includes the following (1) monosodium phosphate (MSP sodium phosphate monobasic) (2) disodium phosphate (DSP sodium phosphate dibasic) (3) trisodium phosphate (TSP sodium phosphate tribasic) (4) sodium acid pyrophosphate (ASPP SAPP disodium dihydrogen pyrophosphate) (5) tetrasodium pyrophosphate (TSPP)

Continued on page 4

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Granular or powdered solid some may appear glassy

4 2 **Color** White

4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** U S Bu Mines toxic dust mask protective gloves chemical type goggles full cover clothing

5 2 **Symptoms Following Exposure** Inhalation of heavy dust may irritate nose and throat Ingestion may injure mouth throat and gastrointestinal tract resulting in nausea vomiting cramps and diarrhea pain and burning in mouth may occur Contact with eyes produces local irritation can lead to chronic damage Contact with skin produces local irritation repeated or prolonged contact can lead to dermatitis

5 3 **Treatment for Exposure** If the following measures do not eliminate the symptoms see a physician INHALATION give large amounts of water or warm salty water to induce vomiting repeat until vomitus is clear milk eggs or olive oil may then be given to soothe stomach EYES immediately flush with large amounts of water for at least 15 min holding eyelids apart to ensure flushing of entire surface avoid chemical neutralizers SKIN flush with water avoid chemical neutralizers

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold.** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire** May melt with loss of steam

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** All dissolve readily MSP and ASPP form weakly acidic solutions TSP forms strong caustic solution similar to soda ash TSPP forms weakly alkaline solution

7 2 **Reactivity with Common Materials** When wet mild steel or brass may be corroded by MSP ASPP and TSP The others are not considered corrosive

7 3 **Stability During Transport:** All forms of sodium phosphate are stable TSP tends to pick up moisture from air and form a hard cake

7 4 **Neutralizing Agents for Acids and Caustics:** For those sodium phosphates that form acidic or basic solutions dilution with water removes hazard

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** 126 ppm 72 hr daphnia magna TLm fresh water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Stauffer Chemical Co
Industrial Chemical Division
Westport Conn 06880

2 FMC Corporation
Inorganic Chemicals Div
633 Third Avenue
New York N Y 10017

3 Monsanto Company
800 North Lindbergh Blvd
St Louis Mo 63166

10 SHIPPING INFORMATION

10 1 **Grades or Purity** All are available in Technical Grade some in Food Grade and Reagent Grade Some are available as hydrates as well as anhydrous forms

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications** Not listed

3 CHEMICAL DESIGNATIONS (Cont'd.)

(6) sodium metaphosphate (insoluble sodium metaphosphate) (7) sodium trimetaphosphate (8) sodium hexametaphosphate and (9) sodium tripolyphosphate (STPP TPP)

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula** (1) NaH_2PO_4 (2) Na_2HPO_4 (3) Na_3PO_4 (4) $Na_4P_2O_7$ (5) $Na_2P_2O_7$ (6) $(NaPO_3)_n$ (7) $(NaPO_3)_3$ (8) $(NaPO_3)_6$ Na_2O (9) $Na_5P_3O_{10}$

3 4 **IMCO/United Nations Numerical Designation** Not assigned

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** Values for anhydrous salts run from 120 to high polymer values

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure.** Not pertinent

13 7 **Specific Gravity** 1 8 2 5 at 25°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** +8 3 to −8 1 Btu lb
= +46 to −45 cal/g
= +1 93 to −1 88 × 10 J kg

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

SSC	SODIUM SILICATE

Common Synonyms	
Water glass Soluble glass	Thick liquid Colorless Odorless Sinks and mixes with water

[illegible]

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID *LIQUID* Harmful if swallowed IF SWALLOWED [illegible] CONSCIOUS [illegible] water or milk DO NOT INDUCE VOMITING
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Water glass
Soluble glass

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula.** Na_2SiO_3, $Na_2SiO_3 \cdot H_2O$

3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** High viscosity liquid

4.2 **Color:** Colorless

4.3 **Odor.** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Goggles or face shield

5.2 **Symptoms Following Exposure** If large doses are ingested some irritation of mucous membranes may occur similar to that caused by caustic soda solution

5.3 **Treatment for Exposure:** INGESTION (large doses) give water or milk do NOT induce vomiting

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5.5 **Short-Term Inhalation Limits** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 2 0.5 to 5 g/kg (human)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics** Non volatile

5.9 **Liquid or Solid Irritant Characteristics** None

5.10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire.** Not pertinent

6.7 **Ignition Temperature** Not flammable

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
2320 ppm 96 hr mosquito fish 11 m fresh water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Diamond Shamrock Chemical Co
[illegible] Superior Ave
Cleveland Ohio 44114
2. E. I. duPont de Nemours & Co Inc
Industrial and Biochemicals Dept
Wilmington Del 19898
3. Philadelphia Quartz Co
Public Ledger Bldg
Philadelphia Pa 19106

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** A wide variety of grades which differ in concentration of sodium silicate in water in specific gravity and in viscosity

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere.** No requirement

10.4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid

13.2 **Molecular Weight:** Not applicable

13.3 **Boiling Point at 1 atm** Decomposes

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 1.1 1.7 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** (est.) −20 Btu/lb = −10 cal/g = −0.4 × 10⁻³ J/kg

13.16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

SFR	SODIUM SILICOFLUORIDE

Common Synonyms			
Sodium fluosilicate Sodium hexafluorosilicate Salufer	Solid	White	Odorless
	Sinks in water		

Fire	Not flammable
Exposure	DUST Irritating to eyes nose and throat If inhaled will cause coughing or difficult breathing SOLID POISONOUS IF SWALLOWED Will burn skin and eyes If swallowed will cause nausea vomiting loss of consciousness
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 448-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Salufer Sodium fluosilicate, Sodium hexafluorosilicate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** Na_2SiF_6

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust respirator goggles or face shield protective gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat Ingestion causes symptoms similar to fluoride poisoning compound is highly toxic initial symptoms include nausea cramps vomiting diarrhea and dehydration in severe cases convulsions shock and cyanosis are followed by death in 2-4 hr Contact with eyes causes irritation Contact with skin causes rash redness and burning sometimes followed by ulcer formation

5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION seek medical attention administer gastric lavage with lime water then give lime water or milk at frequent intervals EYES flush with water for at least 15 min SKIN flush with water wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value).** 2 mg/m³ (as fluoride)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 3 LD50 500 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **behavior in Fire** Decomposes at red heat

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** None

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Gardinier Inc
P O Box 3269
Tampa Fla 33601

2 Fisher Scientific Co
711 Forbes Ave
Pittsburgh Pa 15219

3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 98+%

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-2)

H

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight:** 188

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.68 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion.** Not pertinent

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

SDS	SODIUM SULFIDE

Common Synonyms	Solid flakes Yellow to red Rotten eggs odor Sinks and mixes with water
Fire	Combustible POISONOUS GAS MAY BE PRODUCED IN FIRE Flammable poisonous gas is formed on contact with acids
Exposure	DUST Irritating to eyes nose and throat SOLID Harmful if swallowed
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning corrosive
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** No common synonyms
3.2 **Coast Guard Compatibility Classification** Not applicable
3.3 **Chemical Formula:** Na S
3.4 **IMCO United Nations Numerical Designation:** 4.2 [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Solid
4.2 **Color:** Yellow or light buff
4.3 **Odor** Like rotten eggs

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Goggles or face shield
5.2 **Symptoms Following Exposure:** Caustic action on skin and eyes. Ingested [illegible] liberate hydrogen sulfide in stomach
5.3 **Treatment for Exposure.** INGESTION give [illegible] induce vomiting call a doctor SKIN OR EYE CONTACT [illegible] with water for [illegible] min
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] pertinent
5.5 **Short-Term Inhalation Limits** Not pertinent
5.6 **Toxicity by Ingestion** [illegible] (human)
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics** Non volatile
5.9 **Liquid or Solid Irritant Characteristics** Irritates skin and mucous membranes
5.10 **Odor Threshold** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Moderately flammable solid
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents** Water
6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6.5 **Special Hazards of Combustion Products** Irritating sulfur dioxide is produced in fire
6.6 **Behavior in Fire** Not pertinent
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard.** Not pertinent
6.9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity** [illegible] 48 hr bluegill sunfish TLm fresh water
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp
Specialty Chemicals Division
Marcus Hook, Pa. 19061
2. FMC Corp
Inorganic Chemicals Division
633 Third Ave
New York, N.Y. 10017
3. Mobil Oil Corp
North American Division
Paulsboro, N.J. 08066

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Crystals 60-62% plus water fused chips
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable solid
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm** Very high
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 20°C (solid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization** Not pertinent
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

SSF	SODIUM SULFITE

Common Synonyms	Solid Colorless Odorless Sinks and mixes slowly with water
Fire	Not flammable
Exposure	SOLIDS Ingestion may cause loss of consciousness
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Recommendations
Dispersal and Sink

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** No common synonyms

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula:** Na_2SO_3

3.4 **IMCO United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor.** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Dust mask recommended

5.2 **Symptoms Following Exposure:** When ingested solid in excess of [illegible] irritation and Because rapid [illegible] Irritation [illegible] odor [illegible] depression and death [illegible]

5.3 **Treatment for Exposure:** INGESTION [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** No pertinent.

5.5 **Short-Term Inhalation Limits.** No pertinent.

5.6 **Toxicity by Ingestion** [illegible]

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** No [illegible]

5.9 **Liquid or Solid Irritant Characteristics.** No [illegible]

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air.** Not [illegible]

6.3 **Fire Extinguishing Agents** Not [illegible]

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire** Not [illegible]

6.7 **Ignition Temperature** Not [illegible]

6.8 **Electrical Hazard** Not [illegible]

6.9 **Burning Rate** Not [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No [illegible]

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not [illegible]

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** [illegible]

8.2 **Waterfowl Toxicity** [illegible]

8.3 **Biological Oxygen Demand (BOD).** [illegible]

8.4 **Food Chain Concentration Potential** [illegible]

9 SELECTED MANUFACTURERS

Kaiser Chemicals
Olin Mathieson Chemical Corp.
Pfizer, Chas. & Co., Inc.

Mallinckrodt Chemical Works
Merck & Co., Inc.
[illegible] Pittsburgh Plate Glass Co.
St. Louis, Mo.

Rockland Chemicals, Inc.
[illegible]
West Haverstraw, N.Y. 10992

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, contained in [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight** 126.04

13.3 **Boiling Point at 1 atm** Decomposes

13.4 **Freezing Point** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity** [illegible]

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

SCY	SODIUM THIOCYANATE

Common Synonyms			
Sodium sulfocyanate Sodium rhodanide Rhodanate	Solid	White	Odorless
	Sinks and mixes with water		

Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning, water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Rhodanate, Sodium rhodanide, Sodium sulfocyanate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** NaSCN

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber or plastic gloves, standard goggles, rubber or plastic apron

5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion of large doses causes vomiting, extreme cerebral excitement, convulsions, and death in 10–48 hrs; chronic poisoning can cause flu like symptoms, skin rashes, weakness, fatigue, vertigo, nausea, vomiting, diarrhea, confusion. Contact with eyes causes irritation. Prolonged contact with skin may produce various skin eruptions, dizziness, cramps, nausea, and mild severe disturbance of the nervous system

5.3 **Treatment for Exposure:** INHALATION: move to fresh air; if exposure has been great, get medical attention. INGESTION: consult physician. Hemodialysis is recommended as the treatment of choice. EYE or SKIN: flush with water for 15 min.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, LD50 [illegible] g/kg

5.7 **Late Toxicity:** Causes birth defects in chick embryos

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating vapors of sulfur and nitrogen may form in fire

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
1,240 ppm, 24 hr, fish, mixed fresh water
>500 ppm, 48 hr, green crab, 11 m, aerated salt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Argus Chemical Corp
   Halby Div
   980 Terminal Ave
   New Castle, De. 19720
2. J. T. Baker Chemical Co
   Phillipsburg, N. J. 08865
3. Fisher Scientific Co
   711 Forbes Ave
   Pittsburgh, Pa. 15219

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial 95%, Reagent 99%, 50–80% solutions in water

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

SS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 81.08

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** 472°F = 300°C = 573°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** >1 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** 34.9 Btu/lb = 19.4 cal/g = 0.812 × 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5-NaCN

NOTES

SBT	SORBITOL

Common Synonyms	Liquid	Colorless	Odorless
Sorbol Sorbit 1,2,3,4,5,6 Hexanehexol D-Glucitol	Sinks and mixes with water		

Fire	Not flammable
Exposure	LIQUID Will burn skin and eyes
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

[illegible]

2. LABELS

[illegible]

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** [illegible]

3.2 **Coast Guard Compatibility Classification** [illegible]

3.3 **Chemical Formula.** CH OH CHOH CH OH

3.4 **IMCO United Nations Numerical Designation.** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color** [illegible]

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** [illegible]

5.2 **Symptoms Following Exposure** [illegible]

5.3 **Treatment for Exposure** [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value).** [illegible]

5.5 **Short-Term Inhalation Limits** [illegible]

5.6 **Toxicity by Ingestion** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics** [illegible]

5.9 **Liquid or Solid Irritant Characteristics** [illegible]

5.10 **Odor Threshold** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point** 542°F O.C.

6.2 **Flammable Limits in Air** [illegible]

6.3 **Fire Extinguishing Agents** Water

6.4 **Fire Extinguishing Agents Not to be Used.** Data not available

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire** [illegible]

6.7 **Ignition Temperature.** Data not available

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** [illegible]

7.2 **Reactivity with Common Materials** [illegible]

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD).** [illegible]

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity** [illegible]

10.2 **Storage Temperature.** Elevated

10.3 **Inert Atmosphere** [illegible]

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classification:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm** Very high

13.4 **Freezing Point** [illegible]

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] liquid

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization** Not pertinent

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NOTES

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SRA	STEARIC ACID

Common Synonyms			
Octadecanoic acid n-Octadecyl acid Stearophanic acid 1-Heptadecanecarboxylic acid	Solid	White	Mild odor
	Floats on water		

Fire	Combustible
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1-Heptadecanecarboxylic acid; Octadecanoic acid; n-Octadecyl acid; Stearophanic acid

3.2 **Coast Guard Compatibility Classification:** Listed

3.3 **Chemical Formula:** $CH_3(CH_2)_{16}COOH$

3.4 **IMCO/United Nations Numerical Designation:** Not Listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Faint

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** For prolonged exposure: respirator and supplied air or chemical cartridge respirator; impervious gloves; aprons; impervious clothing

5.2 **Symptoms Following Exposure:** Compound is generally considered non-toxic. Inhalation of dust irritates mucous membranes and throat. Dust causes mechanical irritation of eyes

5.3 **Treatment for Exposure:** INGESTION: induce vomiting if patient is conscious; if unconscious, give nothing by mouth; as an emetic use 1 tablespoon salt in a glass of warm water. Follow with gastric lavage or other medical treatment. SKIN: wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 LD50 > 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 20 ppm

6. FIRE HAZARDS

6.1 **Flash Point.** (Molten solid) 410–435 F (OC); 365 F (CC)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents.** Foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire**

6.7 **Ignition Temperature:** 794 F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** 144% 5 days

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Union Camp Corp
2094 N. Lane Avenue
Jacksonville, Fla. 32205
2. Ashland Chemical Co
P.O. Box 2219
Columbus, Ohio 43216
3. Emery Industries, Inc.
4900 Lake Avenue
Cincinnati, Ohio 45232

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** USP, Commercial, Triple pressed, Double pressed

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Solid

13.2 **Molecular Weight:** 284.32

13.3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13.4 **Freezing Point.** 69.6°C (342.8°K)

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.847 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion.** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on reverse side)

NOTES

STY	STYRENE

Common Synonyms Styrol Vinylbenzene Phenylethylene	Watery liquid Colorless to light yellow Sweet pleasant odor Floats on water Flammable irritating vapor is produced
	FLAMMABLE CONTAINERS MAY EXPLODE IN FIRE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes nose and throat If inhaled will cause dizziness or loss of consciousness LIQUID Will burn skin and eyes Harmful if swallowed
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

[illegible]

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Phenylethylene, Phenylethylene, Styrol, Vinylbenzene

3.2 **Coast Guard Compatibility Classification** Olefin

3.3 **Chemical Formula.** [illegible]

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** [illegible]

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** INHALATION [illegible] INGESTION [illegible] SKIN OR EYE CONTACT [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value).** [illegible]

5.5 **Short-Term Inhalation Limits.** [illegible]

5.6 **Toxicity by Ingestion.** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics** [illegible]

5.9 **Liquid or Solid Irritant Characteristics** [illegible]

5.10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6.1 **Flash Point** [illegible]

6.2 **Flammable Limits in Air** [illegible]

6.3 **Fire Extinguishing Agents** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used** [illegible]

6.5 **Special Hazards of Combustion Products.** [illegible]

6.6 **Behavior in Fire** [illegible]

6.7 **Ignition Temperature** [illegible]

6.8 **Electrical Hazard.** [illegible]

6.9 **Burning Rate** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials** [illegible]

7.3 **Stability During Transport** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics** [illegible]

7.5 **Polymerization** [illegible]

7.6 **Inhibitor of Polymerization:** [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity** [illegible]

8.2 **Waterfowl Toxicity** [illegible]

8.3 **Biological Oxygen Demand (BOD)** [illegible]

8.4 **Food Chain Concentration Potential** [illegible]

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity.** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
[illegible]	
Health	
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	2
[illegible]	
[illegible]	2
[illegible]	[illegible]
[illegible]	[illegible]

12.3 **NFPA Hazard Classifications:**

Category	Classification
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm.** [illegible]

13.4 **Freezing Point.** [illegible]

13.5 **Critical Temperature** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension.** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas)** [illegible]

13.12 **Latent Heat of Vaporization** [illegible]

13.13 **Heat of Combustion.** [illegible]

13.14 **Heat of Decomposition:** [illegible]

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** [illegible]

Continued on page 5 and 6

NOTES

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SRS

SUCROSE

Common Synonyms
Beet sugar
Cane sugar
Saccharose
Saccharum
Sugar

Solid | White | Odorless

Sinks in water

Fire

Combustible

Exposure

DUST
Not harmful

SOLID
Not harmful

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Beet sugar, Cane sugar, Saccharose, Saccharum, Sugar

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $C_{12}H_{22}O_{11}$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask and goggles or face shield

5.2 **Symptoms Following Exposure:** None

5.3 **Treatment for Exposure:** EYES: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade: oral LD_{50} (30 days) = 29,700 mg/kg/day (rats)

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating fumes may form in fires

6.6 **Behavior in Fire:** Melts and chars

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** [illegible] 5 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Amstar Corporation
1251 Avenue of the Americas
New York, N.Y.
2. Great Western Sugar Co.
1530 16th Street
Denver, Colo.
3. Revere Sugar Refining Co.
Prudential Center
Boston, Mass.

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Food grade, Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 342.3

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** (decomposes) 320–366°F = 160–186°C = 433–459°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.59 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** 6,400 Btu/lb = [illegible] cal/g = 150 x 10^6 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

SFL	SULFOLANE

Common Synonyms
Tetrahydrothiophene 1 1 dioxide
Tetramethylene sulfone

Oily liquid — Colorless — Weak oily odor

Solidifies and sinks and mixes with water. Freezing point is 79°F

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

LIQUID
Not irritating to skin
Irritating to eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook

2. LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification: Sulfolane
3.3 Chemical Formula: $CH_2CH_2CH_2SO_2$
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment.
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: INGESTION SKIN OR EYE CONTACT
5.4 Toxicity by Inhalation (Threshold Limit Value)
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity:
5.8 Vapor (Gas) Irritant Characteristics.
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point.
6.2 Flammable Limits in Air
6.3 Fire Extinguishing Agents
6.4 Fire Extinguishing Agents Not to be Used
6.5 Special Hazards of Combustion Products
6.6 Behavior in Fire
6.7 Ignition Temperature
6.8 Electrical Hazard.
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water.
7.2 Reactivity with Common Materials
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization.
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD)
8.4 Food Chain Concentration Potential. None

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:
10.2 Storage Temperature:
10.3 Inert Atmosphere:
10.4 Venting:

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook

NPQ

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations.
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Health	
Fire	
Reactivity	

12.3 NFPA Hazard Classifications.

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm.
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas)
13.12 Latent Heat of Vaporization.
13.13 Heat of Combustion.
13.14 Heat of Decomposition.
13.15 Heat of Solution:
13.16 Heat of Polymerization.

NOTES

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SFD	SULFUR DIOXIDE

Common Synonyms	Liquefied compressed gas. Colorless. Sharp irritating odor. Liquid sinks and boils in water. Poisonous visible vapor cloud is produced.
Fire	Not flammable.
Exposure	VAPOR POISONOUS IF INHALED. LIQUID Will cause frostbite.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

See response methods handbook, CG 446-4

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 Synonyms.

3.2 Coast Guard Compatibility Classification

3.3 Chemical Formula: SO

3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):

4.2 Color:

4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment

5.2 Symptoms Following Exposure:

5.3 Treatment for Exposure: INHALATION

5.4 Toxicity by Inhalation (Threshold Limit Value):

5.5 Short-Term Inhalation Limits

5.6 Toxicity by Ingestion.

5.7 Late Toxicity:

5.8 Vapor (Gas) Irritant Characteristics.

5.9 Liquid or Solid Irritant Characteristics

5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:

6.2 Flammable Limits in Air

6.3 Fire Extinguishing Agents

6.4 Fire Extinguishing Agents Not to be Used

6.5 Special Hazards of Combustion Products

6.6 Behavior in Fire

6.7 Ignition Temperature

6.8 Electrical Hazard

6.9 Burning Rate

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water

7.2 Reactivity with Common Materials.

7.3 Stability During Transport.

7.4 Neutralizing Agents for Acids and Caustics.

7.5 Polymerization:

7.6 Inhibitor of Polymerization

8 WATER POLLUTION

8.1 Aquatic Toxicity

8.2 Waterfowl Toxicity

8.3 Biological Oxygen Demand (BOD)

8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:

10.2 Storage Temperature:

10.3 Inert Atmosphere: No requirement

10.4 Venting: Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A C K M N

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations.

12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating

12.3 NFPA Hazard Classifications

Category	Classification

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:

13.2 Molecular Weight.

13.3 Boiling Point at 1 atm:

13.4 Freezing Point:

13.5 Critical Temperature

13.6 Critical Pressure:

13.7 Specific Gravity:

13.8 Liquid Surface Tension:

13.9 Liquid-Water Interfacial Tension.

13.10 Vapor (Gas) Specific Gravity

13.11 Ratio of Specific Heats of Vapor (Gas):

13.12 Latent Heat of Vaporization.

13.13 Heat of Combustion:

13.14 Heat of Decomposition:

13.15 Heat of Solution.

13.16 Heat of Polymerization:

Continued on page 1 and 4

NOTES

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SFA

SULFURIC ACID

Common Synonyms
Oil of vitriol
Battery acid
Fertilizer acid

Oily liquid — Colorless — Odorless

Sinks and mixes violently with water. Irritating gas is produced.

Fire

Not flammable
May cause fire on contact with combustibles
Flammable gas may be produced on contact with metals
POISONOUS GAS MAY BE PRODUCED IN FIRE

Exposure

MIST
Irritating to eyes, nose and throat
If inhaled, will cause coughing, difficult breathing, or loss of consciousness

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUA LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Action Guide Handbook CG 446-4)

Issue warning: corrosive
Restrict access
Disperse and flush with care

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Battery acid
Chamber acid
Fertilizer acid
Oil of vitriol

3.2 **Coast Guard Compatibility Classification** Sulfuric acid

3.3 **Chemical Formula*** H_2SO_4

3.4 **IMCO/United Nations Numerical Designation** NO/1830

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)*** Liquid

4.2 **Color:** Colorless (pure) to dark brown

4.3 **Odor:** Odorless unless hot (then choking)

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Safety shower, eyewash fountain, safety goggles, face shield, approved respirator (self contained or air line), rubber safety shoes, rubber apron

5.2 **Symptoms Following Exposure** Inhalation of vapor from hot concentrated acid may injure lungs. Swallowing may cause severe internal burns. Contact with skin or eyes causes severe burns.

5.3 **Treatment for Exposure** Call a doctor. INHALATION: oxygen, set up for delayed pulmonary reaction. INGESTION: have victim drink water if possible, do NOT induce vomiting. EYES AND SKIN: wash with large amounts of water for at least 15 min; do not use oils or ointments in eyes; treat skin burns.

5.4 **Toxicity by Inhalation, (Threshold Limit Value)*** 1 mg/m³

5.5 **Short-Term Inhalation Limits** 10 mg/m³ for 5 min; 5 mg/m³ for 10 min; 2 mg/m³ for 30 min; 1 mg/m³ for 60 min

5.6 **Toxicity by Ingestion** Not likely except in very small quantities to cause tissue damage

5.7 **Late Toxicity** None

5.8 **Vapor (Gas) Irritant Characteristics** Vapors from hot acid (77-98%) cause moderate irritation of eyes and respiratory system. Effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics** 77-98% acid causes severe second and third degree burns of skin on short contact and is very injurious to the eyes.

5.10 **Odor Threshold** Greater than 1 mg/m³

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air** Not flammable

6.3 **Fire Extinguishing Agents.** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Water used on adjacent fires should be carefully handled

6.5 **Special Hazards of Combustion Products*** Not pertinent

6.6 **Behavior in Fire** Not flammable

6.7 **Ignition Temperature** Not flammable

6.8 **Electrical Hazard** None

6.9 **Burning Rate** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** Reacts violently with evolution of heat. Spattering occurs when water is added to the compound.

7.2 **Reactivity with Common Materials** Extremely hazardous in contact with many materials, particularly metals and combustibles. Dilute acid reacts with most metals releasing hydrogen which can form explosive mixtures with air in unventilated spaces.

7.3 **Stability During Transport*** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Dilute with water, then neutralize with lime, limestone, or soda ash.

7.5 **Polymerization.** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity*** 24 ppm/24 hr, bluegill, lethal, fresh water
42 ppm/48 hr, prawn, 1% salt water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)*** None

8.4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Industrial Chemical Division
P.O. Box 1139R
Morristown, N.J. 07960

2 Cities Service Co. Inc
North American Chemicals and Metals Group
60 Wall St
New York, N.Y. 10005

3 E.I. duPont de Nemours & Co. Inc
Explosives Dept
Wilmington, DE 19898

10 SHIPPING INFORMATION

10.1 **Grades or Purity** CP, USP, Technical at 33% to 98% (93° Be to 66° Be)

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P O

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive Material

12.2 **NFPA Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	0
Health	
Vapor Irritant	2
Liquid or Solid Irritant	4
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	3
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	2
	W

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight** 98.08

13.3 **Boiling Point at 1 atm** (644°F) = 340°C = 613°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure** Not pertinent

13.7 **Specific Gravity*** 1.84 at 20°C (liquid)

13.8 **Liquid Surface Tension** Not pertinent

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity*** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion*** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution*** −11,900 Btu/lb = −242.2 cal/g = −9.715 × 10⁵ J/kg

13.16 **Heat of Polymerization** Not pertinent

*Physical properties apply to concentrated (98%) acid unless otherwise stated. More dilute acid is more water like.

Continued on back

NOTES

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SAC — SULFURIC ACID, SPENT

Common Synonyms
Dilute sulfuric acid

Oily liquid — Colorless to dark brown — Odorless

Sinks and mixes with water

[illegible]

Fire

Not flammable
Poisonous gas may be produced in fire
Flammable gas may be produced on contact with metals
[illegible]

Exposure

[illegible]
LIQUID
Will burn skin and eyes
Harmful if swallowed
[illegible]
IN EYES [illegible]
IF SWALLOWED [illegible]
DO NOT INDUCE [illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — corrosive
Restrict access
Dispose and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** No common synonyms
3.2 **Coast Guard Compatibility Classification** *Sulfuric acid*
3.3 **Chemical Formula.** $H_2SO_4 \cdot H_2O$
3.4 **IMCO/United Nations Numerical Designation:** NO 1832

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color** Colorless to dark brown
4.3 **Odor.** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Chemical safety goggles and face shield, rubber gloves, boots, and apron
5.2 **Symptoms Following Exposure** Contact with eyes or skin causes severe burns, the severity depending on the strength of the acid. Ingestion causes severe irritation of mouth and stomach
5.3 **Treatment for Exposure** Call a doctor. INGESTION: do NOT induce vomiting. SKIN OR EYES: flush affected parts with large amounts of water for at least 15 min; do NOT use oils or ointments in eyes. Treat burns
5.4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5.5 **Short-Term Inhalation Limits** Not pertinent
5.6 **Toxicity by Ingestion** No effects except those stemming from tissue damage
5.7 **Late Toxicity.** None
5.8 **Vapor (Gas) Irritant Characteristics** Non volatile
5.9 **Liquid or Solid Irritant Characteristics.** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eye
5.10 **Odor Threshold.** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** None unless strength is above 80–90% in which case heat is liberated
7.2 **Reactivity with Common Materials:** Attacks many metals releasing flammable hydrogen gas
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Limestone, lime or soda ash
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity.**
24 Sppm/24 hr bluegill lethal fresh water
42 Sppm/48 hr grass LC50 salt water
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Not manufactured. Dilute or spent sulfuric acid is formed as a result of various uses of the concentrated acid

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Purity depends on the process in which the original acid is used. The strength (in water) is probably below 80% and the solution may contain a wide variety of metals and organic compounds in solution
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Corrosive material
12.2 **NAS hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	0
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm** Liquid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm.** 112°F = 100°C = 373°K
13.4 **Freezing Point** Not pertinent
13.5 **Critical Temperature.** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.19 at 20°C (liquid)
13.8 **Liquid Surface Tension** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent
13.12 **Latent Heat of Vaporization.** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution** < -418 Btu/lb = < -232 cal/g = < -9.71 × 10⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

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SXX SULFUR (LIQUID)

Common Synonyms
Brimstone

Liquid (molten solid) Yellow orange tan brown or gray Faint rotten eggs odor

Thickens and sinks in water

[illegible]

Fire

Combustible
POISONOUS GAS IS PRODUCED IN FIRE

[illegible]

Exposure

[illegible]
LIQUID
Will burn skin and eyes
Harmful if swallowed

[illegible]

Water Pollution

Dangerous to aquatic life in high concentrations
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Sulphur (liquid)
Brimstone (liquid)

3 2 **Coast Guard Compatibility Classification:** Sulfur molten

3 3 **Chemical Formula** S

3 4 **IMCO/United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Bright yellow orange tan brown gray depending upon amount and type of hydrocarbon impurity

4 3 **Odor:** Pure sulfur is odorless but traces of hydrocarbon impurity may impart an oily and/or rotten egg odor Recovered sulfur usually has a strong rotten egg odor

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety goggles with side shields approved respirator heat resistant gloves leather heat resistant clothing If come co sulfur refer to hydrogen sulfide

5 2 **Symptoms Following Exposure:** Can cause eye irritation may cause irritation skin If recovered sulfur refer to hydrogen sulfide *

5 3 **Treatment for Exposure.** EYES wash eyes copiously for at least 15 min SKIN Treat molten sulfur burns with petroleum jelly or mineral oil If recovered sulfur treat as for hydrogen sulfide *

5 4 **Toxicity by Inhalation (Threshold Limit Value).** If recovered sulfur see hydrogen sulfide *

5 5 **Short-Term Inhalation Limits** If recovered sulfur see hydrogen sulfide *

5 6 **Toxicity by Ingestion** Grade 1 LD50 [illegible]

5 7 **Late Toxicity:** None

5 8 **Vapor (Gas) Irritant Characteristics.** Non volatile

5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5 10 **Odor Threshold** If recovered sulfur see hydrogen sulfide *

*Significant amounts of hydrogen sulfide, a very poisonous gas, may collect in poorly ventilated containers of liquid sulfur that has been recovered from hydrogen sulfide

6 FIRE HAZARDS

6 1 **Flash Point.** 405°F C C for recovered sulfur see hydrogen sulfide

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products** Produces toxic sulfur dioxide gas

6 6 **Behavior in Fire** Burns with a pale blue flame that may be difficult to see in daylight

6 7 **Ignition Temperature** 450°F for recovered sulfur see hydrogen sulfide

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials:** No hazardous reactions

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
10,000 ppm 96hr mosquito fish [illegible] fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Freeport Minerals Co
Freeport Sulphur Co Division
521 Gravier St
New Orleans La 70112

2 Pennzoil United Inc
Duval Corp
19 6 First City Nat Bank Bldg
Houston Tex 77002

3 Texas Gulf Sulfur
200 Park Ave
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Trash liquid sulfur 99 8+ % solid sulfur is sold in many varieties and grades these are not presently covered in this manual

10 2 **Storage Temperature:** 270°F

10 3 **Inert Atmosphere** Ventilated (natural)

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-X-1

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1 3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification*	
Health Hazard (Blue)	1	2
Flammability (Red)	0	0
Reactivity (Yellow)	1	1

*First column refers to non fire situations Ratings pertain to solid sulfur

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 256 S

13 3 **Boiling Point at 1 atm**
832 °F = 444 6 °C = 717 8 °K

13 4 **Freezing Point:**
251°F = 121 7 °C = 394 9 °K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 1 80 at 120 °C (liquid)

13 8 **Liquid Surface Tension**
60 N/dynes/cm = 0 0608 N/m at 120 °C

13 9 **Liquid-Water Interfacial Tension** (est)
50 dynes/cm = 0 05 N/m at 127 °C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 582 (est)

13 12 **Latent Heat of Vaporization** 1,40 Btu/lb = 69 cal/g = 2 9 × 10 J/kg

13 12 **Heat of Combustion.** −4 741 Btu/lb = −2 634 cal/g = −110 3 × 10 J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page Sxx4b

NOTES

SFM	SULFUR MONOCHLORIDE

Common Synonyms	Oily liquid Yellow to red Irritating sharp odor Mixes and reacts with water. Poisonous vapor is produced
	[illegible]
Fire	Combustible [illegible]
Exposure	[illegible] VAPOR Irritating to eyes. Poisonous if inhaled [illegible] LIQUID Will burn skin and eyes Poisonous if swallowed [illegible]
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning corrosive air contaminant water contaminant
Restrict access
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification** Not applicable
3 3 **Chemical Formula:** S_2Cl_2
3 4 **IMCO United Nations Numerical Designation.** NO 1828

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color** Yellowish red
4 3 **Odor:** Suffocating pungent nauseating irritating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Chemical safety goggles and or face shield canister type gas mask (high concentrations) or self contained breathing apparatus (heavy concentrations) chemically resistant shoes or boots apron and long sleeve gloves
5 2 **Symptoms Following Exposure** Vapors irritate eyes and respiratory system poisonous effects may result Liquid burns and damages eyes Unless removed at once it burns the skin Ingestion causes severe corrosive effects to mouth and stomach
5 3 **Treatment for Exposure:** INHALATION remove to fresh air use artificial respiration and oxygen if required call doctor INGESTION give water do NOT induce vomiting call a doctor EYES flush with water for at least 15 min obtain medical attention if needed SKIN flush with water remove contaminated clothing and shower
5 4 **Toxicity by Inhalation (Threshold Limit Value).** 1 ppm
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion** Data not available
5 7 **Late Toxicity:** None
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat in very low concentrations. They cannot be tolerated even at low concentrations
5 9 **Liquid or Solid Irritant Characteristics** Severe skin irritant Causes second and third degree burns on short contact and is very irritating to the eyes
5 10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** 245°F C.C. (266°F O.C.)
6 2 **Flammable Limits in Air** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical carbon dioxide water spray
6 4 **Fire Extinguishing Agents Not to be Used** Water reacts violently with compound
6 5 **Special Hazards of Combustion Products** Toxic and corrosive fumes are evolved when heated
6 6 **Behavior in Fire** Not pertinent
6 7 **Ignition Temperature.** 243°F
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts violently with water to produce heat and hydrogen chloride fumes. The solution is strongly acid
7 2 **Reactivity with Common Materials.** The liquid dissolves rubber and plastics After reaction with water the strong acid formed attacks metals generating flammable hydrogen gas
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics** After reaction with water the acid formed can be neutralized with lime or soda ash
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity.** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Hooker Chemical Corp
Industrial Chemicals Division
Niagara Falls, N.Y. 14302

2 Stauffer Chemical Co
Industrial Chemical Division
Niagara Falls, N.Y. 14302

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial material may contain 0.5% free sulfur
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A O

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Corrosive material

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	[illegible]
Aquatic Toxicity	[illegible]
Aesthetic Effect	4
Reactivity	
Other Chemicals	2
Water	4
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid
13 2 **Molecular Weight** 135.03
13 3 **Boiling Point at 1 atm**
280°F = 138°C = 411°K
13 4 **Freezing Point.**
−112°F = −80°C = 193°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.68 at 20°C (liquid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.129
13 12 **Latent Heat of Vaporization:**
[illegible] Btu/lb = [illegible] cal/g = 2.67×10^5 J/kg
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** 502.2 Btu/lb
= 279.0 cal/g = 11.67×10^5 J/kg
13 16 **Heat of Polymerization** Not pertinent

Continued on page [illegible]

NOTES

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SCL

SULFURYL CHLORIDE

Common Synonyms

Water's liquid Colorless to amber yellow [illegible] odor

Mixes and reacts violently with water. Poisonous gas is produced

Fire

Not flammable
Flammable gas may be produced on contact with metals

Exposure

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause coughing, difficult breathing or loss of consciousness

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning [illegible] contaminant
Restrict access
Evacuate area
Disperse and flush with care

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** None commonly used
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula** SO_2Cl_2
3.4 **IMCO United Nations Numerical Designation.** NA 1934

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color** Colorless to light yellow
4.3 **Odor:** Acid choking

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles and face shield. Mask with acid vapor canister, rubber gloves and boots
5.2 **Symptoms Following Exposure:** Vapor causes severe irritation to eyes and respiratory system. Liquid burns eyes and skin. Ingested can cause severe chemical burns of hard stomach
5.3 **Treatment for Exposure:** Call a doctor. INHALATION: remove to fresh air, maintain artificial respiration if required. INGESTION: give water to drink. DO NOT induce vomiting. EYES: Flush with water for 15 min. SKIN: wash with large amounts of water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes severe irritation to eyes and throat and can cause severe lung injury. Low [illegible] may be tolerated even at low concentrations
5.9 **Liquid or Solid Irritant Characteristics:** Highly corrosive to skin. Irritant may cause pain and second degree burns after a few minutes [illegible]
5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Water applied to adjacent fire should be handled carefully
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire** Toxic and irritating gas may be generated
6.7 **Ignition Temperature** Not flammable
6.8 **Electrical Hazard** Not [illegible]
6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously with water (exothermic) hydrolyzes to chloride ion and forming sulfuric acid
7.2 **Reactivity with Common Materials** Acids formed by reaction with moisture attack metals and liberate flammable hydrogen gas
7.3 **Stability During Transport** Stable
7.4 **Neutralizing Agents for Acids and Caustics** Acid formed by reaction with water can be neutralized by caustic, lime, soda ash
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD)** None
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Hooker Chemical Corp
Industrial Chemical Division
Niagara Falls, N.Y. 14302
2. Union Carbide Corp
Linde Division
270 Park Ave
New York, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99
10.2 **Storage Temperature** Ambient
10.3 **Inert Atmosphere:** Not required
10.4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

XO

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations**
Corrosive material
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 134.97
13.3 **Boling Point at 1 atm**
154.1 F = 69.1 C = 342.3 K
13.4 **Freezing Point** Not pertinent
13.5 **Critical Temperature.** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.67 at 20 C (liquid)
13.8 **Liquid Surface Tension.** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 4.6
13.11 **Ratio of Specific Heats of Vapor (Gas)** 1.22
13.12 **Latent Heat of Vaporization:**
89.1 Btu/lb = 49 cal/g = 2.07×10^5 J/kg
13.13 **Heat of Combustion** Not pertinent
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution:** 885.5 Btu/lb
= 491.9 cal/g = 20.58×10^5 J/kg
13.16 **Heat of Polymerization.** Not pertinent

Continued on page 3-[illegible]

NOTES

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TLO	TALLOW

Common Synonyms Edible tallow Inedible tallow	Oily liquid — Dark yellow — Waxy odor Floats on water. Freezing point is 35°F – 45°F
	[illegible]
Fire	Combustible [illegible]
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms** Edible tallow
Inedible tallow
Tallow oil

3.2 **Coast Guard Compatibility Classification:** Ester

3.3 **Chemical Formula:** Not pertinent

3.4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Dark yellow

4.3 **Odor:** Waxy

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, protective clothing if exposure to hot liquid is possible

5.2 **Symptoms Following Exposure** Hot liquid can burn eyes and skin

5.3 **Treatment for Exposure:** Treat burns caused by hot liquid

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 0 LD50 above 15 g/kg

5.7 **Late Toxicity** None

5.8 **Vapor (Gas) Irritant Characteristics.** Not volatile

5.9 **Liquid or Solid Irritant Characteristics:** None

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** 509°F C.C.

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents** Foam, water, carbon dioxide, or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature** Data not available

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity.** Data not available

8.3 **Biological Oxygen Demand (BOD)** 192 v. 5 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Atlas Refinery, Inc.
142 Lockwood St.
Newark, N.J. 07105
2. Reilly Whiteman, Inc.
Conshohocken, Pa. 19428
3. Swift and Co.
115 W. Jackson Blvd.
Chicago, Ill. 60604

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Acidless, buffing, industrial fancy, edible, inedible

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

N E E

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** Very high

13.4 **Freezing Point:** 35°–45°F
= 2.7°C = 275°–280°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** (est.) 0.87 at 80°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization.** Not pertinent

13.13 **Heat of Combustion:** (est.) = 15,000 Btu/lb
= −10,000 cal/g = −420 × 10³ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution.** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

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TFA	TALLOW FATTY ALCOHOL

Common Synonyms			
Higher fatty alcohol Stearyl alcohol crude	Waxy solid Floats on water	White	Mild soapy odor

Fire	Combustible
Exposure	SOLID Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Higher fatty alcohol
Stearyl alcohol crude

3 2 **Coast Guard Compatibility Classification:** Alcohol

3 3 **Chemical Formula**
$C_{18}H_{37}OH$ (approx.)

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Waxy white

4 3 **Odor:** Mild soapy

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Material is practically non toxic Contact with eyes or prolonged contact with skin can cause mild irritation

5 3 **Treatment for Exposure:** EYES flush with water if irritation persists see a doctor SKIN wipe off wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 1,900 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** >270°F C C

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Dry chemical foam carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Procter & Gamble Distributing Co
Industrial Chemicals Division
P O Box 599
Cincinnati Ohio 45201

2 Ashland Chemical Co
Industrial Chemicals and Solvents Div
P O Box 2219
Columbus Ohio 43216

3 M Michel and Co , Inc
90 Broad Street
New York N Y 10004

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 262 (avg)

13 3 **Boiling Point at 1 atm:**
>480°F = >249°C = >522°K

13 4 **Freezing Point:**
127°F = 53°C = 326°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 810 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est.)
−18,500 Btu/lb = −10,200 cal/g
= −430 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(continued on page 5 and 6)

NOTES

TNA	TANNIC ACID

Common Synonyms			
Tanin Chinese tanin Gallotannic acid Gallotannin Glycerite	Solid	Light yellow to tan	Faint odor
	Sinks and mixes with water		

Fire	Combustible
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Chinese tannin
Gallotannic acid, Gallotannin
Glycerite Tannin

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $C_{76}H_{52}O_{46}$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid

4 2 **Color:** Light tan to yellow

4 3 **Odor** Faint characteristic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield protecting gloves

5 2 **Symptoms Following Exposure** Inhalation causes irritation of nose and throat coughing and sneezing Ingestion may cause gastric disturbance Contact with eyes causes irritation

5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION give large amount of water induce vomiting EYES or SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 2 oral LD_{50} = 2 300 mg/kg (rats)

5 7 **Late Toxicity:** Causes cancer of liver in rats

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not pertinent (combustible solid)

6 2 **Flammable Limits in Air** Not pertinent

6 3 **Fire Extinguishing Agents:** Water foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products** Decomposes at 210° to carbon dioxide and pyrogallol which can form irritating vapors

6 6 **Behavior in Fire**

6 7 **Ignition Temperature** 980 F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
97 ppm 96 hr (mosquitofish) TL_m fresh water
<0.7 mg/L 2 hr young chinook salmon critical level salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** 16% 5 days

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 The Harshaw Chemical Co
1948 East 97 Street
Cleveland Ohio 44106

2 J T Baker Chemical Co
Phillipsburg N J 08865

3 Fisher Scientific Co
711 Forbes Ave
Pittsburgh Pa 15219

10 SHIPPING INFORMATION

10 1 **Grades or Purity** Commercial 84% Reagent

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 1 701

13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity** >1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (est) = 9 X 10 Btu/lb = −5,450 cal/g = −228 X 10³ J/kg

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution.** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

TES	2,4,5-T (ESTERS)

Common Synonyms			
Butyl 2,4,5-trichlorophenoxyacetate Butoxypropyl trichlorophenoxyacetate Isooctyl trichlorophenoxyacetate 2-Ethylhexyl trichlorophenoxyacetate	Liquid Sinks in water	Yellowish brown	Mild odor

Fire	Combustible Irritating gases may be produced when heated
Exposure	LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard - label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Butyl 2,4,5-trichlorophenoxyacetate, Butoxypropyl trichlorophenoxyacetate, Isooctyl trichlorophenoxyacetate, 2-Ethylhexyl trichlorophenoxyacetate

3 2 **Coast Guard Compatibility Classification:** Not listed

(continued on page 4)

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Amber, dark amber

4 3 **Odor:** Very weak, mixtures with kerosene or diesel oil have odor of the solvent

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield and rubber gloves

5 2 **Symptoms Following Exposure:** Ingestion causes intestinal disturbances. Contact with eyes or skin causes mild irritation, transient corneal injury may occur

5 3 **Treatment for Exposure:** INGESTION: promptly induce vomiting and get medical attention. EYES: flush with flowing water and get medical attention. SKIN: wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3; LD_{50} 500 mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 205-420°F O.C.

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products.** Hydrogen chloride gas and other irritating fumes may form in fires

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate.** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
Isooctyl ester 26 ppm/46 hr/bluegill/Tl m/fresh water
Butoxypropyl ester 17 ppm/48 hr/bluegill/Tl m/fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9. SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich 48640

2 Transvaal Inc
P O Box 69
Jacksonville, Ark 72076

3 Rhodia Inc
Chipman Division
24 Belmont Drive
Somerset, N J 08873

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 96-99% [illegible] solvents kerosene or diesel oil which are combustible

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirements

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A X Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** Mixtures all greater than 300

13 3 **Boiling Point at 1 atm:**

Butyl	Butoxypropyl	Isooctyl	2-Ethylhexyl
639	651	570	>570°F
337	344	410	>410°C
610	617	683	>683°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.2 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Data not available

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(continued on pages 5 and 6)

3 CHEMICAL DESIGNATIONS (Cont'd)

3 3 **Chemical Formula** $2,4,5\text{-}Cl_3C_6H_2OCH_2COOR$
where R = C_4H_9, C_8H_{17}, etc

3 4 **IMCO/United Nations Numerical Designation:** Not listed

TBT	TETRABUTYL TITANATE

Common Synonyms	
Isobutyl butoxide Butyl titanate Titanium tetrabutoxide Butyl titanate monomer	Liquid — Colorless to light yellow — Weak alcohol-like odor May float or sink in water. Reacts with water

Fire	Combustible Containers may explode in fire
Exposure	LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — water contaminant
Restrict access
Mechanical containment
Disperse and flush

2. LABELS

No label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Butyl titanate, Butyl titanate monomer, Orthotitanic acid tetrabutyl ester, Titanium butoxide, Titanium tetrabutoxide

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $Ti(OC_4H_9)_4$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless to pale yellow

4.3 **Odor:** Weak alcoholic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus or organic canister mask, goggles or face shield, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes nonspecific irritation of the upper respiratory tract. Contact with liquid may cause corneal damage in eyes and local irritation of skin. Ingestion causes nonspecific irritation of gastrointestinal tract, nausea, vomiting, cramps, and diarrhea; in severe cases, central nervous system depression may result.

5.3 **Treatment for Exposure:** INHALATION: move from contaminated atmosphere; if symptoms of respiratory discomfort persist, see a physician. EYES: immediately flush with large amounts of running water for a minimum of 15 min; obtain medical attention if irritation persists. SKIN: immediately flush affected areas with water; obtain medical attention if irritation persists. INGESTION: give large amounts of water or warm salty water to induce vomiting; if this measure is unsuccessful, vomiting may be induced by tickling the back of the patient's throat with a finger; vomiting should be encouraged until vomitus is clear; obtain medical attention if abdominal discomfort persists.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 470°F C.C.

6.2 **Flammable Limits in Air:** 2 – 12

6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** water

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** May give off dense white smoke. Containers may explode

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 1.4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts to form butanol and titanium dioxide; the reaction is not hazardous.

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1. Stauffer Chemical Company, Specialty Chemical Division, Westport, Conn. 06880
2. Venture Corporation, Chemicals Division, 8 Congress Street, Beverly, Mass. 01915
3. Dynamit Nobel of America Inc., 105 Stonehurst Court, Northvale, N.J. 07647

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A O F U A-Y

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 340

13.3 **Boiling Point at 1 atm:** 560°F = 312°C = 585°K

13.4 **Freezing Point:** −67°F = −55°C = 218°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.995 at 25°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** 142 Btu/lb = 79 cal/g = 3.3 × 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) −14,600 Btu/lb = −8,100 cal/g = −340 × 10⁵ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(continued on reverse side)

NOTES

TEC	TETRACHLOROETHANE

Common Synonyms			
1 1 2 2 Tetrachloroethane Acetylene tetrachloride	Liquid Sinks in water	Colorless to pale yellow	Sweet odor

Fire	Not flammable Poisonous gases may be produced when heated
Exposure	VAPOR Irritating to eyes, nose and throat Harmful if inhaled LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - poison air contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Acetylene tetrachloride
1 1 2 2 Tetrachloroethane

3 2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3 3 **Chemical Formula:** $CHCl_2CHCl_2$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless slightly yellow light yellowish green

4 3 **Odor:** Chloroform like, pleasant like carbon tetrachloride mild sweetish similar to several other chlorinated hydrocarbons

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical safety goggles plastic face shield air or oxygen supplied mask, safety hat with brim, solvent proof apron synthetic rubber gloves

5 2 **Symptoms Following Exposure:** Compound is a powerful narcotic and liver poison may also cause changes in blood composition and neurological disturbances Repeated exposure by inhalation can be fatal Ingestion causes vomiting, diarrhea severe mucosal injury liver necrosis cyanosis unconsciousness loss of reflexes, and death Contact with eyes causes irritation and lachrymation Can be absorbed through the skin and may produce severe skin lesions

5 3 **Treatment for Exposure:** INHALATION remove victim from exposure begin artificial respiration if breathing has ceased INGESTION induce vomiting, call a physician EYES irrigate with water for 15 min SKIN remove clothing, wash skin thoroughly with warm water and soap

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5 5 **Short-Term Inhalation Limits:** 10 ppm 30 min

5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 200 mg/kg rats

5 7 **Late Toxicity:** Liver poisoning nervous disorders

5 8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5 10 **Odor Threshold:** 0 5 ppm

6 FIRE HAZARDS

6 1 **Flash Point.** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Irritating hydrogen chloride vapor may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Hooker Chemical Corp
Industrial Chemicals Div
Niagara Falls N Y 14302

2 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

3 Eastman Organic Chemicals
Rochester N Y 14650

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 98 5

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A X

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** ORM A

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 167 85

13 3 **Boiling Point at 1 atm:** 295 3°F = 146 3°C = 419 5°K

13 4 **Freezing Point:** −46 8°F = −43 8°C = 229 4°K

13 5 **Critical Temperature:** Data not available

13 6 **Critical Pressure:** Data not available

13 7 **Specific Gravity:** 1 595 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 37 85 dynes/cm = 0 03785 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** 5 79

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 090 at 25°C

13 12 **Latent Heat of Vaporization:** 99 2 Btu/lb = 55 1 cal/g = 2 30 × 10 J/kg

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

NOTES

TTE	TETRACHLOROETHYLENE

Common Synonyms Tetracap Perclene Perchloroethylene	Water: liquid Colorless Sweet odor Sinks in water. Irritating vapor is produced
Fire	Not flammable Poisonous gases are produced when heated
Exposure	VAPOR Irritating to eyes, nose, and throat If inhaled, will cause difficult breathing or loss of consciousness LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

[illegible]

2. LABELS

[illegible]

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** [illegible]

3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3.3 **Chemical Formula:** [illegible]

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** INHALATION [illegible] INGESTION [illegible] EYES AND SKIN [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** 100 ppm for 60 min

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** [illegible]

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** [illegible]

6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]

6.5 **Special Hazards of Combustion Products:** [illegible]

6.6 **Behavior in Fire:** [illegible]

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** [illegible]

6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]

7.2 **Reactivity with Common Materials:** [illegible]

7.3 **Stability During Transport:** [illegible]

7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]

7.5 **Polymerization:** [illegible]

7.6 **Inhibitor of Polymerization:** [illegible]

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data [illegible]

8.2 **Waterfowl Toxicity:** [illegible]

8.3 **Biological Oxygen Demand (BOD):** [illegible]

8.4 **Food Chain Concentration Potential:** [illegible]

9. SELECTED MANUFACTURERS

[illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** [illegible]

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
[illegible]	

12.3 **NFPA Hazard Classifications:** [illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** 44.4 dynes/cm 0.0444 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** [illegible]

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** [illegible]

Continued on page [illegible]

NOTES

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ITN	TETRADECANOL

Common Synonyms 1-Tetradecanol Myristyl alcohol n-Tetradecyl alcohol	Thick liquid (heated) · Colorless · Faint alcohol odor Solidifies and floats on water
Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:

3.2 Coast Guard Compatibility Classification

3.3 Chemical Formula:

3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):

4.2 Color:

4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:

5.2 Symptoms Following Exposure:

5.3 Treatment for Exposure:

5.4 Toxicity by Inhalation (Threshold Limit Value):

5.5 Short-Term Inhalation Limits:

5.6 Toxicity by Ingestion:

5.7 Late Toxicity:

5.8 Vapor (Gas) Irritant Characteristics:

5.9 Liquid or Solid Irritant Characteristics:

5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:

6.2 Flammable Limits in Air:

6.3 Fire Extinguishing Agents:

6.4 Fire Extinguishing Agents Not to be Used:

6.5 Special Hazards of Combustion Products:

6.6 Behavior in Fire:

6.7 Ignition Temperature:

6.8 Electrical Hazard:

6.9 Burning Rate:

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water:

7.2 Reactivity with Common Materials:

7.3 Stability During Transport:

7.4 Neutralizing Agents for Acids and Caustics:

7.5 Polymerization:

7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:

8.2 Waterfowl Toxicity:

8.3 Biological Oxygen Demand (BOD):

8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:

10.2 Storage Temperature:

10.3 Inert Atmosphere:

10.4 Venting:

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:

12.2 NAS Hazard Rating for Bulk Water Transportation:

12.3 NFPA Hazard Classifications:

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:

13.2 Molecular Weight:

13.3 Boiling Point at 1 atm:

13.4 Freezing Point:

13.5 Critical Temperature:

13.6 Critical Pressure:

13.7 Specific Gravity:

13.8 Liquid Surface Tension: 21.7 dynes/cm = 0.027 N/m at 20°C

13.9 Liquid-Water Interfacial Tension: Data not available

13.10 Vapor (Gas) Specific Gravity:

13.11 Ratio of Specific Heats of Vapor (Gas):

13.12 Latent Heat of Vaporization:

13.13 Heat of Combustion: Data not available

13.14 Heat of Decomposition:

13.15 Heat of Solution:

13.16 Heat of Polymerization:

NOTES

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TTD	1-TETRADECENE

Common Synonyms	Waters liquid — Colorless — Mild pleasant odor Floats on water
Fire	Combustible
Exposure	LIQUID Irritating to eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 445.4

Mechanical containment
[illegible] removed
Chemical and physical treatment

2 LABELS

[illegible]

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: Dodecylethylene
3.2 Coast Guard Compatibility Classification: Oleins
3.3 Chemical Formula: [illegible]
3.4 IMCO/United Nations Numerical Designation: Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: [illegible]
4.3 Odor: [illegible]

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: [illegible]
5.2 Symptoms Following Exposure: [illegible]
5.3 Treatment for Exposure: [illegible]
5.4 Toxicity by Inhalation (Threshold Limit Value): [illegible]
5.5 Short-Term Inhalation Limits: Not pertinent
5.6 Toxicity by Ingestion: [illegible]
5.7 Late Toxicity: [illegible]
5.8 Vapor (Gas) Irritant Characteristics: [illegible]
5.9 Liquid or Solid Irritant Characteristics: [illegible]
5.10 Odor Threshold: Not pertinent

6 FIRE HAZARDS

6.1 Flash Point: [illegible]
6.2 Flammable Limits in Air: [illegible]
6.3 Fire Extinguishing Agents: [illegible]
6.4 Fire Extinguishing Agents Not to be Used: [illegible]
6.5 Special Hazards of Combustion Products: [illegible]
6.6 Behavior in Fire: [illegible]
6.7 Ignition Temperature: [illegible]
6.8 Electrical Hazard: [illegible]
6.9 Burning Rate: [illegible]

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: [illegible]
7.2 Reactivity with Common Materials: [illegible]
7.3 Stability During Transport: [illegible]
7.4 Neutralizing Agents for Acids and Caustics: [illegible]
7.5 Polymerization: [illegible]
7.6 Inhibitor of Polymerization: [illegible]

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

[illegible]

10 SHIPPING INFORMATION

10.1 Grades or Purity: [illegible]
10.2 Storage Temperature: [illegible]
10.3 Inert Atmosphere: [illegible]
10.4 Venting: [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 445.1

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Not listed
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: [illegible]
13.3 Boiling Point at 1 atm: [illegible]
13.4 Freezing Point: [illegible]
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: [illegible]
13.8 Liquid Surface Tension: [illegible]
13.9 Liquid-Water Interfacial Tension: 32.8 dynes/cm = 0.0328 N/m at 22.7°C
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): [illegible]
13.12 Latent Heat of Vaporization: [illegible]
13.13 Heat of Combustion: [illegible]
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

Continued on Page [illegible]

NOTES

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TDB	TETRADECYLBENZENE

Common Synonyms			
1 Phenyltetradecane	Liquid	Colorless	Mild odor
	Floats on water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 1 Phenyltetradecane
3 2 **Coast Guard Compatibility Classification.** Aromatic hydrocarbon
3 3 **Chemical Formula** $C_6H_5(CH_2)_{13}CH_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color** Colorless
4 3 **Odor:** Mild

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure** Ingestion may cause intestinal disturbances Contact with eyes causes mild irritation
5 3 **Treatment for Exposure** INGESTION induce vomiting if large amount has been swallowed EYES flush with water SKIN wipe off wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Data not available
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Foam dry chemical, carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6 5 **Special Hazards of Combustion Products**
6 6 **Behavior in Fire**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate** 4 42 mm/min

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biologic Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Conoco Chemicals
Park Lights Plaza West One
Saddle Brook N J 07662
2 The Humphrey Chemical Co
Devine Street
North Haven, Conn 06473
3 Fisher Scientific Co
711 Forbes Ave
Pittsburgh Pa 15219

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature** Ambient
10 3 **Inert Atmosphere** No requirement
10 4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

X 1-1

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid or liquid
13 2 **Molecular Weight:** 274 47
13 3 **Boiling Point at 1 atm:** 678°F = 359°C = 632°K
13 4 **Freezing Point:** 61°F = 16°C = 289°K
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 0 855 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 30 27 dynes/cm = 0 03027 N/m at 20°C
13 9 **Liquid Water Interfacial Tension.** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** 95 18 Btu/lb = 52 88 cal/g = 2 2 2 × 10⁵ J/kg
13 13 **Heat of Combustion:** −18 430 Btu/lb = −10 240 cal/g = −428 4 × 10⁵ J/kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

(Continued on page Same)

NOTES

TED — TETRAETHYL DITHIOPYROPHOSPHATE

Common Synonyms		
Tetraethyl dithionopyrophosphate	Liquid	Colorless
	Sinks in water	

[illegible]

Fire

Fire data not available

Exposure

[illegible]

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment
Disperse and flush (small discharges)

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Dithiopyrophosphoric acid O,O,O,O-tetraethyl ester; Tetraethyl dithionopyrophosphate; O,O,O,O-Tetraethyl pyrophosphorodithionate

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $(C_2H_5O)_2P_2O_5PS(OC_2H_5)_2$

3.4 **IMCO/United Nations Numerical Designation:** 6.1 1704

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Mask with canister type [illegible] for organic phosphate pesticides; goggles or face shield; rubber gloves and other protective clothing to prevent contact with skin

5.2 **Symptoms Following Exposure:** Contact with liquid causes irritation of eyes and skin. Compound can be absorbed through skin. Ingestion of liquid or inhalation of mist causes nausea, vomiting, mental confusion, abdominal pain, sweating, giddiness, apprehension, and restlessness; later muscular twitching of the eyelids and tongue begin; then other muscles of face and neck become involved; generalized twitching and muscle weakness may occur; pulmonary edema; ataxia, tremor, and convulsions may advance to coma

5.3 **Treatment for Exposure** (*All physicians: all exposures to this compound*): INHALATION: support respiration, keep airway clear; use artificial respiration if breathing is difficult or has stopped. EYES: flush with water immediately after contact for at least 15 min. SKIN: remove victim's clothing and shoes immediately using rubber gloves; quickly wipe off affected area with clean cloths; immediately follow with a shower using plenty of soap; if complete shower is impossible, wash affected skin, hair, and fingernails repeatedly with soap and water using clean cloths each time to prevent spreading the contamination. INGESTION: induce vomiting repeatedly until vomit fluid is clear (save fluid for physician's examination); if vomiting cannot be induced within 5 min, have victim drink plenty of milk or water, have him lie down and keep him warm; if increased secretions make breathing difficult, prop patient up; if he stops breathing, apply artificial or mouth-to-mouth respiration, preferably through an airway; wash victim's mouth of contamination; mechanical resuscitator should be used if available; oxygen may be necessary; keep patient under observation for 24 hrs.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

Continued on page 4

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic phosphorus and sulfur oxides are produced

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly to form non-hazardous products

7.2 **Reactivity with Common Materials:** Corrosive to most metals in the presence of moisture

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Plan. Products Corp
Kennedy Avenue
Blue Point, N.Y. 11715

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, Emulsifiable concentrate, Dry mixtures with inert solid >2

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

[illegible]

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 322.3

13.3 **Boiling Point at 1 atm:** Not pertinent (very high)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 25°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

5 HEALTH HAZARDS (Cont'd)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade [illegible] LD_{50} = 5 mg/kg (rat)

5.7 **Late Toxicity:** Causes chromosomal damage in mice

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

TTG	TETRAETHYLENE GLYCOL

Common Synonyms		
16 Dry Bis-[2-(2-hydroxyethoxy)-ethyl ether 3 6 9 Trioxaundecan 1,11-diol	Liquid	Colorless to straw color	Mild odor
	Sinks and mixes with water	

Fire	Combustible
Exposure	LIQUID Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Bis [2 (2-hydroxyethoxy)ethyl] ether 16 Dry
3 6 9 Trioxaundecan 1 11-diol

3 2 **Coast Guard Compatibility Classification:** Glycol ether

3 3 **Chemical Formula:** $HOC_2H_4O_3H$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Light straw colorless

4 3 **Odor:** Mild

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield and rubber glove

5 2 **Symptoms Following Exposure:** Compound is mild irritating No symptoms observed by any exposure route

5 3 **Treatment for Exposure:** INGESTION if large amounts are swallowed induce vomiting treat symptomatically EYES flush with water get medical attention if ill effects develop SKIN wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 0 oral rat LD_{50} = 28 54 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics** No appreciable hazard Practically harmless to the skin

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 360°F 0°C

6 2 **Flammable Limits in Air**
Data not available

6 3 **Fire Extinguishing Agents** Alcohol foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used**
Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products**

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials.**
May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization**
Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)**
50% 5 days

8 4 **Food Chain Concentration Potential.**
None

9 SELECTED MANUFACTURERS

1 Olin Corp
120 Long Ridge Rd
Stamford Conn 06904

2 Union Carbide Corp
Chemicals & Plastics Div
270 Park Avenue
New York N Y 10017

3 The Dow Chemical Co
2030 Dow Center
Midland Mich 48640

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations**
Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 94 23

13 3 **Boiling Point at 1 atm:**
621°F = 327°C = 600 K

13 4 **Freezing Point**
23 8°F = −4 0°C = 269 0 K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 12 at 20°C (liquid)

13 8 **Liquid Surface Tension**
19 N/dyne/cm = 0 0193 N/m at 32°C

13 9 **Liquid-Water Interfacial Tension:**
Not pertinent

13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)**
Not pertinent

13 12 **Latent Heat of Vaporization.**
Data not available

13 13 **Heat of Combustion:** −10 530 Btu/lb
= −5 850 cal/g = −245 × 10³ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution** Not pertinent

13 16 **Heat of Polymerization.** Not pertinent

Continued on page 5 and 6

NOTES

TTP	TETRAETHYLENEPENTAMINE

Common Synonyms 1 11 Diamino-3,6 9-triazaundecane	Liquid	Yellow	Ammonia odor
	May float or sink in water		

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	LIQUID Will burn skin and eyes If swallowed will cause nausea
Water Pollution	Effect of low concentrations on aquatic life is unknown May be fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning water contaminant
Restrict access
Disperse and flash

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1 11 Diamino-3 6 9 triazaundecane

3 2 **Coast Guard Compatibility Classification:** Amphatic amine

3 3 **Chemical Formula:** $H_2N(C_2H_4NH)_3H$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Yellow

4 3 **Odor:** Ammoniacal disagreeable penetrating

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Air supplied respirator rubber gloves complete eye protection impervious apron

5 2 **Symptoms Following Exposure:** Inhalation may cause nausea and slight irritation, compound is a sensitizer and prolonged contact may cause asthma Ingestion can cause burns of mouth esophagus and possibly stomach Contact with eyes or skin may cause burns Repeated skin contact may cause dermatitis

5 3 **Treatment for Exposure.** INHALATION remove victim to fresh air give oxygen if breathing is difficult treat allergic manifestations by usual methods INGESTION do NOT induce vomiting give large quantities of water give at least one ounce of vinegar in an equal amount of water get medical attention EYES immediately flush with plenty of water get medical care SKIN flush with plenty of water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion** Grade 2 oral LD_{50} = 3,990 mg kg (rat)

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure may cause second degree burns on long exposure

5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 340°F O C

6 2 **Flammable Limits in Air:** (est 1 0 % 4 6 %

6 3 **Fire Extinguishing Agents.** Alcohol foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Ammonia and toxic oxides of nitrogen may form in fires

6 6 **Behavior in Fire.**

6 7 **Ignition Temperature:** 572°F

6 8 **Electrical Hazard.** Data not available

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials** May attack some forms of plastics

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Union Carbide Corp
Chemicals & Plastics Div
270 Park Avenue
New York N Y 10017

2 Jefferson Chemical Co Inc
3336 Richmond Avenue
P O Box 5300
Houston Texas 77052

3 Dow Chemical Co
Midland Mich 48640

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 189

13 3 **Boiling Point at 1 atm:** 644°F = 340°C = 613°K

13 4 **Freezing Point** −22°F = −30°C = 243°K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity** 0 998 at 20°C (liquid)

13 8 **Liquid Surface Tension.** Data not available

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization.** Data not available

13 13 **Heat of Combustion:** Data not available

13 14 **Heat of Decomposition.** Not pertinent

13 15 **Heat of Solution:** Data not available

13 16 **Heat of Polymerization:** Not pertinent

Continued on page and

NOTES

TEL	TETRAETHYL LEAD

Common Synonyms	
TEL Lead tetraethyl	Oily liquid Colorless but generally dyed red Fruity odor Sinks in water Poisonous flammable vapor is produced

AVOID CONTACT WITH LIQUID AND VAPOR [illegible]

Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE Containers may explode in fire Vapor may explode if ignited in an enclosed area [illegible]
Exposure	ACT FOR MEDICAL AID VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED Irritating to eyes [illegible] LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Will burn eyes [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning poison
water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Lead tetraethyl

3 2 **Coast Guard Compatibility Classification** Special class

3 3 **Chemical Formula.** PbC_8H_{20}

3 4 **IMCO United Nations Numerical Designation** (UN 1649)

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Dyed red or other distinctive color

4 3 **Odor** Sweet

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Organic vapor type canister face mask for short periods air line type for longer periods neoprene coated liquid proof gloves protective [illegible] face shield white or light colored clothing rubber shoes or boots

5 2 **Symptoms Following Exposure** Increased urinary output of lead If a large degree of absorption by inhalation occurs death may cause insomnia excitability delirium coma and death Direct contact with inorganic Lead

5 3 **Treatment for Exposure** Remove victim from contaminated area and consult physician immediately INGESTION induce vomiting SKIN wash immediately with kerosene or similar [illegible] or mineral distillate followed by soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0 1 mg/m³

5 5 **Short-Term Inhalation Limit:** 0 15 mg Pb/m³ for 30 min

5 6 **Toxicity by Ingestion** Oral rat LD_{50} = 17 mg/kg

5 7 **Late Toxicity:** Lead poisoning

5 8 **Vapor (Gas) Irritant Characteristics** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure may cause secondary burns on long exposure

5 10 **Odor Threshold.** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 200°F (C C 93°F O C)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents:** Water foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic gases are generated in fires

6 6 **Behavior in Fire** May explode in fires

6 7 **Ignition Temperature** Decomposes above 230°F

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** Rust and some metals cause decomposition

7 3 **Stability During Transport** Stable below 230°F At higher temperatures may detonate or explode when confined

7 4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** 0 20 mg/l 96 hr bluegill TLm fresh water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

1 E I duPont de Nemours & Co Inc
Petroleum Chemicals Division
Antioch Calif 94509

2 Ethyl Corp
Industrial Chemicals Division
451 Florida St
Baton Rouge La 70801

3 PPG Industries Inc
Houston Chemical Co Division
Beaumont Tex 77704

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

XXY

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Poisonous liquid or solid Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	2
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Liquid

13 2 **Molecular Weight:** 323 44

13 3 **Boiling Point at 1 atm** Decomposes

13 4 **Freezing Point.** −218°F = −139°C = 136°K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 633 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 28 5 dynes/cm = 0 0285 N/m at (est) 25°C

13 9 **Liquid-Water Interfacial Tension** (est) 40 dynes/cm = 0 04 N/m at 20 C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion** (est) −7 570 Btu/lb = −4 380 cal/g = −18 3 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization** Not pertinent

Continued on page Vanish

NOTES

REVISED 1978

TEP — TETRAETHYL PYROPHOSPHATE

Common Synonyms

Ethylpyrophosphate
Nifos
TEP
TEPP

Liquid — Colorless to yellow — Faint fruity odor

Mixes with water

Fire

Not flammable
POISONOUS GASES ARE PRODUCED WHEN HEATED

Exposure

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment
Disperse and flush (small discharges)

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Bladan, Ethylpyrophosphate, Killax, Mortopal, Nifos, TEP, TEPP, Tetron, Vapotone

3.2 **Coast Guard Compatibility Classification** Not applicable

3.3 **Chemical Formula** $(C_2H_5O)_2POOPO(OC_2H_5)_2$ or $C_8H_{20}O_7P_2$

3.4 **IMCO/United Nations Numerical Designation.** 6.1 1705

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Water white to amber

4.3 **Odor** Aromatic, faint fruity

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Mask with canister approved for organic phosphate pesticides, goggles or face shield, rubber gloves and other protective clothing to prevent contact with skin

5.2 **Symptoms Following Exposure** Contact with liquid causes irritation of eyes and skin. Compound can be absorbed through skin. Ingestion of liquid or inhalation of mist causes nausea, vomiting, mental confusion, abdominal pain, sweating, giddiness, apprehension, and restlessness; later muscular twitching of eyelids and tongue; begin then other muscles of face and neck become involved; pulmonary edema, ataxia, tremor, and convulsions may advance to coma

5.3 **Treatment for Exposure** *Call physician for all exposures to this compound.* INHALATION: support respiration, keep airways clear, use artificial respiration if breathing difficult or has stopped. EYES: flush with water immediately after contact for at least 15 min. SKIN: remove victim's clothing and shoes immediately, using rubber gloves, quickly wipe off affected area with cotton cloths, immediately follow with a shower using plenty of soap; if complete shower is impossible, wash affected skin, hair, and fingernails repeatedly with soap and water using clean cloths each time to prevent spreading the contamination. INGESTION: induce vomiting by putting a finger down the throat or by giving warm salt water (one tablespoon salt per glass). Repeat until vomit fluid is clear (save fluid for physician's examination). If vomiting cannot be induced within five minutes, have victim drink plenty of milk or water, have him lie down and keep him warm. If there is difficulty in breathing due to increased secretions, chest may be cleared by propping patient up. If he stops breathing, use artificial or mouth to mouth respiration, preferably through an airway; wash victim's mouth of contamination; mechanical resuscitator should be used if available; oxygen may be necessary; keep patient under observation for 24 hrs.

5.4 **Toxicity by Inhalation (Threshold Limit Value).** 0.05 mg/m³

(continued on page 2)

6 FIRE HAZARDS

6.1 **Flash Point** Not flammable

6.2 **Flammable Limits in Air** Not flammable

6.3 **Fire Extinguishing Agents** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6.5 **Special Hazards of Combustion Products** Highly toxic gases and vapors of unburned material and phosphoric acid are formed in fires

6.6 **Behavior in Fire** Water streams applied to adjacent fires will spread contamination of pesticide over wide area

6.7 **Ignition Temperature.** Not pertinent

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Reacts slowly to form phosphoric acid

7.2 **Reactivity with Common Materials** Corrosive to aluminum, slowly corrosive to copper, brass, zinc, and tin

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity**
1.0 ppm 96 hr fathead TLm fresh water
500 ppm * marine plankton no growth of lethal salt water
* Time period not specified

8.2 **Waterfowl Toxicity** LD50 = 4.5 mg/kg

8.3 **Biological Oxygen Demand (BOD).** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Miller Chemical & Fertilizer Corp
P.O. Box 333
Hanover, Pa 17331

2. Chevron Chemical Co
Ortho Division
200 Bush Street
San Francisco, Calif 94120

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 40% plus (6% related ethyl phosphates)
Aerosols (5–10%) (Class A poison)
Dusts (0.66–1.2%) Sprays (0.1–40%)

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting.** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446)

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Poisonous, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 290.2

13.3 **Boiling Point at 1 atm.** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 1.18 at 25°C (liquid)

13.8 **Liquid Surface Tension** Data not available

13.9 **Liquid-Water Interfacial Tension** Not pertinent

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion** Not pertinent

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

(continued on page 2)

5 HEALTH HAZARDS (Cont'd)

5.5 **Short-Term Inhalation Limits:** 0.25 mg/m³ for 30 min

5.6 **Toxicity by Ingestion:** Grade 4 LD50 < 50 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

TFE	TETRAFLUOROETHYLENE, INHIBITED

Common Synonyms			
Teflon monomer	Compressed Gas	Colorless	Odorless or faint odor
	Visible vapor cloud is produced		

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat

Water Pollution

Not harmful to aquatic life

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning, high flammability
Restrict access

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Teflon monomer
3.2 **Coast Guard Compatibility Classification.** Not applicable
3.3 **Chemical Formula** F C=C F
3.4 **IMCO/United Nations Numerical Designation.** 2 1,61

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Compressed gas
4.2 **Color:** Colorless
4.3 **Odor:** None or faint

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self contained breathing apparatus for high gas concentrations
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory system. Contact with eyes causes slight irritation
5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure, if breathing is difficult give artificial respiration and call physician
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Lethal Toxicity:** Causes possible impairment of immunological and defense systems in rats
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (gas)
6.2 **Flammable Limits in Air:** 10% - 58%
6.3 **Fire Extinguishing Agents:** Let fire burn, stop flow of gas, cool containers with water
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** When burned in air, gas forms toxic carbonyl fluoride and hydrogen fluoride
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode
6.7 **Ignition Temperature:** 470°F
6.8 **Electrical Hazard:** C.E.: air mixtures produced explosions which propagated through the smallest clearance in a standard test conducted by Underwriters Laboratories. It does not meet any group classification

Continued on page 4

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Can polymerize in the absence of inhibitor, especially when heated or in presence of oxygen
7.6 **Inhibitor of Polymerization:** d limonene, pinene, tetrahydronaphthalene, or methyl methacrylate

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** None
8.2 **Waterfowl Toxicity:** None
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. E. I. duPont de Nemours & Co., Plastics Department, Wilmington, Del. 19898
2. ICI America, Wilmington, Del. 19897
3. Matheson Gas Products Co., East Rutherford, N. J. 07073

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 98+%
10.2 **Storage Temperature:** Cool ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B-C 2

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable compressed gas
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications.**

Category	Classification*	
Health Hazard (Blue)	2	3
Flammability (Red)	4	4
Reactivity (Yellow)	3	3

*First column refers to nonfire situation

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 100.0
13.3 **Boiling Point at 1 atm:** −105°F = −76°C = 197°K
13.4 **Freezing Point.** −224°F = −142°C = 131°K
13.5 **Critical Temperature:** (est.) 92°F = 33°C = 306°K
13.6 **Critical Pressure:** (est.) 673 psia = 46 atm = 4.56 MN/m²
13.7 **Specific Gravity:** Not pertinent
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 3.45
13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.1261
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion** (est.) −4,000 Btu/lb = −2,000 cal/g = −9.0 × 10⁶ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** −450 Btu/lb = −250 cal/g = −1.05 × 10⁶ J/kg

Continued on pages 5 and 6

6 FIRE HAZARDS (Cont'd.)

6.9 **Burning Rate:** Not pertinent

THF	TETRAHYDROFURAN

Common Synonyms Oxtetrahydrofuran Tetramethylene oxide THF	Liquid Colorless Faint fruity odor Floats and mixes with water. Flammable. Irritating vapor is produced.
	[illegible]
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, headache or loss of consciousness. [illegible] LIQUID Irritating to skin and eyes. Harmful if swallowed. [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning. High flammability. Disperse and flash.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms** Tetramethylene oxide, THF

3.2 **Coast Guard Compatibility Classification** Ether

3.3 **Chemical Formula:** $(CH_2)_4CH_2O$

3.4 **IMCO United Nations Numerical Designation.** 3.1, 2056

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Ether like, similar to acetone

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** [illegible]

5.2 **Symptoms Following Exposure** Vapor causes nausea, dizziness, headache, irritation of eyes, nose and throat. Liquid causes defatting of the skin and irritation. Ingestion causes [illegible]

5.3 **Treatment for Exposure:** INHALATION: [illegible] artificial respiration and oxygen if necessary. INGESTION: [illegible] induce vomiting, cathartics, [illegible] SKIN OR EYE CONTACT: Wash with [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value).** 200 ppm

5.5 **Short-Term Inhalation Limits** [illegible]

5.6 **Toxicity by Ingestion** Grade 1 LD50 [illegible] mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** Vapor causes slight [illegible] at concentrations. The [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** Minimum [illegible] Draize [illegible] including an [illegible] remain may cause smarting and reddening of the skin.

5.10 **Odor Threshold.** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point** [illegible]

6.2 **Flammable Limits in Air** [illegible]

6.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6.5 **Special Hazards of Combustion Products.** Irritating vapor is generated when heated

6.6 **Behavior in Fire** May explode. Vapor is heavier than air and may travel considerable distance to a source of ignition and flashback

6.7 **Ignition Temperature** [illegible]

6.8 **Electrical Hazard** Not pertinent

6.9 **Burning Rate.** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport** Stable unless [illegible] peroxides has accumulated because of prolonged storage in presence of air. When concentrated by evaporation of solution, may explode.

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** [illegible] butylated hydroxytoluene (BHT) prevents peroxide formation

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. E. I. duPont de Nemours & Co., Inc.
   Electrochemicals Dept.
   Wilmington, Del. 19898

2. The Quaker Oats Co.
   Chemical Division
   3324 Chelsea Ave.
   Memphis, Tenn. 38108

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Padded

10.4 **Venting.** Pressure vent

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

VPORS

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classification**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 72.10

13.3 **Boiling Point at 1 atm:** 151°F = 66°C = 339°K

13.4 **Freezing Point:** −163.3°F = −108.5°C = 164.7°K

13.5 **Critical Temperature:** 512.6°F = 267.0°C = 540.2°K

13.6 **Critical Pressure:** 753 psia = 51.2 atm = 5.19 MN/m²

13.7 **Specific Gravity:** 0.889 at 20°C (liquid)

13.8 **Liquid Surface Tension** 28 dynes/cm = 0.028 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** [illegible]

13.12 **Latent Heat of Vaporization** 190 Btu/lb = 98 cal/g = 4.1 × 10⁵ J/kg

13.13 **Heat of Combustion.** −14,900 Btu/lb = −8330 cal/g = −348 × 10⁵ J/kg

13.14 **Heat of Decomposition.** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

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THN	TETRAHYDRONAPHTHALENE

Common Synonyms	Water is liquid	Colorless	Mild turpentine odor
1,2,3,4-tetrahydronaphthalene Tetralin Tetranap	Floats on water		

Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook (CG 446-6)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2,3,4-Tetrahydro-naphthalene
Tetralin
Tetranap

3.2 **Coast Guard Compatibility Classification:** Moderate Restriction

3.3 **Chemical Formula:** [illegible]

3.4 **IMCO United Nations Numerical Designation:** Not assigned

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Mild characteristic odor resembling but less naphthalene or turpentine

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** A supplied-air respirator [illegible] rubber gloves

5.2 **Symptoms Following Exposure:** Liquid [illegible] irritation and vapor irritation

5.3 **Treatment for Exposure:** INGESTION: Induce vomiting [illegible] should be treated [illegible] EYES: flush with water [illegible] SKIN: wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** No data available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 [illegible]

5.7 **Late Toxicity:** Liver and kidney damage from [illegible]

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is a slight irritant [illegible] eyes and throat [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** Minimal hazard. Repeated contact [illegible] and allows [illegible] defatting of the skin

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Avoid water

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 76 ppm 24 hr brine shrimp/21 m

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** [illegible]

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

E. I. duPont de Nemours & Co., Inc.
Organic Chemical Dept.
Wilmington, Delaware

[illegible]

[illegible]
Chemicals and Plastics Div.
[illegible] Ave.
New York, N.Y. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No [illegible]

10.4 **Venting:** Open [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG 446-3)

X F C

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	2
Water Damage	
Human Toxicity	
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	1
Self Reaction	0

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight.** 132.2

13.3 **Boiling Point at 1 atm:** 406°F = 208°C = 481°K

13.4 **Freezing Point:** −23.8°F = −31°C = 242°K

13.5 **Critical Temperature:** Not [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** 0.970 at 20°C (liquid)

13.8 **Liquid Surface Tension:** [illegible] dynes/cm = 0.0[illegible] N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb = [illegible] cal/g = [illegible] J/kg

13.13 **Heat of Combustion:** −18,400 Btu/lb = −10,200 cal/g = −429 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

TML	TETRAMETHYL LEAD

Common Synonyms
Lead tetramethyl

Oily liquid — Colorless — Fruity odor

Sinks in water. Poisonous flammable vapor is produced.

Fire

Combustible
Containers may explode in fire
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
POISONOUS IF INHALED
Irritating to eyes

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED
Will burn eyes

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Evacuate area
Ventilate
Neutralize or treat
Chemical/physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 Synonyms: Lead tetramethyl
3.2 Coast Guard Compatibility Classification: Special cases
3.3 Chemical Formula: $Pb(CH_3)_4$
3.4 IMCO United Nations Numerical Designation: 6.1 Liquids

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Pale yellow to colorless
4.3 Odor: Fairly strong odor

5 HEALTH HAZARDS

5.1 Personal Protective Equipment: Organic vapor cartridge respirator, chemical goggles, face shield, rubber gloves, rubber boots, rubber apron
5.2 Symptoms Following Exposure: Headache, dizziness, nausea, vomiting, diarrhea, muscle twitching, convulsions, coma, death. Irritation of eyes, nose, throat, skin
5.3 Treatment for Exposure: Remove victim to fresh air. If not breathing, give artificial respiration. If breathing difficult, give oxygen. Wash skin with soap and water. Flush eyes with water. Get medical attention
5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m³
5.5 Short-Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 3, oral rat LD_{50} = 109 mg/m³
5.7 Late Toxicity: Teratogenic
5.8 Vapor (Gas) Irritant Characteristics: Vapor causes tearing of eyes, irritation of nose and throat
5.9 Liquid or Solid Irritant Characteristics: Causes smarting of eyes and irritation of skin. Prolonged exposure may cause severe burns
5.10 Odor Threshold: Data not available

6 FIRE HAZARDS

6.1 Flash Point: 80°F TOC
6.2 Flammable Limits in Air: Data not available
6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: None known
6.5 Special Hazards of Combustion Products: Toxic and flammable vapors
6.6 Behavior in Fire: Vapor explosion
6.7 Ignition Temperature: Data not available
6.8 Electrical Hazard: Not applicable
6.9 Burning Rate: Data not available

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable under normal conditions
7.4 Neutralizing Agents for Acids and Caustics: Not applicable
7.5 Polymerization: Not applicable
7.6 Inhibitor of Polymerization: Not applicable

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: Data not available

9 SELECTED MANUFACTURERS

Ethyl Corp.
E. I. du Pont de Nemours & Co.
Gulf Oil Corp.
Nalco Chemical Co.
Nuodex Products Co., Inc.
Petrolite Corp.
Stauffer Chemical Co.
Ethyl Corp.
Nalco Chemical Co.
PPG Industries, Inc.
Stauffer Chemical Co.
Baker & Co., Inc.

10 SHIPPING INFORMATION

10.1 Grades or Purity: Technical
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

N.A.

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Poisonous liquids, Class B
12.2 NAS Hazard Rating for Bulk Water Transportation: Not rated
12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: 267.22
13.3 Boiling Point at 1 atm: 200°F (93.3°C)
13.4 Freezing Point: −27°F (−32.8°C)
13.5 Critical Temperature: Not applicable
13.6 Critical Pressure: Not applicable
13.7 Specific Gravity: 1.999 at 20°C (liquid)
13.8 Liquid Surface Tension: Data not available
13.9 Liquid-Water Interfacial Tension: Data not available
13.10 Vapor (Gas) Specific Gravity: Not applicable
13.11 Ratio of Specific Heats of Vapor (Gas): Not applicable
13.12 Latent Heat of Vaporization: [illegible]
13.13 Heat of Combustion: [illegible]
13.14 Heat of Decomposition: Not applicable
13.15 Heat of Solution: Not applicable
13.16 Heat of Polymerization: Not applicable

Liquid vapor pressure

NOTES

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TPG	THIOPHOSGENE

Common Synonyms			
Thiocarbonyl chloride	Liquid	Red	Sharp choking odor
	Sinks in water. Reacts slowly with water and produces poisonous vapor		

Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE
Exposure	VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat LIQUID POISONOUS IF SWALLOWED Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See the Jones Memory Handbook CG 446-4

Issue warning: poison or contaminant water contaminant
Restrict access
Evacuate area
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Thiocarbonyl chloride
3.2 **Coast Guard Compatibility Classification.** Not applicable
3.3 **Chemical Formula:** $CSCl_2$
3.4 **IMCO/United Nations Numerical Designation:** 6.1

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Red
4.3 **Odor:** Choking very irritating sharp

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus; organic vapor canister; goggles or face shield; rubber gloves
5.2 **Symptoms Following Exposure** Inhalation causes irritation of respiratory system and delayed pulmonary edema. Vapor irritates eyes. Liquid burns skin and eyes. Ingestion causes irritation of mouth and stomach
5.3 **Treatment for Exposure** *Get medical attention at once after any exposure to this compound.* INHALATION: remove victim from exposure, support respiration, watch for pulmonary edema. EYES: irrigate with large quantities of water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; give large amounts of water
5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} [illegible] mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics.** Data not available
5.9 **Liquid or Solid Irritant Characteristics.** Data not available
5.10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6.1 **Flash Point.** Data not available
6.2 **Flammable Limits in Air** Data not available
6.3 **Fire Extinguishing Agents.** Dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam
6.5 **Special Hazards of Combustion Products:** Toxic phosgene, hydrogen chloride and sulfur dioxide may be generated in a fire
6.6 **Behavior in Fire:** Decomposes above 200°C; carbon bisulfide vapors flammable and carbon tetrachloride
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water** Forms hydrogen chloride, carbon dioxide and carbon disulfide. Reaction is slow unless water is hot
7.2 **Reactivity with Common Materials.** Corrodes metals in presence of moisture
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics.** Flush with water; rinse with sodium bicarbonate or lime solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** Data not available
8.2 **Waterfowl Toxicity** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Aldrich Chemical Co
940 West St. Paul Avenue
Milwaukee, Wis. 53233
2. Pfaltz and Bauer, Inc.
126-04 Northern Boulevard
Flushing, N.Y. 11368

10 SHIPPING INFORMATION

10.1 **Grades or Purity** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vent

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446)

X O X Y

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Poisonous Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed
12.3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight.** 115.0
13.3 **Boiling Point at 1 atm:** 164°F = 73°C = 346°K
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.5 at 20°C
13.8 **Liquid Surface Tension.** (est.) 25 dynes/cm = 0.025 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 4
13.11 **Ratio of Specific Heats of Vapor (Gas).** Data not available
13.12 **Latent Heat of Vaporization** (est.) 28 Btu/lb = 7[illegible] cal/g = 3.0 × 10[illegible] J/kg
13.13 **Heat of Combustion.** (est.) −3,400 Btu/lb = −[illegible] cal/g = −9.0 × 10[illegible] J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

THR	THIRAM

Common Synonyms

Bis(dimethylthiocarbamoyl) disulfide
Bis(dimethylthiocarbamoyl) disulfide
Tetramethylthiuram disulfide

Solid — White to light yellow

Sinks in water

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

Exposure

DUST
POISONOUS IF INHALED
Irritating to eyes, nose and throat

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-6

Issue warning — water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

Not a Hazardous Substance
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Arasan, Bis(dimethylthiocarbamoyl) disulfide, Bis(dimethylthiocarbamoyl) disulfide, Methyl thiuram, Methyl tuads, Tetramethylthiuram disulfide, Thiuram

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:**
$(CH_3)_2NCSSSCSN(CH_3)_2$
$C_6H_{12}N_2S_4$

Continued on page 2

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White to slightly yellow

4.3 **Odor:** Data not available

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, goggles, dust mask

5.2 **Symptoms Following Exposure:** Inhalation of dust may cause respiratory irritation. Liquid irritates eyes and skin and may cause allergic eczema. Ingestion causes nausea, vomiting and diarrhea, after which may be persistent paralysis may develop

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure. If breathing has stopped or is difficult, give artificial respiration and call physician. EYES or SKIN: wash with water. If irritation persists, consult a physician. INGESTION: call physician, induce vomiting and follow with gastric lavage. Treatment thereafter is symptomatic and supportive. As with fats and lipid solvents, which enhance absorption, vigorous purgatives prohibit ethyl alcohol. Maximum recovery if 10 days intervene, doctor. Epinephrine has used as shot within 48 hrs.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m³

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** Causes [illegible] and hemorrhage

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (solid)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases (sulfur dioxide) are formed. Carbon dioxide is also formed in a burning material

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] fresh water

8.2 **Waterfowl Toxicity:** LD_{50} = [illegible] mg/kg

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Pennwalt Corporation
Chemicals Division
Three Parkway
Philadelphia, Pa. 19102

2. E. I. duPont de Nemours & Co.
Wilmington, Del. 19898

3. R. T. Vanderbilt Co., Inc.
230 Park Avenue
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 95% min 24 mesh

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

II

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-A

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not rated

12.3 **NFPA Hazard Classifications:** Not rated

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 240.4

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:**
[illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.43 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 2

3 CHEMICAL DESIGNATIONS (Cont'd)

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

TRN	THORIUM NITRATE

Common Synonyms			
Thorium nitrate tetrahydrate	Solid	White	Odorless
	Mixes with water		

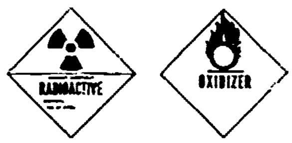
Fire	Not flammable May cause fire on contact with combustibles POISONOUS GASES ARE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat Harmful if inhaled SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: radioactive, oxidizing material, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Thorium nitrate tetrahydrate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $Th(NO_3)_4 \cdot 4H_2O$ (approx.)
3.4 **IMCO/United Nations Numerical Designation:** Low Specific Activity

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator; goggles; rubber shoes; gloves
5.2 **Symptoms Following Exposure:** Compound has low chemical toxicity, but alpha emission is expected to constitute a hazard if a fairly large amount is inhaled or ingested. Dust may irritate eyes and cause diffuse dermatitis. Beta and gamma emission is small.
5.3 **Treatment for Exposure:** EYES: flush with water until solid is removed. SKIN: wash thoroughly with soap and water. INGESTION: get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Data not available
5.7 **Late Toxicity:** Genetic effects due to exposure to low-level radiation are suspected to be harmful
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable but may cause fire on contact with combustibles
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Water
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Yields toxic nitrogen oxides [illegible] when involved in fire
6.6 **Behavior in Fire:** When large quantities are involved in fire, nitrate may fuse [illegible] water may result in extensive scattering of molten material [illegible]
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Forms a weak [illegible] solution [illegible] not hazardous
7.2 **Reactivity with Common Materials:** In contact with easily oxidizable substances may react rapidly enough to cause ignition, violent combustion or explosion. Solutions [illegible] acids and [illegible] metals
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 100 ppm/48 h/water flea/not lethal/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

W. R. Grace & Co.
Davison Chemical Division
P. O. Box [illegible]
Pompton Plains, N. J. 07444

American Potash & Chemical Corp.
Indian River Earths Division
258 Ann Street
West Chicago, Ill. 60185

J. T. Baker Chemical Co.
Phillipsburg, N. J. 08865

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Radioactive material
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

*[illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

[illegible]

NOTES

TTT	TITANIUM TETRACHLORIDE

Common Synonyms	Waters liquid Colorless to light yellow Irritating odor Reacts violently with water. Produces dense fumes in air
Fire	Not flammable
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled, will cause coughing or headache LIQUID Will burn skin and eyes If swallowed, will cause nausea and vomiting
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 Synonyms:
3.2 Coast Guard Compatibility Classification:
3.3 Chemical Formula:
3.4 IMCO United Nations Numerical Designation:

4 OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped):
4.2 Color:
4.3 Odor:

5 HEALTH HAZARDS

5.1 Personal Protective Equipment:
5.2 Symptoms Following Exposure:
5.3 Treatment for Exposure: INHALATION
5.4 Toxicity by Inhalation (Threshold Limit Value): ppm in moist air
5.5 Short-Term Inhalation Limits:
5.6 Toxicity by Ingestion:
5.7 Late Toxicity: Disturbances of upper respiratory and nervous system in man
5.8 Vapor (Gas) Irritant Characteristics:
5.9 Liquid or Solid Irritant Characteristics:
5.10 Odor Threshold:

6 FIRE HAZARDS

6.1 Flash Point:
6.2 Flammable Limits in Air:
6.3 Fire Extinguishing Agents:
6.4 Fire Extinguishing Agents Not to be Used:
6.5 Special Hazards of Combustion Products:
6.6 Behavior in Fire:
6.7 Ignition Temperature:
6.8 Electrical Hazard:
6.9 Burning Rate:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:
7.2 Reactivity with Common Materials:
7.3 Stability During Transport:
7.4 Neutralizing Agents for Acids and Caustics:
7.5 Polymerization:
7.6 Inhibitor of Polymerization:

8 WATER POLLUTION

8.1 Aquatic Toxicity:
8.2 Waterfowl Toxicity:
8.3 Biological Oxygen Demand (BOD):
8.4 Food Chain Concentration Potential:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity: Technical
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Pressure-vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating

12.3 NFPA Hazard Classifications

Category	Classification

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:
13.2 Molecular Weight:
13.3 Boiling Point at 1 atm:
13.4 Freezing Point:
13.5 Critical Temperature:
13.6 Critical Pressure:
13.7 Specific Gravity:
13.8 Liquid Surface Tension:
13.9 Liquid-Water Interfacial Tension:
13.10 Vapor (Gas) Specific Gravity:
13.11 Ratio of Specific Heats of Vapor (Gas):
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion:
13.14 Heat of Decomposition:
13.15 Heat of Solution:
13.16 Heat of Polymerization:

NOTES

REVISED 1978

TOL	TOLUENE

Common Synonyms
Toluol
Methylbenzene
Methylbenzol

Watery liquid — Colorless — Pleasant odor

Floats on water. Flammable. Irritating vapor is produced

[illegible]

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

[illegible]

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled will cause nausea, vomiting headache dizziness difficult breathing or loss of consciousness

[illegible]

LIQUID
Irritating to skin and eyes.
If swallowed will cause nausea vomiting or loss of consciousness.

[illegible]

DO NOT INDUCE VOMITING

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability
Evacuate area

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Methylbenzene
Methylbenzol
Toluol

3.2 **Coast Guard Compatibility Classification** Aromatic hydrocarbon

3.3 **Chemical Formula:** $C_6H_5CH_3$

3.4 **IMCC/United Nations Numerical Designation:** 3.2 1294

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Pungent aromatic benzene like distinct pleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask goggles or face shield plastic gloves

5.2 **Symptoms Following Exposure** Vapors irritate eyes and upper respiratory tract cause dizziness headache anesthesia respiratory arrest Liquid irritates eyes and causes drying of skin. If aspirated causes coughing gagging distress and rapidly developing pulmonary edema. If ingested causes vomiting griping diarrhea, depressed respiration

5.3 **Treatment for Exposure:** INHALATION remove to fresh air give artificial respiration and oxygen if needed call a doctor INGESTION do NOT induce vomiting call a doctor EYES flush with water for at least 15 min SKIN wipe off wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits.** 600 ppm for 30 min

5.6 **Toxicity by Ingestion.** Grade 2 LD_{50} 0.5 to 5 g/kg

5.7 **Late Toxicity:** Kidney and liver damage may follow ingestion

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin

5.10 **Odor Threshold:** 0.17 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 40°F (C.C.) 55°F (O.C.)

6.2 **Flammable Limits in Air:** 1.27 – 7.1

6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires ordinary foam for large fires

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products.** Not pertinent

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** 997°F

6.8 **Electrical Hazard:** Class I Group D

6.9 **Burning Rate:** 5.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity** 1180 mg/l 96 hr sunfish/11 m fresh water

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD).** Ov 5 days 3% (theor) 18 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co
Houston Tex 77001
2. Shell Chemical Co
Petrochemicals Division
Houston Tex 77001
3. Sun Oil Co
St Davids Pa 19087

10. SHIPPING INFORMATION

10.1 **Grades or Purity** Research reagent nitration all 99.8+% industrial contains 94+% with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons 96/120 less pure than industrial

10.2 **Storage Temperature** Ambient

10.3 **Inert Atmosphere** No requirement

10.4 **Venting:** Open (flame arrester) or pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 92.14

13.3 **Boiling Point at 1 atm.** 231.1°F = 110.6°C = 383.8°K

13.4 **Freezing Point** −139°F = −95.0°C = 178.2°K

13.5 **Critical Temperature** 605.4°F = 318.6°C = 591.8°K

13.6 **Critical Pressure** 596.1 psia = 40.55 atm = 4.108 MN/m²

13.7 **Specific Gravity** 0.867 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 29.0 dynes/cm = 0.0290 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension:** 36.1 dynes/cm = 0.0361 N/m at 25°C

13.10 **Vapor (Gas) Specific Gravity** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.089

13.12 **Latent Heat of Vaporization.** 155 Btu/lb = 86 cal/g = 3.6 × 10⁵ J/kg

13.13 **Heat of Combustion** −17,430 Btu/lb = −9686 cal/g = −405.8 × 10⁵ J/kg

13.14 **Heat of Decomposition** No pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization** Not pertinent

(Continued on pages 5 and 6)

NOTES

TDI	# TOLUENE 2,4-DIISOCYANATE

Common Synonyms
TDI
Hylene T
Mondur TDS
Naccanate 100

Liquid — Colorless to light yellow — Sharp, sweet fruity odor

Sinks and reacts with water. Freezing point is 68° F – 72° F

AVOID CONTACT WITH LIQUID AND VAPOR. Keep upwind. Wear goggles, self-contained breathing apparatus and rubber protective clothing including gloves.
Stop leak if you can do it without risk.
Call for assistance.
Isolate area and prevent unauthorized entry.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GAS IS PRODUCED IN FIRE
Wear goggles, self-contained breathing apparatus and rubber protective clothing including gloves.
Extinguish with dry chemical or carbon dioxide.
Water and foam may be ineffective on this.
Do not expose containers to water.

Exposure

CALL FOR MEDICAL AID

LIQUID
POISONOUS IF SWALLOWED
Will burn skin and eyes
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES: Hold open and flush with plenty of water.
IF SWALLOWED: Induce CONSCIOUS vomiting by drinking water and emetic.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
Notify local health and pollution control agencies.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning – water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Hylene T, Mondur TDS, Naccanate 100, 2,4-Tolylene diisocyanate, TDI
3.2 **Coast Guard Compatibility Classification:** Isocyanate
3.3 **Chemical Formula:** $1\text{-}CH_3\text{-}C_6H_3(NCO)_2$ 2,4
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to light yellow
4.3 **Odor:** Sweet, fruity, pungent

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister, goggles or face shield, rubber gloves, boots and apron
5.2 **Symptoms Following Exposure:** Irritates eyes and skin. Potent sensitizer and lung irritant if inhaled. May produce bronchospasm (asthma), pneumonitis, bronchitis, and pulmonary edema. Nocturnal cough and shortness of breath are common. Repeated low level exposure may produce chronic lung disease. Oral toxicity is low.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, administer artificial respiration and oxygen if needed, call a doctor at once. INGESTION: do NOT induce vomiting, call a doctor. EYES: flush with water for at least 15 min, call doctor at once. SKIN: flush with water, wipe off, wipe with rubbing alcohol, wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.02 ppm
5.5 **Short-Term Inhalation Limits:** 0.02 ppm for 5 min
5.6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 to 5 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant, may cause pain and second degree burns after a few minutes contact.
5.10 **Odor Threshold:** 0.4 – 2.14 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 270°F O.C.
6.2 **Flammable Limits in Air:** 0.9% – 9.5%
6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause froothing
6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** > 800°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Forms carbon dioxide gas and an organic base; the reaction is not violent
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Slow, not hazardous above 113°F
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. BASF Wyandotte Corp.
   Industrial Chemicals Group
   1609 Biddle Ave.
   Wyandotte, Mich. 48192
2. Bayhem Corp.
   Mobay Chemical Co. Division
   Penn Lincoln Pkwy. West
   Pittsburgh, Pa. 15205
3. E. I. duPont de Nemours & Co., Inc.
   Elastomer Chemicals Dept.
   Wilmington, Del. 19898

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial distilled 99% total diisocyanate. The following isomer ratios are shipped: (a) 100% 2,4; (b) 80% 2,4, 20% 2,6-(most common); (c) 65% 2,4, 35% 2,6-. All mixtures have about the same hazard characteristics.
10.2 **Storage Temperature:** 75° – 100°F
10.3 **Inert Atmosphere:** Inerted
10.4 **Venting:** Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poison, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	
Aesthetic Effect	4
Reactivity	
Other Chemicals	3
Water	3
Self Reaction	4

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 174.16
13.3 **Boiling Point at 1 atm.:** 482°F = 250°C = 523°K
13.4 **Freezing Point:** 68° – 72°F = 20° – 22°C = 293° – 295°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.22 at 25°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 25°C
13.9 **Liquid-Water Interfacial Tension:** (est.) 45 dynes/cm = 0.045 N/m at 25°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** (est.) −10,300 Btu/lb = −5720 cal/g = −239 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

TAP — p-TOLUENESULFONIC ACID

Common Synonyms

Methylbenzenesulfonic acid
Tosic acid
p-TSA

Solid — Colorless to black — Odorless or slight odor

Mixes with water

Fire

Combustible
Irritating gases may be produced when heated

Exposure

SOLID
Irritating to skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning corrosive
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Methylbenzenesulfonic acid, Tosic acid, p-TSA

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $CH_3C_6H_4SO_3H$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White to brown to black, yellow or amber

4 3 **Odor:** None when pure technical grade has slight aromatic odor

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical goggles or face shield rubber gloves

5 2 **Symptoms Following Exposure:** Contact with eyes or skin causes severe irritation Ingestion causes irritation of mouth and stomach

5 3 **Treatment for Exposure:** EYES wash thoroughly with copious amounts of water for at least 15 min., call physician if irritation persists SKIN wash thoroughly with large amounts of water for at least 15 min INGESTION give large amount of water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 400 mg/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (solid with low flammability)

6 2 **Flammable Limits in Air:** Not pertinent

6 3 **Fire Extinguishing Agents:** Water

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur may be formed

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** A strong acid which can react with common metals

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Flush with water rinse with dilute sodium bicarbonate or lime solution

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** 0% 5 days

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Cities Service Company
Industrial Chemicals Division
3445 Peachtree Road N E
P O Box 90360
Atlanta Ga 30302

2 Neave Chemical Co Inc
P O Box 221
State College, Pa 16801

3 Aldrich Chemical Co
940 West St Paul Avenue
Milwaukee Wis 53233

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 93+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Corrosive solid

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 172 2

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 219 221°F = 104 105°C = 377 378°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 45 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** −50 Btu/lb = −28 cal/g = −1 2 × 10⁵ J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

TLI	o-TOLUIDINE

Common Synonyms		
2 Amino-1-methylbenzene 2 Aminotoluene 2 Methylaniline o-Methylaniline	Liquid Colorless to yellow brown Chemical odor May float or sink in water	

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	LIQUID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness
Water Pollution	Effect of low concentrations on aquatic life unknown Fouling to shoreline May be dangerous if it enters water intake

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Restrict access
Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 2 Amino-1 methylbenzene, 2-Aminotoluene, 2 Methylaniline, o Methylaniline

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula:** 1,2 $CH_3C_6H_4NH_2$

3 4 **IMCO/United Nations Numerical Designation:** 6 1 1708

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Clear to light yellow, turns yellow, brown or deep red on exposure to air and light

4 3 **Odor:** Aromatic aniline like

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical safety goggles face shield, Bu Mines approved respirator leather or rubber safety shoes, butyl rubber gloves

5 2 **Symptoms Following Exposure:** Absorption of toxic quantities by any route causes cyanosis (blue discoloration of lips nails skin), nausea, vomiting, and coma may follow Repeated inhalation of low concentrations may cause pallor low grade secondary anemia fatigability, and loss of appetite Contact with eyes causes irritation

5 3 **Treatment for Exposure:** Get medical attention following all exposures to this compound INHALATION move to fresh air INGESTION if victim is conscious promptly induce vomiting by giving lukewarm soapy water or mustard and water EYES flush with copious amounts of water for at least 15 min holding lids apart SKIN remove all contaminated clothing wash affected areas immediately and thoroughly with plenty of warm water and soap

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 ppm

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 [illegible] LD_{50} = 500 mg/kg (rat)

5 7 **Late Toxicity:** Causes tumors [illegible] bladder of rats

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 167°F (C.C.) 85°F (C.C.)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen and flammable vapors may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** 900°F

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate:** 3 62 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity**
50 ppm/* 96 hr lethal-fresh water
* Time period not specified

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD):** 143% 5 days

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 First Chemical Corp
636 N State St
Jackson, Miss 39205

2 E I du Pont de Nemours & Co Inc
Wilmington, Del 19898

3 Aldrich Chemical Co
940 W Saint Paul Ave
Milwaukee Wis 53233

10. SHIPPING INFORMATION

10 1 **Grades or Purity** Commercial 99 5+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3.

A-P Q T U-X Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 107 2

13 3 **Boiling Point at 1 atm:** 392°F = 200°C = 473°K

13 4 **Freezing Point:** −11°F = −24°C = 249°K

13 5 **Critical Temperature:** 790°F = 421°C = 694°K

13 6 **Critical Pressure:** 544 psia = 37 0 atm = 3 75 MN/m²

13 7 **Specific Gravity:** 0 998 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 43 55 dynes/cm = 0 04355 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Data not available

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** 179 1 Btu/lb = 99 5 cal/g = 4 16 × 10⁵ J/kg

13 13 **Heat of Combustion:** −16 180 Btu/lb = −8 990 cal/g = −376 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

TXP	# TOXAPHENE

Common Synonyms Octachlorocamphene	Waxy solid or in solution Amber Solid sinks in water solution floats on water
[illegible]	
Fire	Solid not flammable, but usually dissolved in combustible liquid. POISONOUS GASES ARE PRODUCED IN FIRE [illegible]
Exposure	CALL FOR MEDICAL AID SOLID OR SOLUTION POISONOUS IF SWALLOWED Irritating to skin and eyes. [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Solution is fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Pesticides Manual, Handbook CG-446-4)

Issue warning - poison water contaminant

Should be removed

Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Octachlorocamphene

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $C_{10}H_{10}Cl_8$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Waxy solid

4 2 **Color:** Amber

4 3 **Odor:** Mild turpentine odor

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical type respirator, rubber gloves, chemical goggles or face shield

5 2 **Symptoms Following Exposure:** May be absorbed through skin, lungs, or intestinal tract. Symptoms include salivation, leg and back muscle spasms, nausea, vomiting, hyperexcitability, tremors, shivering, clonic convulsions, then tetanic contractions of all skeletal muscles. Lethal doses cause respiratory failure. Respiration affected as a result of the exertion from vomiting or convulsions, is first arrested because of tetanic muscular contractions, then increased in both amplitude and rate as the muscles relax.

5 3 **Treatment for Exposure:** If symptoms of poisoning appear, promptly remove the unabsorbed pesticide from the stomach by induced vomiting with warm salty or soapy water if the patient is conscious, or from the skin with soap and water. Keep patient warm and quiet. Call a physician.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 4 LD$_{50}$ below 50 mg/kg (dog)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** The solid is non volatile; for solutions, see metal xylene

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point** 84°F (C.C. solution)

6 2 **Flammable Limits in Air:** 1.1 - 6.4 (xylene only)

6 3 **Fire Extinguishing Agents** Foam, dry chemical, or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Toxic vapors are generated when heated

6 6 **Behavior in Fire:** Solution in xylene may produce corrosive products when heated

6 7 **Ignition Temperature:** 956°F (solution)

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
0.05 ppm 20 days goldfish 100% kill fresh water
0.02 ppm * bluegill 100% kill fresh water
0.0032 ppm 24 hr spot 100% kill salt water
* Time period not specified

8 2 **Waterfowl Toxicity:** 30 mg/kg

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Hercules Inc.
Synthetics Dept
Brunswick, Ga 31521

2 Sanford Chemical Co
Pure Atlantic Highway
Port Neches, Tex 77651

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, 40% dust concentrate, 90% solution in xylene

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Sealed containers in well-ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446)

H A T E

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Poisonous liquid or solid, Class B

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Waxy solid

13 2 **Molecular Weight:** 414 (avg)

13 3 **Boiling Point at 1 atm:** Decomposes

13 4 **Freezing Point:** 149 - 158 = 65 - 90°C = 338 - 363°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** [illegible]

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page [illegible])

NOTES

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TCE	TRICHLOROETHANE

Common Synonyms 1 1 1 Trichloroethane Methylchloroform	Watery liquid Colorless Sweet odor Sinks in water Irritating vapor is produced
[illegible]	
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat If inhaled will cause dizziness or difficult breathing [illegible] LIQUID Irritating to skin and eyes. If swallowed may produce nausea [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Emergency Methods, NAS Rep. CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Aerothene
Chlorothene
Methylchloroform
1 1 1 Trichloroethane

3 2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3 3 **Chemical Formula:** CH_3CCl_3

3 4 **IMCU United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Chloroform like, sweetish

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic vapor acid gas canister self-contained breathing apparatus for emergencies neoprene or polyvinyl alcohol rubber gloves chemical safety goggles and face shield, neoprene safety shoes leather safety shoes plus neoprene footwear neoprene or polyvinyl alcohol suit or apron for splash protection

5 2 **Symptoms Following Exposure:** INHALATION symptoms range from loss of equilibrium and incoordination to loss of consciousness high concentrations can be fatal due to simple asphyxiation combined with loss of consciousness INGESTION produces effects similar to inhalation and may cause some feeling of nausea EYES slightly irritating and lachrymatory SKIN defatting action may cause dermatitis

5 3 **Treatment for Exposure:** Get medical attention for all eye exposures and any other serious over exposures Do NOT administer adrenalin or epinephrine otherwise, treatment is symptomatic INHALATION remove victim to fresh air if necessary apply artificial respiration and/or administer oxygen INGESTION have victim drink water and induce vomiting EYES flush thoroughly with water SKIN remove contaminated clothing and wash exposed area thoroughly with soap and warm water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 350 ppm

5 5 **Short-Term Inhalation Limits:** 1000 ppm for 60 min in man

5 6 **Toxicity by Ingestion:** Grade 1 LD50 5 to 15 g/kg rat mouse rabbit guinea pig

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary

(Continued on page 4)

6. FIRE HAZARDS

6 1 **Flash Point:** Data not available

6 2 **Flammable Limits in Air:** [illegible]

6 3 **Fire Extinguishing Agents** Dry chemical foam or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products.** Toxic and irritating gases are generated in fires

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 932°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** (est) 2 9 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts slowly releasing corrosive hydrochloric acid

7 2 **Reactivity with Common Materials:** Corrodes aluminum but reaction is not hazardous

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
75 150 ppm * sunfish 11 m salt water
*Time period not specified

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland Mich 48640

2 PPG Industries Inc
Industrial Chemicals Division
Gateway Center
Pittsburgh Pa 15222

3 Vulcan Materials Co
Chemicals Division
Wichita Kan 67201

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Uninhibited inhibited industrial inhibited white room cold cleaning

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-X-Y

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 133 41

13 3 **Boiling Point at 1 atm:**
165°F = 74°C = 347°K

13 4 **Freezing Point:**
< -30°F = < -34°C = < 234°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 34 at 20°C (liquid)

13 8 **Liquid Surface Tension:**
25 4 dynes/cm = 0 0254 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:**
(est 145 dynes/cm = 0 045 N/m at 20°C)

13 10 **Vapor (Gas) Specific Gravity:** 4 6

13 11 **Ratio of Specific Heats of Vapor (Gas):**
1 064

13 12 **Latent Heat of Vaporization:**
100 Btu/lb = 55 cal/g = 2 4 × 10⁵ J/kg

13 13 **Heat of Combustion:** (est) 4700 Btu/lb
= 2600 cal/g = 110 × 10⁵ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 3 and 4)

5. HEALTH HAZARDS (Cont'd.)

5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5 10 **Odor Threshold:** 100 ppm

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TCL — TRICHLOROETHYLENE

Common Synonyms
Trichloroethene
Trichlene

Watery liquid — Colorless — Sweet odor

Sinks in water. Irritating vapor is produced.

[illegible]

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE

[illegible]

Exposure

[illegible]

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause nausea, vomiting, difficult breathing or loss of consciousness

[illegible]

LIQUID
Irritating to skin and eyes
If swallowed, will cause nausea, vomiting, difficult breathing, or loss of consciousness.

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Algylen, Chlorylen, Gemalgene, Threthylene, Trethylene, Tri, Trichloran, Trichloroethene, Tri Clene, Tricleno, Trilene, Trimar

3.2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3.3 **Chemical Formula:** $CHCl=CCl_2$

3.4 **IMCO/United Nations Numerical Designation:** 9.0/1710

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Chloroform like, ethereal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor acid gas canister, self-contained breathing apparatus for emergencies, neoprene or vinyl gloves, chemical safety goggles, face shield, neoprene safety shoes, neoprene suit or apron for splash protection

5.2 **Symptoms Following Exposure:** INHALATION: symptoms range from irritation of the nose and throat to nausea, an attitude of irresponsibility, blurred vision, and fatally disturbance of central nervous system resulting in cardiac failure. Chronic exposure may cause organic injury. INGESTION: symptoms similar to inhalation. SKIN: defatting action can cause dermatitis. EYES: slightly irritating sensation and lachrymation

5.3 **Treatment for Exposure:** Do NOT administer adrenalin or ephedrine; get medical attention in all cases of overexposure. INHALATION: remove victim to fresh air, if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting, repeat three times, then give 1 tablespoon epsom salt in water. EYES: flush thoroughly with water. SKIN: wash thoroughly with soap and warm water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** 200 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 3 LD$_{50}$ 50 to 500 mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effects are temporary

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5.10 **Odor Threshold:** 50 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 90°F (C.C.) practically nonflammable

6.2 **Flammable Limits in Air:** 8.0 – 10.5%

6.3 **Fire Extinguishing Agents:** Water fog

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are produced in fire situations

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 770°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 660 mg/l 40 hr daphnia, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co., Midland, Mich. 48640
2. E. I. duPont de Nemours & Co., Inc., Electrochemicals Dept., Wilmington, Del. 19898
3. PPG Industries Inc., Industrial Chemical Division, Lake Charles, La. 70601

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical, dry cleaning, degreasing, extraction

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-X-Y

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** ORM-A

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 131.39

13.3 **Boiling Point at 1 atm:** 189°F = 87°C = 360°K

13.4 **Freezing Point:** −123.8°F = −86.4°C = 186.7°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.46 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 29.3 dynes/cm = 0.0293 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** 34.5 dynes/cm = 0.0345 N/m at 24°C

13.10 **Vapor (Gas) Specific Gravity:** 4.5

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.116

13.12 **Latent Heat of Vaporization:** 103 Btu/lb = 57.2 cal/g = 2.40 × 10^5 J/kg

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5-4.6

NOTES

REVISED 1978

TCF	TRICHLOROFLUOROMETHANE

Common Synonyms F 11 Freon 11 Genetron 11	Liquid Colorless Odorless Sinks in water. Harmful vapor is produced. Boiling point is 75°F
[illegible]	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE. [illegible]
Exposure	CAUTIONARY VAPOR If inhaled, will cause dizziness or difficult breathing. [illegible] LIQUID Not harmful
Water Pollution	Not harmful to aquatic life May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4:

Should be removed

Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Arcton 11, Freon 11, Isotron 11, Kaiger 11, Isotron 11, F 11, Genetron 11, Leon [illegible]

3 2 **Coast Guard Compatibility Classification:** Halogenated hydrocarbon

3 3 **Chemical Formula:** $CFCl_3$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Odorless, mild chlorinated odor [illegible]

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** [illegible] rubber gloves, [illegible]

5 2 **Symptoms Following Exposure:** Breathing concentrations approaching [illegible] cause dizziness and drowsiness. Contact with [illegible] may cause frostbite

5 3 **Treatment for Exposure:** INHALATION: remove victim [illegible] contaminated area and apply artificial respiration if breathing has stopped and physician immediately. [illegible] may be [illegible] SKIN: [illegible] rinse with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5 9 **Liquid or Solid Irritant Characteristics:** Mild irritant

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Produces irritating and toxic gas when heated to decomposition temperatures

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Not reactive

7 2 **Reactivity with Common Materials:** Not reactive

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** None

8 2 **Waterfowl Toxicity:** None

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 E I duPont de Nemours & Co Inc
Freon Products Division
Wilmington, DE 19898

2 Pennwalt Corp
Chemical Division
3 Penn Center
Philadelphia, PA 19102

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-C-I-J

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 137.4

13 3 **Boiling Point at 1 atm:** 24°C = 75°F = 297°K

13 4 **Freezing Point:** −108°F = −77°C = 165°K

13 5 **Critical Temperature:** 388°F = 198°C = 471°K

13 6 **Critical Pressure:** 639.4 psia = 43.5 atm = 4.41 MN/m²

13 7 **Specific Gravity:** 1.49 at 20°C (liquid)

13 8 **Liquid Surface Tension:** 23 dynes/cm = 0.023 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** 4.7

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.126

13 12 **Latent Heat of Vaporization:** 76 cal/g = 3.2 × 10⁵ J/kg

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

REVISED 1978

TPH	TRICHLOROPHENOL

Common Synonyms 2,4,5-Trichlorophenol Dowicide 2 Preventol	Solid crystals or flakes — Yellow — Strong disinfectant odor Sinks in water
[illegible]	
Fire	Not flammable
Exposure	DUST OR SOLID Irritating to eyes, nose, and throat [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Boil water — water contaminant
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Dowicide 2
Ortho
Phenachlor
2 4 5-Trichlorophenol

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula:** $HOC_6H_2Cl_3$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Colorless to gray

4 3 **Odor:** Strong disinfectant

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved dust respirator [illegible] goggles [illegible] clothing to prevent contact with skin

5 2 **Symptoms Following Exposure:** Dust may cause swelling of eyes and [illegible] irritation of nose and throat. Solid irritates [illegible] prolonged contact

5 3 **Treatment for Exposure:** INHALATION remove to fresh air get medical attention EYES flush with water [illegible] get medical attention SKIN wash with soap and water [illegible] get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** [illegible]

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Exposure [illegible] outside at ordinary temperatures

5 9 **Liquid or Solid Irritant Characteristics:** May cause [illegible] Prolonged contact with skin causes [illegible] Dust irritates nose and throat

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** Not flammable

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Not reactive

7 2 **Reactivity with Common Materials:** None

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
[illegible] ppm 24 hr TLm [illegible] fresh water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Dow Chemical
Midland Mich [illegible]

2 Eltel Organics Inc
Niles W Va [illegible]

3 Hooker Chemical Corp
Industrial Chemicals Division
Niagara Falls N Y 14302

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical [illegible]

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Solid form not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 197.5

13 3 **Boiling Point at 1 atm:** 465°F = 252°C = 525°K

13 4 **Freezing Point:** 155°F = 68°C = 330°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.7 at 25°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 4

NOTES

TCA	2,4,5-TRICHLOROPHENOXYACETIC ACID

Common Synonyms	Solid	White	Odorless
2,4,5-T	Sinks in water		

Fire

Combustible
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

POISON

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2,4,5-T
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $2,4,5\text{-}Cl_3C_6H_2OCH_2COOH$
3.4 **IMCO/United Nations Numerical Designation:** n.1.1609

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** White
4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask and rubber gloves
5.2 **Symptoms Following Exposure:** Overexposure to dust by inhalation or ingestion may cause fatigue, nausea, vomiting, lowered blood pressure, convulsions, coma. Dust may irritate eyes and skin
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, if required, give artificial respiration. EYES: flush with water until irritating dust is removed. SKIN: wash with soap and water. INGESTION: call physician at once; induce vomiting and administer gastric lavage
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m³
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3, oral LD_{50} = 500 mg/kg (rat)
5.7 **Late Toxicity:** Birth defects in rats and mice. Causes an acne-like skin eruption among human workers
5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (solid)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene gases may be formed
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Can be corrosive to common metals
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity**
[illegible] ppm 24 hr bluegill, [illegible] in fresh water
[illegible] ppm/48 hr spot, [illegible] in salt water
8.2 **Waterfowl Toxicity:** [illegible] ppm LD_{50}
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Will not bioconcentrate

9. SELECTED MANUFACTURERS

1. Dow Chemical Co
   Midland, Mich. 48640
2. Transvaal Inc
   P.O. Box 69
   Jacksonville, Ark. 72076
3. Monsanto Co
   800 N. Lindbergh Boulevard
   St. Louis, Mo. 63166

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisons, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classification:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 255.5
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** 316°F = 158°C = 431°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.803 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible] Btu/lb = [illegible] cal/g = [illegible] kJ/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

TCS	TRICHLOROSILANE

Common Synonyms			
Trichlorosilane Silicochloroform	Liquid	Colorless	Sharp choking odor
	Reacts violently with water. Irritating gas is produced on contact with water. Boiling point is 90°F.		

Fire	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. LIQUID Will burn skin and eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG-446-4)

Issue warning: high flammability, corrosive, air contaminant.
Restrict access.
Evacuate area.
Disperse and flush.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Silicochloroform, Trichlorosilane
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $SiHCl_3$
3.4 **NBCO/United Nations Numerical Designation:** 1 1 1295

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sharp, choking, like hydrochloric acid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor type respirators, protection, rubber gloves, chemical worker's goggles, other protective equipment as necessary to protect skin and eyes.
5.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of respiratory system. Liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach.
5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure; if breathing is difficult or stopped, give artificial respiration, call physician. EYES or SKIN: flush with plenty of water immediately for at least 15 min and get medical attention. INGESTION: do NOT induce vomiting, give large amount of water, get medical attention.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 1,000 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** −18°F (−27°C) (−38°F (−39°C))
6.2 **Flammable Limits in Air:** 1.2% – 90.5%
6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam
6.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and chlorine gases may form in fires.
6.6 **Behavior in Fire:** Difficult to extinguish; reignition may occur. Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 120°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride fumes (hydrochloric acid).
7.2 **Reactivity with Common Materials:** Reacts with surface moisture to form hydrochloric acid, which corrodes common metals and forms flammable hydrogen gas.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Venture Corp.
Chemicals Division
8 Congress Street
Beverly, Mass. 01915
2. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017
3. Dow Corning Corporation
P.O. Box 592
Midland, Mich. 48640

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG-446-3)

A-0

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	4
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 135.5
13.3 **Boiling Point at 1 atm:** 90°F = 32°C = 305°K
13.4 **Freezing Point:** −197°F = −127°C = 146°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.344 at 20°C (liquid)
13.8 **Liquid Surface Tension:** (est.) 18.1 dynes/cm = 0.0181 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 4.9
13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13.12 **Latent Heat of Vaporization:** 85 Btu/lb = 47 cal/g = 2.0 × 10⁵ J/kg
13.13 **Heat of Combustion:** Data not available
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

(continued on page 7 and 8)

NOTES

TCT	TRICHLORO-s-TRIAZINETRIONE

Common Synonyms			
Trichlorotriazine 2,4,6-(1H,3H,5H)-trione Trichlorotriazinetrione Trichloroisocyanuric acid Trichloroisocyanuric acid	Solid	White	Bleach-like odor
	Sinks and mixes slowly with water		

Fire	Not flammable May cause fire on contact with combustibles POISONOUS GASES ARE PRODUCED IN FIRE Containers may explode in fire
Exposure	INGEST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Isolate warning - endanger material water contaminant
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichloroisocyanuric acid, Trichloroisocyanuric acid, Trichlorotriazine 2,4,6-(1H,3H,5H)-trione, Trichlorotriazinetrione, 1,3,5-Trichloro-2,4,6-triazo-1,3,5-triazine

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $C_3N_3O_3Cl_3$

3.4 **IMCO/United Nations Numerical Designation:** 5.1

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Like chlorine

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask or chlorine canister mask, goggles, rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes sneezing and coughing. Contact with dust causes moderate irritation of eyes and itching and redness of skin. Ingestion causes burns of mouth and stomach

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. EYES: irrigate with running water for 15 min., call physician. SKIN: flush with water. INGESTION: induce vomiting and call physician

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2, oral LD_{50} = 700 mg/kg (rat)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable, but may cause fire on contact with ordinary combustibles

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Water in large amounts

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic chlorine or hydrogen chloride may be formed in fires

6.6 **Behavior in Fire:** Containers may explode when heated

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts to form bleach solution. The reaction is not hazardous

7.2 **Reactivity with Common Materials:** Contact with most foreign material, organic matter or rusts chlorinated or oxidized materials may result in fire. Avoid oil, grease, sawdust, floor sweepings, other easily oxidized organic compounds

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. FMC Corporation
   Industrial Chemical Division
   633 Third Avenue
   New York, N.Y. 10017
2. Monsanto Co.
   800 N. Lindbergh Boulevard
   St. Louis, Mo. 63166
3. Eastman Kodak Co.
   Eastman Organic Chemicals
   Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 39 - 40% available chlorine

10.2 **Storage Temperature:** Ambient. Avoid elevated temperatures

10.3 **Inert Atmosphere:** No requirement of this

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

H-SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizing material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	2
	OXY

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 232.5

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** (est.) > 1 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 of 3

NOTES

TCP	TRICRESYL PHOSPHATE

Common Synonyms
TCP
Tri-p-cresyl phosphate

Liquid | Colorless | Odorless

Sinks in water

[illegible]

Fire

Compatible
[illegible]

Exposure

LIQUID
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** TCP
Tri-p-tolyl phosphate
Tri-p-cresyl phosphate

3.2 **Coast Guard Compatibility Classification.** Not applicable

3.3 **Chemical Formula:** $(pCH_3C_6H_4O)_3PO$

3.4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color:** Colorless

4.3 **Odor** Odorless

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** Goggles or face shield

5.2 **Symptoms Following Exposure.** Vapors may irritate eyes but only at high temperatures. Ingestion of liquid may cause severe damage to central nervous system and death if significant amounts of the toxic ortho isomer are present

5.3 **Treatment for Exposure** INGESTION induce vomiting and call a doctor EYES flush with water for at least 15 min SKIN wipe off wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent

5.5 **Short-Term Inhalation Limits** Not pertinent

5.6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 to 5 g/kg (Chicken LD_{50} > 2 g/kg)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. The compound is non volatile for all practical purposes

5.9 **Liquid or Solid Irritant Characteristics.** No appreciable hazard. Practically harmless to the skin

5.10 **Odor Threshold** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point** 410°F C.C.

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents** Foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate.** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 FMC Corp
Organic Chemicals Division
633 Third Ave
New York, N.Y. 10017

2 Monsanto Co
Monsanto Industrial Chemicals Co
800 N. Lindbergh Blvd
St. Louis, Mo. 63166

3 Stauffer Chemical Co
Specialty Chemicals Division
Gallipolis Ferry, W. Va. 25515

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Consists primarily of the para isomer but several commercial grades may contain a significant proportion of tri-orthocresyl phosphate. Latter is considerably more toxic than the para isomer if ingested

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A X

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight** 368

13.3 **Boiling Point at 1 atm.** 770°F = 410°C = 683°K

13.4 **Freezing Point** −27°F = −33°C = 240°K

13.5 **Critical Temperature.** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** 1.16 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 44 dynes/cm = 0.044 N/m at 25°C

13.9 **Liquid-Water Interfacial Tension.** Data not available

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization.** [illegible] 150.0 Btu/lb = 44.5 cal/g = 1.86 × 10⁵ J/kg

13.13 **Heat of Combustion.** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

(Continued on pages 5 and 6)

NOTES

REVISED 1978

TRIDECANOL

Common Synonyms			
1 Tridecanol Oxotridecyl alcohol	Oily liquid Floats on water	Colorless	Mild, pleasant odor

Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Isotridecanol
Isotridecyl alcohol
1-Tridecanol

3 2 **Coast Guard Compatibility Classification.** Alcohol

3 3 **Chemical Formula.** $C_{13}H_{27}OH$

3 4 **IMCO/United Nations Numerical Designation.** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild alcoholic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Synthetic rubber gloves chemical goggles

5 2 **Symptoms Following Exposure** Inhalation hazard slight Skin contact results in moderate irritation Liquid contact with eyes causes severe irritation and possible eye damage

5 3 **Treatment for Exposure:** EYES promptly flush with clean water for at least 15 min and see a physician SKIN wash exposed area with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Data not available

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard Practically harmless to the skin

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 280°F O C

6 2 **Flammable Limits in Air.** Data not available

6 3 **Fire Extinguishing Agents** Alcohol foam dry chemical water fog

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity.** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Exxon Chemical Co
Houston Tex 77001

2 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Mixed isomers 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 200 37

13 3 **Boiling Point at 1 atm.** 525°F = 274°C = 547°K

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure** Not pertinent

13 7 **Specific Gravity:** 0 846 at 20°C (liquid)

13 8 **Liquid Surface Tension:** (est) 30 dynes/cm = 0 03 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** (est) 30 dynes/cm = 0 03 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1 027

13 12 **Latent Heat of Vaporization:** 120 Btu/lb = 64 cal/g = 2 7 × 10⁵ J/kg

13 13 **Heat of Combustion:** (est) −12 200 Btu/lb = −6 700 cal/g = −28 × 10⁶ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(continued on pages 5 and 6)

NOTES

TDC	1-TRIDECENE

Common Synonyms			
Undecylethylene	Watery liquid	Colorless	Mild pleasant odor
	Floats on water		

	No pipeline [illegible] possible [illegible] [illegible] [illegible]
Fire	**Combustible** [illegible] Water may be ineffective [illegible] [illegible]
Exposure	**LIQUID** **Irritating to eyes.** [illegible] water
Water Pollution	**Effect of low concentrations on aquatic life is unknown** **Fouling to shoreline** **May be dangerous if it enters water intakes** [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Undecylethylene
3 2 **Coast Guard Compatibility Classification** Olefin
3 3 **Chemical Formula.** $CH_2CH(CH_2)_8CH=CH_2$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Mild pleasant

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield
5 2 **Symptoms Following Exposure:** Liquid may irritate eyes
5 3 **Treatment for Exposure:** EYES flush with water for 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Lethal Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Non volatile
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point.** 175°F (approx.)
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical foam, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent.
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Exxon Chemical Co
Houston, Tex. 77001
2 The Humphrey Chemical Co
Devine Street
North Haven, Conn. 06473
3 Phillips Petroleum Co
Bartlesville, Okla. 74004

10 SHIPPING INFORMATION

10 1 **Grades or Purity.** Technical 95%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-1-U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 182.35
13 3 **Boiling Point at 1 atm:** 451°F = 233°C = 506°K
13 4 **Freezing Point:** −11°F = −24°C = 249°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.765 at 20°C (liquid)
13 8 **Liquid Surface Tension:** 24.5 dynes/cm = 0.0245 N/m at 20°C
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.029
13 12 **Latent Heat of Vaporization.** 110 Btu/lb = 59 cal/g = 2.5×10^5 J/kg
13 13 **Heat of Combustion.** −19,048 Btu/lb = −10,582 cal/g = -443.0×10^5 J/kg
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

TEA	TRIETHANOLAMINE

Common Synonyms	
Triethylolamine Trihydroxytriethylamine Tris hydroxyethylamine	Oily liquid Colorless Mild ammonia odor Sinks and mixes with water. Freezing point is 71° F

[illegible]

Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible]
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** 2,2,2" Nitrilotriethanol
Triethylolamine
Trihydroxytriethylamine
Tris(hydroxyethyl)amine

3 2 **Coast Guard Compatibility Classification.** Alkanolamine

3 3 **Chemical Formula:** $(HOCH_2CH_2)_3N$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Mild ammoniacal

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield, rubber gloves and boots

5 2 **Symptoms Following Exposure:** Liquid may irritate eye and skin

5 3 **Treatment for Exposure** EYES flush with water for at least 15 min, call a doctor. SKIN wipe off, wash with soap and water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion** Grade 2 (LD50 [illegible] g/kg guinea pig)

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Not available

5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin

5 10 **Odor Threshold** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point.** 355°F (C.C.) 375°F (O.C.)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Alcohol foam, dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire.** Not pertinent

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics** Dilute with water

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** >100 ppm 48 hr shrimp TLm salt water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 1 [illegible] days 0.[illegible] [illegible] days 0.2 [illegible] 20 days

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland, Mich 48640

2 Jefferson Chemical Co Inc
3336 Richmond Ave
Houston, Tex 77082

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 85, 99%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-2)

V P Q

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	1	1
Flammability (Red)	1	1
Reactivity (Yellow)	1	1

*First column refers to non fire situations

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 149.19

13 3 **Boiling Point at 1 atm.** Decomposes

13 4 **Freezing Point.** 70.9°F = 21.6°C = 294.8°K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.13 at 20°C (4 and)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** 1.036

13 12 **Latent Heat of Vaporization** 176 Btu/lb = 97 Btu/gal = 4.10 × 10⁵ J/kg

13 13 **Heat of Combustion:** -11,050 Btu/lb = -6140 cal/g = -2.57 × 10⁷ J/kg

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** (est.) 20 Btu/lb = 12 cal/g = 2.5 × 10⁴ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

TAL	TRIETHYLALUMINUM

Common Synonyms	Liquid — Colorless
TEA Aluminum triethyl ATE	IGNITES WHEN EXPOSED TO AIR. Flammable gas is produced on contact with water

Fire	IGNITES WHEN EXPOSED TO AIR POISONOUS GASES MAY BE PRODUCED IN FIRE [illegible]
Exposure	[illegible] LIQUID Will burn skin and eyes Harmful if swallowed [illegible] DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
Restrict access
Evacuate area
Disperse and flush with care

2. LABELS

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** ATE, Aluminum triethyl, TEA

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $(C_2H_5)_3Al$

3.4 **IMCO/United Nations Numerical Designation:** 9.2, 1102

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Not pertinent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full protective clothing, preferably of aluminized glass cloth, goggles, face shield, gloves. In case of fire: all purpose canister or self contained breathing apparatus

5.2 **Symptoms Following Exposure:** Exposure to smoke from fire causes metal fume fever (flu like symptoms). Since liquid ignites spontaneously, contact with eyes or skin causes severe burns

5.3 **Treatment for Exposure:** INHALATION: only fumes from fire need be considered; metal fume fever is not critical (lasting less than 36 hrs). EYES: flush gently with copious quantities of water for 15 min, with lids held open; treat burns if fire occurred; get medical attention. SKIN: wash with water; treat burns caused by fire; get medical attention

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Not pertinent; ignites instantly in air; reacts vigorously with water

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Ignites spontaneously in air at all temperatures

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Inert powders (sand, limestone), dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam, halogenated extinguishing agents

6.5 **Special Hazards of Combustion Products:** Heavy smoke may cause metal fume fever

6.6 **Behavior in Fire:** Dense smoke of aluminum oxide forms. Contact with water applied to adjacent fires causes violent reaction producing toxic and flammable gases

6.7 **Ignition Temperature:** Not pertinent (self ignites at ambient temperature)

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to form flammable ethane gas

7.2 **Reactivity with Common Materials:** No significant reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Not pertinent

8.2 **Waterfowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** Not pertinent

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Ethyl Corporation
   Industrial Chemicals Division
   Ethyl Tower, 451 Florida
   Baton Rouge, La. 70801
2. Texas Alkyls, Incorporated
   P. O. Box 600
   Deer Park, Texas 77536
3. Ventron Corporation
   Alfa Products
   P. O. Box 159
   Beverly, Mass. 01915

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 93+% 20% or less by weight in benzene, hexane, or heptane. Solutions are non pyrophoric

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Inerted dry nitrogen at 5 psig

10.4 **Venting:** Safety relief with rupture disc

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-O-/

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	3
Flammability (Red)	
Reactivity (Yellow)	3
	W

*Up to 20% by wt. in hydrocarbon solution

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 114.2

13.3 **Boiling Point at 1 atm:** 186.9°F = 186.9°C = 459.8°K

13.4 **Freezing Point:** 51°F = −46°C = 227.2°K

13.5 **Critical Temperature:** 761°F = 405°C = 678°K

13.6 **Critical Pressure:** 1,970 psia = 134 atm = 13.6 MN/m²

13.7 **Specific Gravity:** 0.836 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 26.1 dynes/cm × 0.0261 N/m at 28°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available

13.12 **Latent Heat of Vaporization:** 216 Btu/lb = 120 cal/g = 5.02 × 10³ J/kg

13.13 **Heat of Combustion:** −18,364 Btu/lb = −10,202 cal/g = −426.55 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** −1,995 Btu/lb = −1,109 cal/g = −46.40 × 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

TEN	TRIETHYLAMINE

Common Synonyms
TEN

Watery liquid Colorless Fishy odor

Floats on water. Flammable, irritating vapor is produced

Fire

FLAMMABLE
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

CAUTION FORMIDABLE WARNING

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause coughing, difficult breathing, or loss of consciousness.

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Foul ? to shoreline
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning - high flammability
Evacuate area
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** TEN
3.2 **Coast Guard Compatibility Classification:** Aliphatic amine
3.3 **Chemical Formula** $(C_2H_5)_3N$
3.4 **IMCO/United Nations Numerical Designation:** 3.2 1296

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Fishy

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air supplied mask, goggles or face shield, rubber gloves
5.2 **Symptoms Following Exposure:** Vapors irritate nose, throat and lungs causing coughing, choking and difficult breathing. Contact with eyes causes severe burns. Clothing wet with chemical causes skin burns
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give artificial respiration if needed, call a doctor. INGESTION: induce vomiting if patient is conscious. EYES: flush with water for at least 30 min, call a doctor. SKIN: flush with water for at least 30 min
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 25 ppm
5.5 **Short-Term Inhalation Limits:** 100 ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 3 LD50 50 to 500 mg/kg (rat); LD50 460 mg/kg)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first degree burns on short exposure, may cause second degree burns on long exposure
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 20°F (-6°C)
6.2 **Flammable Limits in Air:** 1.2 - 8.0%
6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, alcohol foam for large fires
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 542°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 6.2 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 80 ppm/24 hr/Fish/lethal/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals Inc, Allentown, PA 18105
2. Pennwalt Corp, Chemical Division, 4658 Biddle Ave, Wyandotte, Mich 48193
3. Union Carbide Corp, Chemicals and Plastics Division, 270 Park Ave, New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 98.5+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P Q R S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetics Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 101.19
13.3 **Boling Point at 1 atm:** 193.1°F = 89.5°C = 362.7°K
13.4 **Freezing Point:** -174.5°F = -114.7°C = 158.5°K
13.5 **Critical Temperature:** 504°F = 262°C = 535°K
13.6 **Critical Pressure:** 440 psia = 30 atm = 3.0 MN/m²
13.7 **Specific Gravity:** 0.729 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 20.7 dynes/cm = 0.0207 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 3.5
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.055
13.12 **Latent Heat of Vaporization:** 140 Btu/lb = 80 cal/g = 3.3 × 10⁵ J/kg
13.13 **Heat of Combustion:** -17,040 Btu/lb = -9,465 cal/g = -396.3 × 10⁵ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** -180 Btu/lb = -99 cal/g = -4.1 × 10⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

TEB	TRIETHYLBENZENE

Common Synonyms: 1,3,5-Triethylbenzene; sym-Triethylbenzene	Liquid — Colorless — Weak chemical odor Floats on water
	[illegible]
Fire	Combustible [illegible]
Exposure	[illegible] LIQUID Irritating to skin and eyes [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4:

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1,3,5-Triethylbenzene; sym-Triethylbenzene
3 2 **Coast Guard Compatibility Classification.** Aromatic hydrocarbon
3 3 **Chemical Formula:** $C_6H_3(C_2H_5)_3$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Weak aromatic

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Goggles or face shield, rubber gloves
5 2 **Symptoms Following Exposure:** Eye irritation by vapors or liquid. Central nervous system depression. Prolonged skin contact with liquid can cause dermatitis
5 3 **Treatment for Exposure:** EYES: flush with water for at least 15 min., call a doctor. SKIN: wipe off, wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the respiratory system if present in high concentrations. The effect is temporary
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point.** 181 F (O.C.)
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** Data not available
8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

No bulk shipments

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Data not available
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

X-T-3

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	
Reactivity	
Other Chemicals	
Water	
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 162.27
13 3 **Boiling Point at 1 atm:** 421°F = 216°C = 489 K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0.861 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension.** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.039
13 12 **Latent Heat of Vaporization:** (est.) 120 Btu/lb = 65 cal/g = 2.7 × 10⁵ J/kg
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

TEG	TRIETHYLENE GLYCOL

Common Synonyms Triglycol	Liquid Colorless Mild odor Sinks and mixes with water
[illegible]	
Fire	Combustible [illegible]
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Di-beta hydroxyethoxyethane 2 2 Ethylenedioxydiethanol Ethylene glycol diglycol ether HGE Triglycol

3 2 **Coast Guard Compatibility Classification:** Glycol

3 3 **Chemical Formula:** HOCH$_2$CH$_2$OCH$_2$CH$_2$OCH$_2$CH$_2$OH

3 4 ***IMCO United Nations Numerical Designation.*** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Liquid

4 2 **Color:** Colorless

4 3 **Odor:** Very mild sweet

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Gloves plastic gloves

5 2 **Symptoms Following Exposure:** Vapor and liquid are unlikely to cause harm

5 3 **Treatment for Exposure:** Flush eyes and skin with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5 5 **Short-Term Inhalation Limits:** Not pertinent

5 6 **Toxicity by Ingestion:** Grade 1 LD 50 15 g/kg guinea pigs

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are non-irritating to the eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 350°F (C.C.) 330°F (O.C.)

6 2 **Flammable Limits in Air:** 0.9% - 9.2%

6 3 **Fire Extinguishing Agents:** Alcohol foam dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature:** 700°F

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** 1.7 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:** No reaction

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** 50% 5 days

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland Mich 48640

2 Jefferson Chemical Co
3350 Richmond Ave
Houston Tex 77002

3 Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** High purity at treatment commercial

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

VPQ

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 150.17

13 3 **Boiling Point at 1 atm.** 550°F = 288°C = 561°K

13 4 **Freezing Point:** 23.3°F = -4.3°C = 268.9 K

13 5 **Critical Temperature** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1.128 at 25°C (liquid)

13 8 **Liquid Surface Tension:** 45.2 dynes/cm = 0.0452 N/m at 20°C

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.039

13 12 **Latent Heat of Vaporization.** 180 Btu/lb = 99 cal/g = 4.1 × 10^5 J/kg

13 13 **Heat of Combustion:** −10,190 Btu/lb = −5,660 cal/g = −237.0 × 10^5 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** (est.) −13 Btu/lb = −7 cal/g = −3.0 × 10^5 J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

TET — TRIETHYLENETETRAMINE

Common Synonyms
TETA
N,N' Bis(2-aminoethyl) ethylenediamine

Oily liquid — Light straw to amber — Ammonia odor

Floats and mixes with water

Fire

Combustible

Exposure

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** N,N' Bis(2 aminoethyl) ethylenediamine
TETA
Trien

3 2 **Coast Guard Compatibility Classification.** Aliphatic amine

3 3 **Chemical Formula:** $NH_2CH_2CH_2NHCH_2CH_2NHCH_2CH_2NH_2$

3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color** Light straw amber

4 3 **Odor** Ammoniacal

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Amine type canister, goggles or face shield, rubber gloves

5 2 **Symptoms Following Exposure:** Vapors from hot liquid can irritate eyes and upper respiratory system. Liquid burns eyes and skin. May cause sensitization of skin.

5 3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. INGESTION: do NOT induce vomiting, give large quantities of water, give at least one ounce of vinegar in equal amount of water, get medical attention. SKIN: flush with plenty of water. EYES: flush with plenty of water for at least 15 min. and get medical attention.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion.** Grade 2 LD[illegible] 0.[illegible] g/kg (rat)

5 7 **Late Toxicity:** May cause dermatitis, asthma and other allergic reactions in man

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation, such that personnel will [illegible] if such high concentrations are present. The effect is temporary.

5 9 **Liquid or Solid Irritant Characteristics.** Causes smarting of the skin and first degree burns in short exposure, may cause severe burns during long exposure.

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 275°F (C.C.) 290°F (O.C.)

6 2 **Flammable Limits in Air:** Data not available

6 3 **Fire Extinguishing Agents.** Dry chemical, alcohol foam, carbon dioxide

5 4 **Fire Extinguishing Agents Not to be Used:** Water or foam (may cause frothing)

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:** Not pertinent

6 7 **Ignition Temperature.** 640°F

6 8 **Electrical Hazard** Not pertinent

6 9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Not reactive

7 2 **Reactivity with Common Materials:** Not reactive

7 3 **Stability During Transport.** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** After dilution with water can be neutralized with acetic acid

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co.
Midland, Mich. 48640

2 Jefferson Chemical Co. Inc.
4306 Richmond Ave.
Houston, Tex. 77027

3 Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** 99+%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

A P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight:** 146.24

13 3 **Boiling Point at 1 atm:** 541.3°F = 277.4°C = 550.6°K

13 4 **Freezing Point:** −31°F = −35°C = 238°K

13 5 **Critical Temperature:** 500°F = 260°C = 733°K

13 6 **Critical Pressure:** 470 psia = 32 atm = 3.2 MN/m²

13 7 **Specific Gravity:** 0.982 at 20°C (liquid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1.03*

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** (c.v.) −13,500 Btu/lb = −7,530 cal/g = −315 × 10³ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution.** (est.) +1 Btu/lb = +7 cal/g = +0.3 × 10³ J/kg

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

REVISED 1978

TFC	TRIFLUOROCHLOROETHYLENE

Common Synonyms	
Chlorotrifluoroethylene Trifluoroethyl chloride CTFE Genetron 1113 Trifluorocomonochloroethylene Kel F monomer Plaskon monomer	Liquefied compressed gas Colorless Odorless or faint odor Sinks and boils in water Flammable visible vapor cloud is produced

Fire	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR If inhaled will cause dizziness nausea or vomiting LIQUID Will cause frostbite
Water Pollution	Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning high flammability, air contaminant
Restrict access
Evacuate area

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chlorotrifluoroethylene, Kel F monomer, Plaskon monomer, Trifluorocomonochloroethylene, Trifluorovinyl chloride

3.2 **Coast Guard Compatibility Classification:** Halogenated compounds (5)

3.3 **Chemical Formula:** $F_2C=CFCl$

3.4 **IMCO/United Nations Numerical Designation.** 2.1062

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Compressed liquefied gas

4.2 **Color:** Colorless

4.3 **Odor:** None faint ethereal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus goggles rubber gloves

5.2 **Symptoms Following Exposure:** Inhalation causes dizziness nausea vomiting, liver and kidney injury may develop after several hours and cause jaundice and necrosis of the kidney. Contact with liquid causes frostbite of eyes and possible of skin

5.3 **Treatment for Exposure:** *Call a physician after all exposures to this compound it is more toxic than most of the closely related propellant gases* INHALATION remove victim to fresh air enforce bed rest, administer oxygen for 30 min of every hour for 6 hours even if no symptoms appear SKIN if frostbite has occurred apply warm water and treat burn

5.4 **Toxicity by Inhalation (Threshold Limit Value).** 20 ppm (suggested)

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Not pertinent (TFC is a gas at normal temperatures)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point.** Not pertinent (gas)

6.2 **Flammable Limits in Air:** 16% 34

6.3 **Fire Extinguishing Agents:** Let fire burn stop gas flow cool containers with water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products.** Toxic hydrogen chloride and hydrogen fluoride gases are formed

6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode in a fire

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Can occur

7.6 **Inhibitor of Polymerization.** Terpenes, Tributylamine (1%)

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity:** None

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. 3M Company
   3M Center
   Saint Paul, Minn 55101
2. Matheson Gas Products Co
   East Rutherford, N J 07073
3. Allied Chemical Corporation
   Plastics Division
   Morristown, N J 07960

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Polymerization grade 99.0+%

10.2 **Storage Temperature:** Ambient but less than 130°F

10.3 **Inert Atmosphere:** Air must be excluded

10.4 **Venting.** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B C H I J

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	4
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight.** 116.5

13.3 **Boiling Point at 1 atm:** −18°F = −28°C = 245°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** (est.) 223.2°F = 106.2°C = 379.4°K

13.6 **Critical Pressure:** (est.) 592 psia = 40.2 atm = 4.08 MN/m²

13.7 **Specific Gravity:** 1.50 at 20°C (liquid)

13.8 **Liquid Surface Tension:** (est.) 12 dynes/cm = 0.012 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 4.02

13.11 **Ratio of Specific Heats of Vapor (Gas)** Data not available

13.12 **Latent Heat of Vaporization:** 83 Btu/lb = 46 cal/g = 1.92 × 10⁵ J/kg

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Data not available

Continued on page 1 back

NOTES

TFR	TRIFLURALIN

Common Synonyms	
alpha, alpha, alpha-trifluoro-2, 6-dinitro-N, N-dipropyl-p-toluidine Treflan	Solid — Yellow-orange Sinks in water

Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE
Exposure	DUST POISONOUS IF INHALED SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning - poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 2, 6-Dinitro-N, N-dipropyl-4-(trifluoromethyl)aniline, 2, 6-Dinitro-N, N-dipropyl-alpha, alpha, alpha-trifluoro-p-toluidine, N, N-Dipropyl-2, 6-dinitro-4-trifluoro methylaniline, Treflan, alpha, alpha, alpha-Trifluoro-2, 6-dinitro-N, N-dipropyl-p-toluidine

3.2 **Coast Guard Compatibility Classification:** Not applicable

Continued on page 4

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Yellow-orange
4.3 **Odor:** Data not available

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves, goggles, dust mask
5.2 **Symptoms Following Exposure:** Dust may irritate eyes. No toxic symptoms have been observed during the manufacture and use of this compound
5.3 **Treatment for Exposure:** INHALATION: move to fresh air. EYES: wash with running water, call physician if irritation persists. SKIN: wash with soap and running water. INGESTION: induce vomiting, call physician
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 3 oral LD_{50} = 500 mg/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** >165°F (C.C.)
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen fluoride gas may be formed in fire.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
[illegible] mg/l 48 hr TLm (Shiner trout) [illegible] m/l fresh water
0.55 ppm 48 hr bluegill [illegible] fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

Elanco Products Company
P. O. Box 1750
Indianapolis, Ind. 46206

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 95%, Emulsifiable concentrate in flammable solvents
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not Listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 335.3
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** 108°F = 42°C = 315 K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.294 at 25°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** (est.) 9,040 Btu/lb = −5,020 cal/g = −210 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 3 and 4

3. CHEMICAL DESIGNATIONS (Cont'd.)

3.3 **Chemical Formula:** $C_{13}H_{16}F_3N_3O_4$
3.4 **IMCO/United Nations Numerical Designation:** 6.1 1690

TIA — TRIISOBUTYLALUMINUM

Common Synonyms

TIBA
TIBAL
Aluminum triisobutyl

Liquid — Colorless

IGNITES WHEN EXPOSED TO AIR. Flammable gas is produced on contact with water

Fire

IGNITES WHEN EXPOSED TO AIR

POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

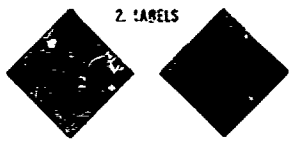
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning — high flammability
Restrict access
Evacuate area
Disperse and flush with care

2. LABELS



3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Aluminum triisobutyl
TIBA, TIBAL

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $(iso\text{-}C_4H_9)_3Al$

3.4 **IMCO/United Nations Numerical Designation:** 3.2, 1920

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Not pertinent

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Full protective clothing, preferably of aluminized glass cloth, goggles, face shield, gloves. In case of fire, air purifying canister or self-contained breathing apparatus

5.2 **Symptoms Following Exposure:** Inhalation of vapors from fire causes metal fume fever (flu like symptoms). Contact with liquid can cause severe burns of eyes and skin because of spontaneous ignition

5.3 **Treatment for Exposure:** INHALATION: only fumes from fire need be considered. Metal fume fever lasts less than 36 hrs. and is not critical. EYES: flush gently with copious quantities of water for 15 min. with lids open. Treat burns. If fire occurred, get medical attention. SKIN: wash with water. Treat burns caused by fire, get medical attention. INGESTION: not pertinent

5.4 **Toxicity by Inhalation, (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Not pertinent

5.7 **Late Toxicity:** Metal fume fever may develop following exposure to vapors from fire

5.8 **Vapor (Gas) Irritant Characteristics:** Not pertinent

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (ignites spontaneously)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Inert powder (e.g. sand, limestone, dry chemical)

6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam, halogenated extinguishing agents

6.5 **Special Hazards of Combustion Products:** Dense smoke may cause metal fume fever

6.6 **Behavior in Fire:** Dense white aluminum oxide forms

6.7 **Ignition Temperature:** Ignites spontaneously under ambient conditions

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently to form flammable hydrocarbon gases

7.2 **Reactivity with Common Materials:** Not compatible with silicone rubber, urethane rubber

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Not pertinent

8.2 **Water Fowl Toxicity:** Not pertinent

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Ethyl Corporation
Industrial Chemicals Division
Ethyl Tower, 451 Florida
Baton Rouge, La. 70801

2. Texas Alkyls, Incorporated
P.O. Box 80
Deer Park, Texas 77536

3. Newport Corporation
Alta Products
P.O. Box 199
Beverly, Mass. 01915

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical grade, 20% or less by weight in heptane. Because of heptane in liquid, are not pyrophoric; electronic grade

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Inerted dry nitrogen at 5 psig

10.4 **Venting:** Safety relief with rupture disc

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

X O Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]
W	

*Refers to 20% or less by weight in hydrocarbon solution

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 198.3

13.3 **Boiling Point at 1 atm:**
[illegible]°F = [illegible]°C = [illegible]°K

13.4 **Freezing Point:**
[illegible]°F = [illegible]°C = [illegible]°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.788 at 20°C (liquid)

13.8 **Liquid Surface Tension:** [illegible]
24 dynes/cm = 0.024 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:**
Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent

13.12 **Latent Heat of Vaporization:** [illegible] Btu/lb
= [illegible] cal/g = [illegible] × 10³ J/kg

13.13 **Heat of Combustion:** −[illegible] Btu/lb
= −[illegible] cal/g = −[illegible] × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

TMA	TRIMETHYLAMINE

Common Synonyms	Liquefied compressed gas — Colorless — Fish or ammonia odor Floats and mixes and boils on water. Poisonous. Flammable. Toxic vapor cloud is produced
Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat LIQUID Will burn skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-6

1 [illegible] Isolate hazard area and deny entry
Remove source
Emergency [illegible]

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** [illegible]
3 2 **Coast Guard Compatibility Classification:** Aliphatic amine
3 3 **Chemical Formula:** C_3H_9N
3 4 **IMCO United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied compressed gas
4 2 **Color:** [illegible]
4 3 **Odor:** [illegible]

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Vapor proof goggles and [illegible] [illegible]
5 2 **Symptoms Following Exposure:** Vapor [illegible] Liquid [illegible]
5 3 **Treatment for Exposure.** INHALATION [illegible] SKIN [illegible]
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating [illegible]
5 9 **Liquid or Solid Irritant Characteristics:** [illegible]
5 10 **Odor Threshold:** [illegible]

6 FIRE HAZARDS

6 1 **Flash Point:** Not pertinent (gas)
6 2 **Flammable Limits in Air:** [illegible]
6 3 **Fire Extinguishing Agents:** Stop flow of gas. Use water, alcohol foam, dry chemical, carbon dioxide, or water solution fog
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance [illegible] ignition and flash back
6 7 **Ignition Temperature:** [illegible]
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Although water solutions may be neutralized with acids and dilute, evaporation will remove all of the compound
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Air Products and Chemicals Inc
Allentown, Pa 18105
2 Commercial Solvents Corp
245 Park Ave
New York, N.Y. [illegible]
3 Rohm and Haas Co
Independence Mall West
Philadelphia, Pa 19105

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Anhydrous [illegible] also shipped as 25% [illegible] solution in water
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirements
10 4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-5

A B C-A E M S

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable compressed gas
12 2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Damage	3
Liquid or Solid Damage	2
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	4
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES*

13 1 **Physical State at 15°C and 1 atm:** Gas
13 2 **Molecular Weight:** [illegible]
13 3 **Boiling Point at 1 atm:** [illegible]
13 4 **Freezing Point:** [illegible]
13 5 **Critical Temperature:** 320.2°F = 160.1°C = 433.3°K
13 6 **Critical Pressure:** [illegible] = 44.2 atm = 4.47 MN/m²
13 7 **Specific Gravity:** 0.633 at 20°C (liquid)
13 8 **Liquid Surface Tension:** [illegible] = 0.0274 N/m at [illegible]
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** [illegible]
13 11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13 12 **Latent Heat of Vaporization:** [illegible]
13 13 **Heat of Combustion:** [illegible]
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** [illegible]
13 16 **Heat of Polymerization:** Not pertinent

*Physical properties apply to anhydrous material

Continued on page [illegible]

NOTES

TMC	TRIMETHYLCHLOROSILANE

Common Synonyms	Liquid	Colorless	Sharp irritating odor
Chlorotrimethylsilane Trimethylsilyl chloride	Reacts violently with water. Irritating gas is produced on contact with water		

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled

LIQUID
Will burn skin and eyes
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Isolate hazard: high flammability
Restrict access
Evacuate area
Disperse and flush with water

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Chlorotrimethylsilane
Trimethylsilyl chloride

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** CH_3SiCl

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Sharp hydrochloric acid like odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor respirator, protective rubber gloves, chemical worker's goggles, other protective equipment as necessary to protect skin and eyes

5.2 **Symptoms Following Exposure:** Inhalation: vapor irritates mucous membranes. Contact of liquid with eyes or skin causes severe burns. Ingestion causes severe burns of mouth and stomach

5.3 **Treatment for Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove victim from exposure; if breathing is difficult or stopped, give artificial respiration. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; give large amount of water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 1 LD50 [illegible] g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations

5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is a dangerous irritant to the eyes

5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** 0°F (0°C)

6.2 **Flammable Limits in Air:** [illegible]

6.3 **Fire Extinguishing Agents:** Dry chemical

6.4 **Fire Extinguishing Agents Not to be Used:** Water [illegible]

6.5 **Special Hazards of Combustion Products:** Toxic and corrosive hydrogen chloride and phosgene may be formed in fire

6.6 **Behavior in Fire:** Dry chemical extinguishes fire; water applied to adjacent fire may produce toxic hydrogen chloride gas

6.7 **Ignition Temperature:** [illegible]

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts violently, yielding hydrogen chloride, trimethylsilanol, and hexamethyldisiloxane

7.2 **Reactivity with Common Materials:** Reacts with surface moisture on metals and hydrogen chloride which is then formed reacts with metals and forms flammable hydrogen gas

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water [illegible]

7.5 **Polymerization:** Not [illegible]

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD)** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Dow Corning Corporation
P.O. Box [illegible]
Midland, Michigan [illegible]

[illegible]
[illegible]
Minneapolis, Minnesota [illegible]

[illegible]
P.O. Box [illegible]
[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** [illegible]

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	[illegible]
Liquid or Solid Irritant	[illegible]
Poisons	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Aesthetic Effect	[illegible]
Reactivity	
Other Chemicals	
Water	[illegible]
Self Reaction	

12.3 **NFPA Hazard Classifications:** [illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 108.[illegible]

13.3 **Boiling Point at 1 atm:** 107°F = 42°C = 315°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.85 at 24°C (liquid)

13.8 **Liquid Surface Tension:** [illegible] dynes/cm at [illegible]°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** 125 Btu/lb = [illegible] cal/g = 2.4 × 10^5 J/kg

13.13 **Heat of Combustion:** [illegible] = 10,800 Btu/lb = 5,700 cal/g = 240 × 10^3 J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

TGC	TRIPROPYLENE GLYCOL

Common Synonyms	Liquid	Colorless	Characteristic odor
	May float or sink and mix with water		

Stop discharge if possible
[illegible]
[illegible]
[illegible]

Fire	Combustible [illegible] [illegible] Cool exposed [illegible]
Exposure	LIQUID Not harmful
Water Pollution	Effect of low concentrations on aquatic life is [illegible] known May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms

3 2 **Coast Guard Compatibility Classification:** Glycol ether

3 3 **Chemical Formula:** $HO(C_3H_6O)_2C_3H_6OH$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid

4 2 **Color.** Colorless

4 3 **Odor.** Characteristic

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Plastic gloves safety glasses or face shield

5 2 **Symptoms Following Exposure** Non irritating no symptoms observed by any exposure route

5 3 **Treatment for Exposure:** INGESTION if large amounts are swallowed induce vomiting treat symptomatically EYES or SKIN flush with water get medical attention if ill effects develop

5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 3 000 mg kg (rat)

5 7 **Late Toxicity** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Vapors are nonirritating to eyes and throat

5 9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard Practically harmless to the skin

5 10 **Odor Threshold:** Goodless

6 FIRE HAZARDS

6 1 **Flash Point:** 285°F O C

6 2 **Flammable Limits in Air.** 0 8 [illegible] 5 0 [illegible] (est)

6 3 **Fire Extinguishing Agents:** Alcohol foam dry chemical carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6 5 **Special Hazards of Combustion Products:** Acrid fumes of acids and aldehydes may form in fires

6 6 **Behavior in Fire**

6 7 **Ignition Temperature** Data not available

6 8 **Electrical Hazard** Data not available

6 9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** May attack some forms of plastics

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity.** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1 Union Carbide Corp
Chemicals and Plastics Div
274 Park Avenue
New York N Y 10017

2 The Dow Chemical Co
2030 Dow Center
Midland Mich 48640

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99%

10 2 **Storage Temperature** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A-P Q

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid

13 2 **Molecular Weight.** 192 26

13 3 **Boiling Point at 1 atm** 523°F = 273°C = 546°K

13 4 **Freezing Point:** (sets to glass) −49°F = −45°C = 228°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 1 022 at 20°C (liquid)

13 8 **Liquid Surface Tension** Data not available

13 9 **Liquid-Water Interfacial Tension** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Data not available

13 13 **Heat of Combustion** (est) −13 700 Btu/lb = −7 610 cal/g = −318 × 10 2 kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

TPO	TRIS(AZIRIDINYL)PHOSPHINE OXIDE

Common Synonyms	
APO Tris(1-aziridinyl)phosphine oxide Phosphoric acid triethylene amide Triethylenephosphoramide	Solid White Mixes with water

[illegible]

Fire	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
Exposure	[illegible] **SOLID** **Irritating to skin and eyes** **Harmful if swallowed** [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 445 4)

Issue warning corrosive water contaminant

Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** APO Phosphoric acid triethylenemide Triethylenephosphoramide Tris(1-aziridinyl) phosphine oxide

3 2 **Coast Guard Compatibility Classification** Not applicable

3 3 **Chemical Formula.** $(CH_2CH_2N)_3PO$ or $C_6H_{12}N_3PO$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Data not available

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Protective clothing and gloves to prevent contact with skin goggles

5 2 **Symptoms Following Exposure** Inhalation (unlikely unless a heavy mist is formed) causes symptoms similar to those observed after ingestion. Contact with liquid or powder causes irritation of eyes and (on prolonged contact) irritation and burns of skin. Burns are slow to develop and slow to heal. May sensitize on repeated contact. Ingestion causes depression anorexia and diarrhea appearing 2-3 days before death, followed by terminal dyspnea incoordination epistaxis salivation, prostration and cyanosis

5 3 **Treatment for Exposure** INHALATION remove victim to fresh air EYES flush with water at once for at least 15 min get medical attention SKIN flush with water at once followed by vinegar and dilute hydrogen peroxide INGESTION only symptomatic and supportive measures are available

5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion** Grade 4 oral rat LD_{50} = 37 mg/kg

5 7 **Late Toxicity:** None observed

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air.** Not flammable

6 3 **Fire Extinguishing Agents.** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products:** Phosphoric acid mist may form in fire Toxic oxides of nitrogen may form

6 6 **Behavior in Fire.** Data not available

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction unless in presence of acids or strong caustics

7 2 **Reactivity with Common Materials:** Slow decomposition not considered hazardous

7 3 **Stability During Transport:** Stable if cool

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Violent polymerization occurs at about 255°F Acid fumes also cause polymerization at ordinary temperatures

7 6 **Inhibitor of Polymerization:** None used

8 WATER POLLUTION

8 1 **Aquatic Toxicity** Data not available

8 2 **Waterfowl Toxicity** 8 5 13 mg/kg LD_{50}

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Chemirad Corporation
P O Box 182
Port Washington N Y 11050

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 85% solution in acetone methylene chloride

10 2 **Storage Temperature:** Below 100°F

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Corrosive

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight** 173 16

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** 106°F = 41 C = 314°K

13 5 **Critical Temperature.** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (60°) >1 at 20°C (solid)

13 8 **Liquid Surface Tension** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity.** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas).** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Data not available

(Continued on pages 5 and 6)

NOTES

TPT	TURPENTINE

Common Synonyms
Spirits of turpentine
Turps
Gum turpentine
Wood turpentine

Water: liquid. Colorless. Penetrating, unpleasant odor.

Floats on water. Irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose, and throat.
If inhaled, will cause nausea, vomiting, headache, difficult breathing, or loss of consciousness.

LIQUID
POISONOUS IF SWALLOWED
Irritating to skin and eyes.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Mechanical containment.
Should be removed.
Chemical and physical treatment.

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.**
D.D. turpentine; Sulfate turpentine; Gum turpentine; Turps; Spirits of turpentine; Wood turpentine

3.2 **Coast Guard Compatibility Classification:** Olefin

3.3 **Chemical Formula:** $C_{10}H_{16}$

3.4 **IMCO/United Nations Numerical Designation:** 3.3, 1299

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor:** Aromatic, rather unpleasant, penetrating

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Organic vapor mask or supplied-air respirator, goggles or face shield, rubber gloves.

5.2 **Symptoms Following Exposure.** Vapors cause headache, confusion, respiratory distress. Liquid irritates skin. If ingested, can irritate the entire digestive system and may injure kidneys; if liquid is taken into lungs, causes severe pneumonitis.

5.3 **Treatment for Exposure.** INHALATION: remove victim into fresh air, call a doctor, administer artificial respiration and oxygen if required. INGESTION: give water and induce vomiting, call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm

5.5 **Short-Term Inhalation Limits:** 300 ppm for 30 min

5.6 **Toxicity by Ingestion:** Grade 2. LD_{50}: 0.5 to 5 g/kg

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** Data not available.

6 FIRE HAZARDS

6.1 **Flash Point:** 95°F (C.C.)

6.2 **Flammable Limits in Air:** 0.8% (LFL)

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Forms heavy black smoke and soot

6.7 **Ignition Temperature:** 488°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 2.4 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 100 ppm */fish, toxic, fresh water
* Time period not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Hercules Inc., Hattiesburg, Miss. 39401
2. Tenneco Chemicals Inc., Newport Division, Pensacola, Fla. 32501
3. Union Camp Corp., Chemical Division, Jacksonville, Fla. 32205

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** A wide variety of grades and purities are shipped. All have about the same hazardous properties.

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A.T.L.

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** Not pertinent

13.3 **Boiling Point at 1 atm:** 302–320°F = 150–160°C = 423–433°K

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.86 at 15°C (liquid)

13.8 **Liquid Surface Tension.** Data not available

13.9 **Liquid Water Interfacial Tension:** 14 dynes/cm = 0.014 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 1 and 6

NOTES

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UND	UNDECANOL

Common Synonyms			
Alcohol, C-11 (undecylic) 1-Hendecanol Undecyl alcohol 1-Undecanol	Solid or liquid Floats on water	Colorless	Mild odor

Stop discharge if possible
Call Fire department
Isolate and remove discharged material
Notify [illegible]

Fire	Combustible Extinguish with [illegible]
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to eyes IF IN EYES [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify [illegible] Notify [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Hendecanoic alcohol, 1-Hendecanol, n-Hendecylenic alcohol, 1-Undecanol, Undecyl alcohol, Undecylic alcohol

3.2 **Coast Guard Compatibility Classification.** Alcohol

3.3 **Chemical Formula** $CH_3(CH_2)_8CH_2OH$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Colorless

4.3 **Odor.** Faint alcoholic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield

5.2 **Symptoms Following Exposure:** Liquid can irritate eyes

5.3 **Treatment for Exposure.** Wash eyes with water for at least 15 min

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion.** Grade 2 1 Dg 0.5 to 5 g/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics** None

5.9 **Liquid or Solid Irritant Characteristics:** No appreciable hazard. Practically harmless to the skin

5.10 **Odor Threshold** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point** 200°F O C

6.2 **Flammable Limits in Air** Data not available

6.3 **Fire Extinguishing Agents.** Foam, carbon dioxide, or dry chemical

6.4 **Fire Extinguishing Agents Not to be Used** Water or foam may cause frothing

6.5 **Special Hazards of Combustion Products** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity.** Data not available

8.2 **Waterfowl Toxicity.** Data not available

8.3 **Biological Oxygen Demand (BOD).** 12.1% (theor.) 5 days, 5.3% (theor.) 1 day

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Union Carbide Corp
Chemicals and Plastics Division
270 Park Ave
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T-U

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** 172.30

13.3 **Boiling Point at 1 atm:** 473°F = 245°C = 518°K

13.4 **Freezing Point:** 60.6°F = 15.9°C = 289.1°K

13.5 **Critical Temperature:** 739°F = 393°C = 666°K

13.6 **Critical Pressure:** 308 psia = 21 atm = 2.1 MN/m

13.7 **Specific Gravity:** 0.835 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 26.5 dynes/cm = 0.0265 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.032

13.12 **Latent Heat of Vaporization** Not pertinent

13.13 **Heat of Combustion:** (est.) −18,000 Btu/lb = −10,000 cal/g = −419 × 10³ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

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UDC	1-UNDECENE

Common Synonyms n-Nonylethylene	Liquid	Colorless	Mild odor
	Floats on water		

Stop discharge if possible
[illegible]
[illegible] with liquid
[illegible]
[illegible]

Fire	**Combustible** Extinguish with [illegible] Water may be ineffective [illegible] [illegible] with water
Exposure	CALL FOR MEDICAL AID **LIQUID** **Irritating to skin and eyes.** **Harmful if swallowed** [illegible] Flush [illegible] water IF IN EYES hold [illegible] and flush with plenty of water IF SWALLOWED [illegible] CONSCIOUS have [illegible] drink water [illegible] DO NOT INDUCE VOMITING
Water Pollution	**Effect of low concentrations on aquatic life is unknown** **Fouling to shoreline** **May be dangerous if it enters water intakes** [illegible] wildlife [illegible] [illegible] water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** n Nonylethylene
3 2 **Coast Guard Compatibility Classification:** Olefin
3 3 **Chemical Formula:** $CH_3(CH_2)_8CH=CH_2$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Liquid
4 2 **Color.** Colorless
4 3 **Odor:** Mild pleasant

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield rubber gloves
5 2 **Symptoms Following Exposure:** Aspiration hazard if ingested Slight skin and eye irritation No inhalation hazard expected
5 3 **Treatment for Exposure:** INHALATION remove victim to fresh air INGESTION do NOT lavage or induce vomiting give vegetable oil and demulcents call a doctor EYES flush with water for 15 min SKIN wipe off wash with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion.** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Slight smarting of eyes and respiratory system at high concentrations The effect is temporary
5 9 **Liquid or Solid Irritant Characteristics:** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of the skin
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** 160°F O C
6 2 **Flammable Limits in Air** Data not available
6 3 **Fire Extinguishing Agents:** Foam dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6 5 **Special Hazards of Combustion Products** Not pertinent
6 6 **Behavior in Fire.** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** 4 8 mm min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

The Humphrey Chemical Co
Devine Street
North Haven Conn 06473

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical 99
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting.** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A T U

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Combustible Liquid
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Liquid
13 2 **Molecular Weight.** 154 2
13 3 **Boiling Point at 1 atm:** 378 9°F = 192 7°C = 465 9°K
13 4 **Freezing Point.** [illegible] = [illegible] = 22[illegible] K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0 750 at 20°C (liquid)
13 8 **Liquid Surface Tension** 23 4 dynes cm = 0 0234 N m at 20°C
13 9 **Liquid-Water Interfacial Tension** (est) 50 dynes cm = 0 050 N m at 20°C
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 [illegible]
13 12 **Latent Heat of Vaporization.** 154 Btu lb = 88 8 cal g = 3 59 × 10[illegible] kg
13 13 **Heat of Combustion** −19 084 Btu lb = −10 602 cal/g = −44 8 89 × 10[illegible] kg
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization** Not pertinent

Continued on pages 5 and 6

NOTES

UDB	n-UNDECYLBENZENE

Common Synonyms			
1 Phenylundecane	Liquid	Colorless	Mild odor
	Floats on water		

[illegible]

Fire

Combustible

[illegible]

Exposure

[illegible]

LIQUID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
Fouling to shoreline
May be dangerous if it enters water intakes

[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** 1-Phenylundecane
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $C_6H_5(CH_2)_{10}CH_3$
3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** Mild

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face shield and rubber gloves
5 2 **Symptoms Following Exposure:** Ingestion may cause intestinal disturbances Contact with eyes causes mild irritation
5 3 **Treatment for Exposure:** INGESTION induce vomiting if large amount has been swallowed EYES flush with water SKIN remove spills on skin or clothing by washing with soap and water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** 285°F C C
6 2 **Flammable Limits in Air:** Data not available
6 3 **Fire Extinguishing Agents:** Foam dry chemical carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Data not available
6 9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** May attack some forms of plastics
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** Data not available
8 4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1 The Humphrey Chemical Co
Devine Street
North Haven Conn 06473

2 Conoco Chemicals
Park 80 Plaza Lan
Saddle Brook N J 07662

3 Fisher Scientific Co
711 Forbes Ave
Pittsburgh Pa 15219

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Mixture with decylbenzene and dodecylbenzene, all of which have same general properties
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A-T U

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 232.4
13 3 **Boiling Point at 1 atm:** 601°F = 316°C = 589°K
13 4 **Freezing Point:** 23°F = −5°C = 268°K
13 5 **Critical Temperature:** 918.1°F = 492.3°C = 765.5°K
13 6 **Critical Pressure:** 234 psia = 15.9 atm = 1.61 MN/m²
13 7 **Specific Gravity:** 0.855 at 20°C (liquid)
13 8 **Liquid Surface Tension.** Data not available
13 9 **Liquid-Water Interfacial Tension.** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** 101.37 Btu/lb = 56.26 cal/g = 2.354 × 10⁵ J/kg
13 13 **Heat of Combustion.** −19,490 Btu/lb = −10,830 cal/g = −453.1 × 10⁵ J/kg
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

URA	# URANYL ACETATE

Common Synonyms			
Uranyl acetate dihydrate Uranium acetate Uranium oxyacetate dihydrate Bis (acetato) dioxouranium Uranium acetate dihydrate	Solid	Yellow	Slight vinegar odor
	Sinks and mixes slowly with water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Restrict access
Disperse and flush

2 LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Bis(acetato)dioxouranium Uranium acetate Uranium acetate dihydrate, Uranium oxyacetate dihydrate Uranyl acetate dihydrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $UO_2(C_2H_3O_2)_2 \cdot 2H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellow

4 3 **Odor:** Slight vinegar

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved dust respirator goggles or face shield protective clothing

5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat Contact with eyes can cause irritation

5 3 **Treatment for Exposure:** *Get medical attention after all exposures to this compound*
INHALATION move to fresh air INGESTION give large amount of water induce vomiting EYES flush with water for at least 15 min SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value)** 0.05 mg/m³ (as uranium)

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 1 LD50 [illegible] mg/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:**

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Dissolves and reacts to give a milky solution The reaction is not hazardous

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** 3.7 ppm/96 hr fathead minnow 11 m soft water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Varlacoid Chemical Co
666 South Front St
Elizabeth N J 07202

2 J T Baker Chemical Co
Phillipsburg N J 08865

3 Mallinckrodt Chemical Works
2nd and Mallinckrodt St
St Louis Mo 63160

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Commercial Reagent

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

NS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Radioactive material

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 424.2

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 2.89 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

UAN — URANYL NITRATE

Common Synonyms

Uranium nitrate

Solid | Light yellow | Odorless

Mixes with water

[illegible]

Fire

Not flammable
May cause fire on contact with combustibles.
POISONOUS GASES MAY BE PRODUCED IN FIRE
[illegible]

Exposure

[illegible]

DUST

Irritating to eyes, nose and throat
Harmful if inhaled
[illegible]

SOLID

Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
May be dangerous if it enters water intakes.
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: radioactive solid, hazardous material, water contaminant
Restrict access
Disperse and flush

2. LABELS

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Uranium nitrate

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $UO_2(NO_3)_2 \cdot 6H_2O$

3.4 **IMCO/United Nations Numerical Designation:** 7/1 or specific entry

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Pale yellow

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, gloves, goggles

5.2 **Symptoms Following Exposure:** Excessive inhalation of dust may cause irritation of lungs and delayed symptoms similar to those observed after ingestion. Dust irritates eyes and skin and may be absorbed through skin on prolonged exposure. Ingestion causes irritation of mouth and stomach, inflammation of kidney and liver develops 1 to 4 days after exposure.

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. EYES: flush with water for at least 15 min., see physician if irritation persists. SKIN: wash thoroughly with soap and water. INGESTION: administer large doses of sodium bicarbonate (This will convert the uranium salt to the bicarbonate, which is much less toxic.) Additional treatment is symptomatic, get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** 0.05 mg/m³

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 3, LD_{50} 50 to 500 mg/kg

5.7 **Late Toxicity:** Delayed inflammation of kidneys. Airborne radioactive particles have apparently been responsible for a significantly increased death rate from lung cancer among long term uranium miners.

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable, but may cause fire on contact with combustibles.

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Flooding amounts of water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen formed in fires

6.6 **Behavior in Fire:** Intensifies fires. When large quantities are involved, nitrate may fuse or melt; application of water may then cause excessive scattering of molten material.

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Dissolves forming weak solution of nitric acid; the reaction is not hazardous

7.2 **Reactivity with Common Materials:** In contact with easily oxidizable substances may react rapidly enough to cause ignition, violent combustion or explosion. Water solutions are acidic and can corrode metals.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Wash with water

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 3.1 mg/l/96hr, fathead minnow, TL_m, fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. The S. W. Shattuck Chemical Co., Inc.
   1005 South Barnock Street
   Denver, Colo. 80223
2. J. T. Baker Chemical Co.
   222 Red School Lane
   Phillipsburg, N. J. 08865
3. Mallinckrodt Chemical Works
   223 West Side Avenue
   P. O. Box 384
   Jersey City, N. J. 07303

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Analytical reagent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Radioactive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification*	
Health Hazard (Blue)	0	1
Flammability (Red)	0	0
Reactivity (Yellow)	0	0
	OXY	OXY

*First column refers to non-fire situation

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 502.13

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** 140.4°F = 60.2°C = 333.4°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.81 at 13°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 4 and 5)

NOTES

URS

URANYL SULFATE

Common Synonyms
Uranyl sulfate trihydrate
Uranium sulfate
Uranium sulfate trihydrate

Solid | Yellow | Odorless

Sinks and mixes with water

[illegible]

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID
DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]
SOLID
Irritating to skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Restrict access
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Uranium sulfate Uranium sulfate trihydrate, Uranyl sulfate trihydrate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $UO_2SO_4 \cdot 3H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Yellow
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Approved dust respirator goggles or face shield, protective clothing
5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat Contact with eyes causes irritation
5 3 **Treatment for Exposure:** *Get medical attention after all exposures to this compound* INGESTION give large amounts of water induce vomiting EYES flush with water for at least 15 min SKIN flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 2 mg/m³ (as uranium)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 1 LD_{50} 5 15 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:**
6 6 **Behavior in Fire:**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization.** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity**
1 35 ppm/96 hr fathead minnow/TLm hard water
2 8 ppm/96 hr fathead minnow TLm soft water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential.** Data not available

9. SELECTED MANUFACTURERS

1 Vanderbilt Chemical Co
666 South Front St
Elizabeth N J 07202
2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N Y 11514
3 Ventron Corp
P O Box 159
Beverly Mass 01915

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial, Pure
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Radioactive material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 420 2
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity** 3 28 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

URE	UREA

Common Synonyms Carbamide Carbonyldiamide	Solid crystals or pellets White Odorless Sinks and mixes with water
Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Carbamide
Carbonyldiamide

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** NH_2CONH_2

3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** Odorless or [illegible] ammonia odor

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, dust [illegible]

5.2 **Symptoms Following Exposure:** Major [illegible] eyes

5.3 **Treatment for Exposure:** Wash eye with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent

5.5 **Short-Term Inhalation Limits:** Not pertinent

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** None

5.8 **Vapor (Gas) Irritant Characteristics:** Non-[illegible]

5.9 **Liquid or Solid Irritant Characteristics:** None

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point.** Not flammable

6.2 **Flammable Limits in Air.** Not flammable

6.3 **Fire Extinguishing Agents:** Water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Melts and decomposes generating ammonia

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials.** No reaction

7.3 **Stability During Transport:** Occurs only above melting point (132°C) yielding ammonia and other products. The decomposition is not explosive

7.4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
[illegible] mg/l 24 hr creek chub [illegible] fresh water
[illegible] mg/l 24 hr creek chub [illegible] fresh water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** [illegible] days

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. [illegible] Chemical Corp
Agricultural Division
[illegible]

2. [illegible] Gas Co
Nipak Inc. Division
Dallas, Tex. 75221

3. Triad Chemical Co
Yazoo City, Miss. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Various grades and purities which depends on manufacturing process and intended use. All have essentially the same hazardous properties

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Decomposes

13.4 **Freezing Point.** [illegible]

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure.** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension.** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** [illegible]

13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

UPO — UREA PEROXIDE

Common Synonyms

Urea hydrogen peroxide
Hydrogen peroxide carbamide
Urea hydrogen peroxide salt
Carbamide peroxide
Carbonyl diamine peroxide

Solid — White — Odorless

Mixes with water

Fire

Combustible
May cause fire on contact with combustibles
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Containers may explode in fire

Exposure

SOLID
Irritating to skin and eyes.

Water Pollution

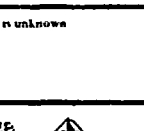
Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-1)

Issue warning — oxidizing material
Restrict access
Disperse and flush

2. LABEL



3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Carbamide peroxide, Carbonyl diamine peroxide, Hydrogen peroxide carbamide, Percarbamide, Perhydrol Urea, Urea hydrogen peroxide

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula:** $CO(NH_2)_2 \cdot H_2O_2$

3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White

4.3 **Odor:** None

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, [illegible] protective goggles

5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose from hydrogen peroxide formed when heated. Contact with eyes causes severe damage. Contact with moist skin causes temporary tickling or burning sensation. Ingestion causes irritation of mouth and stomach.

5.3 **Treatment for Exposure:** INHALATION: remove victim from exposure, call physician. EYES: wash thoroughly with large quantities of water for at least 15 min., call physician. SKIN: flush with water. INGESTION: give large amounts of water, get medical attention.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Data not available

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent (combustible solid that cause fire upon contact with ordinary combustibles)

6.2 **Flammable Limit in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Inert powders (e.g., sand, limestone), water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Irritating ammonia gas may be formed in fire

6.6 **Behavior in Fire:** Melts and decomposes giving off oxygen and ammonia. Increases severity of fire. Containers may explode.

6.7 **Ignition Temperature:** >60°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Forms solution of hydrogen peroxide (non hazardous reaction)

7.2 **Reactivity with Common Materials:** No significant reaction at ordinary temperatures. At 50°C (122°F) reacts with dust and rubbish

7.3 **Stability During Transport:** Stable below 60°C (140°F)

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. The Norac Company, Inc.
   405 South Motor Avenue
   P.O. Box 1
   Azusa, Calif. 91702
2. Degussa Incorporated
   Chemicals Division
   2 Pennsylvania Plaza
   New York, N.Y. 10001
3. Gallard Schlesinger Chemical Mfg. Co.
   584 Mineola Avenue
   Carle Place, N.Y. 11514

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 98–100%

10.2 **Storage Temperature:** Below 60°C (140°F)

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open, flame arresters

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG-446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Organic Peroxide

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 94.1

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.9 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Data not available

13.14 **Heat of Decomposition:** −540 Btu/lb (= −300 cal/g = −1.2 × 10⁶ J/kg)

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

VAL	VALERALDEHYDE

Common Synonyms Amyl aldehyde Valeric aldehyde Pentanal Valeral	Watery liquid Colorless Fruity odor Floats on water. Flammable, irritating vapor is produced

Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes, nose, and throat LIQUID Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning: high flammability
Evacuate area
Disperse and flush

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Amyl aldehyde, Pentanal, Valeral, Valeric aldehyde

3.2 **Coast Guard Compatibility Classification:** Aldehyde

3.3 **Chemical Formula:** $CH_3(CH_2)_3CHO$

3.4 **IMCO United Nations Numerical Designation:** [illegible]

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** [illegible]

4.3 **Odor:** [illegible]

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** [illegible]

5.2 **Symptoms Following Exposure:** [illegible]

5.3 **Treatment for Exposure:** [illegible]

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** [illegible]

5.6 **Toxicity by Ingestion:** [illegible]

5.7 **Late Toxicity:** [illegible]

5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]

5.9 **Liquid or Solid Irritant Characteristics:** [illegible]

5.10 **Odor Threshold:** [illegible]

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 1.9 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** [illegible] (theory) 5 days

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

[illegible] Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** [illegible]

10.4 **Venting:** [illegible]

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A-P-Q-T-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
[illegible]	[illegible]

12.3 **NFPA Hazard Classifications:** [illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** [illegible]

13.6 **Critical Pressure:** [illegible]

13.7 **Specific Gravity:** [illegible]

13.8 **Liquid Surface Tension:** [illegible]

13.9 **Liquid-Water Interfacial Tension:** [illegible]

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]

13.12 **Latent Heat of Vaporization:** [illegible]

13.13 **Heat of Combustion:** [illegible]

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

VOT	VANADIUM OXYTRICHLORIDE

Common Synonyms			
Vanadyl trichloride Trichlorovanadium Vanadyl chloride	Liquid	Lemon yellow	Sharp unpleasant odor
	Sinks and mixes violently with water		

Fire	Not flammable
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Isolate hazard area and deny entry
Stop release
Restrict access
Disperse and mix

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichlorovanadium
Vanadyl trichloride, Vanadyl chloride

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $VOCl_3$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid

4.2 **Color:** Lemon yellow

4.3 **Odor:** Acrid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor mask, rubber gloves, face shield, and resistant clothing

5.2 **Symptoms Following Exposure:** Inhalation: Vapor causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes severe irritation

5.3 **Treatment for Exposure:** Consult physician after all exposures to this compound. INHALATION: move to fresh air, give artificial respiration if necessary, call MD. INGESTION: give large amount of water. EYES: flush with water for [illegible] min. SKIN: wash exposed areas free of the chemical with a dry cloth, then flush thoroughly with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Upper IDLH (exposure over 30 min) is 1 ppm (that compound decomposes in moist air into vanadium and HCl)

5.6 **Toxicity by Ingestion:** Grade 3 oral rat LD_{50} [illegible] mg/kg

5.7 **Late Toxicity:** Repeated exposure may cause desquamation of tongue, loss of appetite, anemia, kidney disorders, and blindness

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** 10 ppm HCl based on decomposition of compound in moist air

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Water, unless in flooding amounts, should not be used on a liquid fire

6.5 **Special Hazards of Combustion Products:** Evolution of hydrogen chloride may occur in fires

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts to form a mixture of hydrochloric acid

7.2 **Reactivity with Common Materials:** In presence of moisture will corrode most metals

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water and sprinkle with powdered limestone or rinse with dilute solution of sodium bicarbonate or soda ash

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Not available [illegible]

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. Eagle Picher Co
   Box [illegible]
   Joplin, Pa. [illegible]
2. Stauffer Chemical Company
   Specialty Chemical Div
   Westport, Conn. [illegible]
3. Vertron Inc
   P.O. Box [illegible]
   Beverly, Mass. 01915

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** [illegible]

13.4 **Freezing Point:** [illegible]

13.5 **Critical Temperature:** Data not available

13.6 **Critical Pressure:** Data not available

13.7 **Specific Gravity:** [illegible] 20°C (liquid)

13.8 **Liquid Surface Tension:** Data not available

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available

13.12 **Latent Heat of Vaporization:** Data not available

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

(continued on page [illegible])

NOTES

VOX	VANADIUM PENTOXIDE

Common Synonyms			
Vanadic anhydride Vanadium pentaoxide	Solid	Yellowish brown	Odorless
	Sinks in water		

Fire	Not flammable Will increase the intensity of a fire
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Vanadic anhydride
Vanadium pentaoxide

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** V_2O_5

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Yellow orange powders dark gray (flakes) yellowish brown

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Bu. Mines approved respirator, rubber gloves, goggles, or prolonged exposure

5.2 **Symptoms Following Exposure:** Inhalation of dust or [illegible] nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation, eczema may develop

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. Exposure to dust may be severe, get medical attention. INGESTION: induce vomiting, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible] mg/m

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} [illegible] mg/kg (mouse)

5.7 **Late Toxicity:** Repeated exposures may cause discoloration of tongue, loss of appetite, anemia, kidney disorders, and blindness

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** May increase intensity of fire when in contact with combustible materials

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
[illegible] hard water
[illegible] soft water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

Foote Mineral Co.
Route 100
Exton, Pa. [illegible]

Kerr-McGee Chemical Corp.
Soda Springs
Idaho [illegible]

Stauffer Chemical Co.
Industrial Chemicals Div.
Westport, Conn. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Not pertinent decomposes

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on next 1 and 4)

NOTES

VSF	VANADYL SULFATE

Common Synonyms			
Vanadium oxysulfate Vanadyl sulfate dihydrate	Solid	Pale blue	Odorless
	Sinks and mixes with water		

[illegible]

Fire	Not flammable
Exposure	CAUSE FOR MEDICAL AID **DUST** Irritating to eyes nose and throat If inhaled will cause coughing or difficult breathing [illegible] **SOLID** Irritating to skin and eyes If swallowed will cause nausea or coughing [illegible] IF SWALLOWED [illegible] CONSCIOUS OR HAVING CONVULSIONS [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Vanadium oxysulfate
Vanadyl sulfate dihydrate

3 2 **Coast Guard Compatibility Classification.** Not listed

3 3 **Chemical Formula** $VOSO_4 \cdot 2H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Pale blue

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles or face shield protective gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat Ingestion causes irritation of mouth and stomach Contact with eyes or skin causes irritation eczema may develop (Results of prolonged exposure are described in section 5 7)

5 3 **Treatment for Exposure:** INHALATION move to fresh air, if exposure to dust has been severe get medical attention INGESTION give large amount of water induce vomiting get medical attention EYES flush with water for at least 15 min SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 3, LD_{50} 50 500 mg/kg

5 7 **Late Toxicity:** Repeated exposures may cause discoloration of tongue loss of appetite anemia kidney disorders, and blindness

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature.** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water.** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
30 ppm/96 hr/fathead minnow/TL_m hard water
4 8 ppm/96 hr/fathead minnow/TL_m/soft water

8 2 **Waterfowl Toxicity** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Gallard Schlesinger Chemical Mfg Co
584 Mincola Ave
Carle Place, N Y 11514

2 Eastman Organic Chemicals
Rochester N Y 14650

3 Ventron Inc
P O Box 159
Beverly Mass 01915

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial Pure

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight.** 199 1

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (approx) 2 5 at 20°C (solid)

13 8 **Liquid Surface Tension.** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution** Data not available

13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

VAM — VINYL ACETATE

Common Synonyms
VyAc
Vinyl A monomer

Water liquid — Colorless — Pleasant fruity odor

Floats on water. Flammable. Irritating vapor is produced.

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid and vapor.
Stay upwind and on water (may be [illegible]).
Dike and contain discharged material.
[illegible]

Fire

FLAMMABLE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-[illegible] breathing apparatus.
Cool fires from safe distance or protected site.
Extinguish with dry chemical, CO2, foam, water fog.
Cool exposed containers with water.

Exposure

CAUTION MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause dizziness or difficult breathing
May cause [illegible]
If [illegible] seek medical assistance.
If breathing stopped, [illegible] CPR.

LIQUID
Irritating to skin and eyes
Harmful if swallowed or if spilled on skin
Remove contaminated clothing and shoes.
Flush affected areas with water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED [illegible] induce vomiting [illegible] drink water.
[illegible]

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes
Notify [illegible]
Notify [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG-446-4)

Issue warning: high flammability, air contaminant.
Evacuate area.

2 LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** VAM, Vinyl A monomer, VyAc
3.2 **Coast Guard Compatibility Classification.** Vinyl acetate
3.3 **Chemical Formula:** $CH_3COOCH=CH_2$
3.4 **IMCO/United Nations Numerical Designation.** 3.2 1301

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color.** Colorless
4.3 **Odor.** Not unpleasant, sweet smell in small quantities, pleasant fruity characteristic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Approved canister or air supplied mask, goggles or face shield, rubber or plastic gloves.
5.2 **Symptoms Following Exposure.** High vapor concentrations cause narcosis. Liquid irritates eyes and may irritate skin.
5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air, give artificial respiration if required. EYES: flush with water for at least 15 min.
5.4 **Toxicity by Inhalation (Threshold Limit Value).** 10 ppm
5.5 **Short-Term Inhalation Limits.** Data not available.
5.6 **Toxicity by Ingestion:** Grade 2. LD_{50} 0.5 to 5 g/kg (rat).
5.7 **Late Toxicity:** Data not available.
5.8 **Vapor (Gas) Irritant Characteristics.** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics.** Minimum hazard. If spilled on clothing and allowed to remain, may cause scarring and reddening of the skin.
5.10 **Odor Threshold.** 0.12 ppm

6 FIRE HAZARDS

6.1 **Flash Point:** 18 °F (-8 °C) [illegible]
6.2 **Flammable Limits in Air.** 2.6 – 13.4
6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; ordinary foam for large fires.
6.4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective.
6.5 **Special Hazards of Combustion Products.** Not pertinent.
6.6 **Behavior in Fire.** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. May polymerize when heated in a fire and rupture container.
6.7 **Ignition Temperature.** 800 °F
6.8 **Electrical Hazard.** Class I, Group D
6.9 **Burning Rate.** 3.8 mm/min

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water.** No reaction
7.2 **Reactivity with Common Materials.** No reaction
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
7.5 **Polymerization:** Can occur violently in contact with peroxides and strong acids, but only under extreme conditions.
7.6 **Inhibitor of Polymerization.** 3 – 5 ppm or 14 – 17 ppm hydroquinone. Shipments usually also contain 200 ppm of diphenylamine.

8. WATER POLLUTION

8.1 **Aquatic Toxicity**
15 ppm/96 hr bluegill, 11 mg/l/96 hr/salt water
> 100 ppm/48 hr flounder, 1 C/salt water
8.2 **Waterfowl Toxicity.** Data not available.
8.3 **Biological Oxygen Demand (BOD)**
62% of theoretical in 5 days, freshwater, acclimated seed
8.4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1. Celanese Corp.
Celanese Chemical Co. Division
245 Park Ave.
New York, N.Y. 10017
2. National Distillers & Chemical Corp.
U.S. Industrial Chemicals Co. Division
Houston, Tex. 77001
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**
Grade A (Diphenylamine inhibited) 99%
Grade B (Hydroquinone inhibited) 99%
10.2 **Storage Temperature.** Ambient
10.3 **Inert Atmosphere.** No requirement
10.4 **Venting.** Pressure/vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

A-P-2-T-U-V-W-Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight.** 86.09
13.3 **Boiling Point at 1 atm:**
163.2 °F = 72.9 °C = 346 °K
13.4 **Freezing Point:**
−138.0 °F = −92.8 °C = 180.4 °K
13.5 **Critical Temperature**
486 °F = 252 °C = 525 °K
13.6 **Critical Pressure.**
617 atm = 42 psia = 4.25 MN/m²
13.7 **Specific Gravity.** 0.934 at 20/20 °C (liquid)
13.8 **Liquid Surface Tension:**
23.95 dynes/cm = 0.0239 N/m at 20 °C
13.9 **Liquid-Water Interfacial Tension:**
(est.) 30 dynes/cm = 0.03 N/m at 20 °C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas)**
1.103
13.12 **Latent Heat of Vaporization.** 166 Btu/lb
= 90.6 cal/g = 3.79 × 10⁵ J/kg
13.13 **Heat of Combustion.** −4284 Btu/lb
= −9419 cal/g = −226.9 × 10⁶ J/kg
13.14 **Heat of Decomposition.** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** −439 Btu/lb
= −244 cal/g = −10.2 × 10⁵ J/kg

Continued on pages 5 and 6

NOTES

REVISED 1978

VCM	VINYL CHLORIDE

Common Synonyms Chloroethylene VCL Vinyl Monomer	Liquefied compressed gas Colorless Sweet odor Liquid floats and boils on water Flammable irritating visible vapor cloud is produced
	[illegible]
Fire	FLAMMABLE POISONOUS GAS IS PRODUCED IN FIRE Flashback along vapor trail may occur May explode if ignited in an enclosed area [illegible]
Exposure	[illegible] VAPOR Irritating to eyes, nose and throat If inhaled, will cause dizziness or difficult breathing [illegible] LIQUID Will cause frostbite [illegible]
Water Pollution	Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning high flammability
Evacuate area

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms** Chloroethene
Chloroethylene
Vinyl Monomer
VCL
VCM

3 2 **Coast Guard Compatibility Classification** Vinyl halides

3 3 **Chemical Formula** $CH_2=CHCl$

3 4 **IMCO/United Nations Numerical Designation** 2 0 1086

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied gas

4 2 **Color:** Colorless

4 3 **Odor:** Pleasant sweet

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Rubber gloves and shoes gas tight goggles organic vapor canister or self contained breathing apparatus

5 2 **Symptoms Following Exposure:** INHALATION high concentrations cause dizziness anesthesia lung irritation SKIN may cause frostbite phenol inhibitor may be absorbed through skin if large amounts of liquid evaporate

5 3 **Treatment for Exposure.** INHALATION remove patient to fresh air and keep him quiet and warm call a doctor give artificial respiration if breathing stops EYES AND SKIN flush with plenty of water for at least 15 min for eyes get medical attention remove contaminated clothing

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 200 ppm

5 5 **Short-Term Inhalation Limits** 500 ppm for 5 min

5 6 **Toxicity by Ingestion.** Not pertinent

5 7 **Late Toxicity:** Chronic exposure may cause liver damage

5 8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant The effect is temporary

5 9 **Liquid or Solid Irritant Characteristics** Minimum hazard If spilled on clothing and allowed to remain may cause smarting and reddening of skin May cause frostbite

5 10 **Odor Threshold** 260 ppm

6 FIRE HAZARDS

6 1 **Flash Point** −110°F O C

6 2 **Flammable Limits in Air:** 4% 26%

6 3 **Fire Extinguishing Agents:** For small fire use dry chemical or carbon dioxide For large fires stop flow of gas Cool exposed containers with water

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products.** Forms highly toxic combustion products such as hydrogen chloride phosgene and carbon monoxide

6 6 **Behavior in Fire.** Container may explode in fire Gas is heavier than air and may travel considerable distance to a source of ignition and flash back

6 7 **Ignition Temperature:** 882°F

6 8 **Electrical Hazard:** Class I Group D

6 9 **Burning Rate:** 4 3 mm/min

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.** No reaction

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Polymerizes in presence of air sunlight or heat unless stabilized by inhibitors

7 6 **Inhibitor of Polymerization.** Not normally used except when high temperatures are expected Then 40 100 ppm of phenol used

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** None

8 2 **Waterfowl Toxicity:** None

8 3 **Biological Oxygen Demand (BOD)** None

8 4 **Food Chain Concentration Potential.** None

9 SELECTED MANUFACTURERS

1 Dow Chemical Co
Midland Mich 48640

2 The B F Goodrich Co
6100 Oak Tree Blvd
Cleveland Ohio 44131

3 PPG Industries Inc
Chemical Division
Guayanilla Puerto Rico 00656

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial or technical 99+%

10 2 **Storage Temperature:**
Under pressure ambient
At atm pressure low

10 3 **Inert Atmosphere** No requirement

10 4 **Venting.**
Under pressure safety relief
At atm pressure pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A B C D E F G Z

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	4
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aquatic Effect	0
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	2

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Gas

13 2 **Molecular Weight:** 62 50

13 3 **Boiling Point at 1 atm:** 7 2°F = −13 8°C = 259 4°K

13 4 **Freezing Point:** −244 8°F = −153 8°C = −119 4°K

13 5 **Critical Temperature:** 317 1°F = 158 4°C = 431 6°K

13 6 **Critical Pressure:** 775 psia = 52 7 atm = 5 34 MN/m

13 7 **Specific Gravity:** 0 969 at −13°C (liquid)

13 8 **Liquid Surface Tension:** 16 0 dynes/cm = 0 0160 N/m at 25°C

13 9 **Liquid-Water Interfacial Tension:** (est) 30 dynes/cm = 0 03 N/m at 20°C

13 10 **Vapor (Gas) Specific Gravity:** 2 2

13 11 **Ratio of Specific Heats of Vapor (Gas):** 1 186

13 12 **Latent Heat of Vaporization:** 160 Btu/lb = 88 cal/g = 3 7 × 10⁵ J/kg

13 13 **Heat of Combustion:** −8136 Btu/lb = −4520 cal/g = −18 9 × 10⁶ J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** −729 Btu/lb = −405 cal/g = −16 9 × 10⁶ J/kg

Continued on pages 5 and 6

NOTES

REVISED 1978

VFI — VINYL FLUORIDE, INHIBITED

Common Synonyms

Fluoroethylene
Monofluoroethylene

Liquefied compressed gas Colorless Faint odor

Floats and boils on water Flammable visible vapor cloud is produced

[illegible]

Fire

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
Wear goggles and self-contained breathing apparatus
Let fire burn
Stop flow of gas if safe to do so
Cool exposed containers with water

Exposure

[illegible]

VAPOR
If inhaled will cause headache, or dizziness
Move victim to fresh air
[illegible]

LIQUID
Will cause frostbite
Flush affected areas with water
DO NOT REMOVE CLOTHING

Water Pollution

Not harmful to aquatic life

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability
air contaminant
Restrict access
Evacuate area

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Fluoroethylene
Monofluoroethylene

3.2 **Coast Guard Compatibility Classification:** Not applicable

3.3 **Chemical Formula.** $CH_2=CHF$

3.4 **IMCO/United Nations Numerical Designation** 2924/1860

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped).** Liquefied compressed gas

4.2 **Color:** Colorless

4.3 **Odor:** Faint ethereal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Protective gloves, safety glasses, self contained breathing apparatus

5.2 **Symptoms Following Exposure:** Inhalation of vapor causes slight intoxication, some shortness of breath. Liquid may cause frostbite of eyes or skin

5.3 **Treatment for Exposure:** INHALATION: remove victim to fresh air. SKIN: if frostbite has occurred, immerse in warm water, treat burn

5.4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available

5.5 **Short-Term Inhalation Limits.** Data not available

5.6 **Toxicity by Ingestion:** Not pertinent (gas at normal temperatures)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

Flash Point Not pertinent (flammable compressed liquefied gas)

6.2 **Flammable Limits in Air** 2.6% - 21.7%

6.3 **Fire Extinguishing Agents** Let fire burn, shut off flow of gas, cool adjacent containers with water

6.4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6.5 **Special Hazards of Combustion Products** Toxic hydrogen fluoride gas is generated in a fire

6.6 **Behavior in Fire** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode

6.7 **Ignition Temperature** 725°F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport** Stable

7.4 **Neutralizing Agents for Acids and Caustics** Not pertinent

7.5 **Polymerization:** In the absence of inhibitor polymerization can occur

7.6 **Inhibitor of Polymerization** Terpene B 0.2%

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterfowl Toxicity** None

8.3 **Biological Oxygen Demand (BOD)** None

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. E. I. duPont de Nemours & Co., Inc.
Organic Chemicals Department
Freon Products Division
Nemours Building
Wilmington, Del. 19898

2. Matheson Gas Products Co.
East Rutherford, N.J. 07073

3. Scientific Gas Products, Inc.
513 Raritan Center
Edison, N.J. 08817

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.9+

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A B C-D E F-G Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Flammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation** Not Listed

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Gas

13.2 **Molecular Weight:** 46.1

13.3 **Boiling Point at 1 atm** −98°F = −72°C = 201°K

13.4 **Freezing Point** −256°F = −161°C = 112°K

13.5 **Critical Temperature.** 130.5°F = 54.7°C = 327.9°K

13.6 **Critical Pressure** 760 psia = 51.6 atm = 5.23 MN/m²

13.7 **Specific Gravity:** 0.707 @ 0°C (liquid)

13.8 **Liquid Surface Tension** [illegible] dynes/cm = 1.005 N/m at 15°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** [illegible]

13.11 **Ratio of Specific Heats of Vapor (Gas).** 1.2097

13.12 **Latent Heat of Vaporization** 156 Btu/lb = 86.5 cal/g = 3.62 × 10⁵ J/kg

13.13 **Heat of Combustion** (est.) −6,900 Btu/lb = −3,800 cal/g = −1.59 × 10⁷ J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization.** Data not available

Continued on pages 5 and 6

NOTES

VCI	VINYLIDENE CHLORIDE, INHIBITED

Common Synonyms
1,1-Dichloroethylene
unsym-Dichloroethylene

Water: Liquid Colorless Sweet odor

Sinks in water. Flammable, irritating vapor is produced. Boiling point is 89°F.

[illegible]

Fire

FLAMMABLE
POISONOUS GASES PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area
[illegible]

Exposure

CARCINOGEN [illegible]

VAPOR
Irritating to eyes, nose, and throat
If inhaled, will cause dizziness or difficult breathing
[illegible]

LIQUID
Will burn skin and eyes
Harmful if swallowed
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes
[illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Issue warning, high flammability
Evacuate area

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,1-Dichloroethylene
unsym-Dichloroethylene

3.2 **Coast Guard Compatibility Classification**
Vinyl halides

3.3 **Chemical Formula:** CH_2CCl_2

3.4 **IMCO United Nations Numerical Designation** 3.1, 1304

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid

4.2 **Color** Colorless

4.3 **Odor** Sweet, like carbon tetrachloride or chloroform

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment** Approved canister or air supplied mask, goggles, face shield, rubber gloves and boots

5.2 **Symptoms Following Exposure:** Vapor can cause dizziness, headache, nausea, loss of coordination, anesthesia. Liquid irritates eyes and skin

5.3 **Treatment for Exposure** INHALATION: If any illness develops, remove person to fresh air promptly, keep warm and quiet, and get medical attention. If breathing stops, start artificial respiration. INGESTION: not likely a problem. If swallowed, induce vomiting, get medical attention. EYES OR SKIN: Flush with plenty of water for at least 15 min, get medical attention for eyes. Remove contaminated clothing and wash before reuse

5.4 **Toxicity by Inhalation (Threshold Limit Value)** 25 ppm (suspected)

5.5 **Short-Term Inhalation Limits** Data not available

5.6 **Toxicity by Ingestion** Grade 3. Oral LD50 rat = 84 mg/kg (adrenalectomized rat)

5.7 **Lethal Toxicity** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes moderate irritation of eyes, but is not severe enough to deter prolonged exposure at concentrations anticipated in use

5.9 **Liquid or Solid Irritant Characteristics:** Causes burning [illegible] skin and first degree burns on prolonged exposure. May cause secondary burns [illegible]

5.10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6.1 **Flash Point** 0°F (-18°C)

6.2 **Flammable Limits in Air.** 7.3% - 16.0%

6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical

6.4 **Fire Extinguishing Agents Not to be Used** Water may be ineffective

6.5 **Special Hazards of Combustion Products.** Toxic hydrogen chloride and phosgene are generated in fires

6.6 **Behavior in Fire** May explode in fire due to polymerization. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back

6.7 **Ignition Temperature:** 900°-1031°F

6.8 **Electrical Hazard.** Not pertinent

6.9 **Burning Rate.** 2.7 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Copper and aluminum can cause polymerization

7.3 **Stability During Transport.** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization** Can occur if exposed to sunlight, air, copper, aluminum, heat

7.6 **Inhibitor of Polymerization:** 200 ppm ethyl ether of hydroquinone (0.02% [illegible])

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co
Midland, Mich. 48640
2. PPG Industries, Inc
Industrial Chemicals Division
1 Gateway Center
Pittsburgh, Pa. 15222
3. Vulcan Materials Co
Chemicals Division
Wichita, Kans. 67201

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Padded

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A X-Y Z

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
Flammable liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	3
Aquatic Toxicity	
Human Toxicity	0
Aquatic Toxicity	2
Aesthetic Effects	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	3

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm.** Liquid

13.2 **Molecular Weight:** 96.95

13.3 **Boiling Point at 1 atm.**
88.9°F = 31.6°C = 304.8°K

13.4 **Freezing Point**
-187.6°F = -122.0°C = 151.2°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity** 1.21 at 20°C (liquid)

13.8 **Liquid Surface Tension:**
24 dynes/cm = 0.024 N/m at 15°C

13.9 **Liquid-Water Interfacial Tension:**
37 dynes/cm = 0.037 N/m at 22.7°C

13.10 **Vapor (Gas) Specific Gravity:** 3.3

13.11 **Ratio of Specific Heats of Vapor (Gas)**
Data not available

13.12 **Latent Heat of Vaporization:**
150 Btu/lb = 72 cal/g = 3.0 × 10^5 J/kg

13.13 **Heat of Combustion.** 4860 Btu/lb
= -2700 cal/g = -11.3 × 10^5 J/kg

13.14 **Heat of Decomposition** Not pertinent

13.15 **Heat of Solution** Not pertinent

13.16 **Heat of Polymerization:** -333 Btu/lb
= -185 cal/g = -7.75 × 10^5 J/kg

Continued on next page

NOTES

REVISED 1978

VME	VINYL METHYL ETHER, INHIBITED

Common Synonyms	
Methyl vinyl ether Methoxyethylene	Liquefied compressed gas Colorless Sweet pleasant odor Floats and may boil on water Boiling point is 54° F

Fire	**FLAMMABLE** Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	**VAPOR** Irritating to eyes, nose and throat If inhaled will cause headache, dizziness, or loss of consciousness **LIQUID** Irritating to eyes Will cause frostbite Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning high flammability air contaminant
Restrict access
Evacuate area

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Methoxyethylene
Methyl vinyl ether

3 2 **Coast Guard Compatibility Classification:** Not applicable

3 3 **Chemical Formula.** $CH_2=CH-O-CH_3$

3 4 **IMCO/United Nations Numerical Designation.** 2 1087

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquefied compressed gas

4 2 **Color:** Colorless

4 3 **Odor:** Sweet pleasant

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Organic vapor mask plastic or rubber gloves safety glasses

5 2 **Symptoms Following Exposure:** Inhalation cause irritation, blurring of vision headache dizziness excitation loss of consciousness Liquid or concentrated vapor irritates eyes and causes frostbite of skin Aspiration of the liquid will cause chemical pneumonitis

5 3 **Treatment for Exposure.** INHALATION remove victim to fresh air breathing is difficult, administer oxygen can pass clean EYES wash with copious quantities of water consult an eye specialist SKIN wash with copious quantities of water treat frostbite by use of warm water or blankets INGESTION do NOT induce vomiting get medical attention

5 4 **Toxicity by Inhalation (Threshold Limit value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0 5 to 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** −69°F (C)

6 2 **Flammable Limits in Air:** 2 6 – 39

6 3 **Fire Extinguishing Agents.** Let fire burn shut off gas flow extinguish small fires with dry chemical or carbon dioxide

6 4 **Fire Extinguishing Agents Not to be Used.** Water may be ineffective

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:** Containers may explode Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back

6 7 **Ignition Temperature:** Data not available

6 8 **Electrical Hazard:** Data not available

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Reacts slowly to form acetaldehyde reaction is not hazardous unless water is hot or acids are present

7 2 **Reactivity with Common Materials:** Acids will cause polymerization

7 3 **Stability During Transport** Stable if kept free from acids

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization** Can polymerize in the presence of acids

7 6 **Inhibitor of Polymerization:** Diethylamine Triethanolamine Solid potassium hydroxide

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD).** Data not available

8 4 **Food Chain Concentration Potential.** None

9. SELECTED MANUFACTURERS

1 GAF Corporation
140 West 51st Street
New York, N Y 10020

2 Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N Y 10017

3 Matheson Gas Products Co
East Rutherford, N J 07073

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** 99 7+

10 2 **Storage Temperature.** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting.** Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

A B C D E F G Z

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Flammable compressed gas

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	4
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Gas

13 2 **Molecular Weight:** 58 1

13 3 **Boiling Point at 1 atm:** 41 9°F = 5 5°C = 278 7°K

13 4 **Freezing Point.** −188 F = −122°C = 151 K

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 0 777 at 0°C (liquid)

13 8 **Liquid Surface Tension.** (est) 10 dynes/cm = 0 010 N/m at 0°C

13 9 **Liquid-Water Interfacial Tension.** (est) 25 dynes/cm = 0 025 N/m at 0°C

13 10 **Vapor (Gas) Specific Gravity:** 2 0

13 11 **Ratio of Specific Heats of Vapor (Gas)** (est) 1 1473

13 12 **Latent Heat of Vaporization:** (est) 180 Btu/lb = 100 cal/g = 4 2 × 10 J/kg

13 13 **Heat of Combustion:** (est) −14 200 Btu/lb = −7 900 cal/g = −330 × 10 J/kg

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Data not available

Continued on page 5-62A

NOTES

VNT	VINYLTOLUENE

Common Synonyms			
p-Methylstyrene	Watery liquid	Colorless	Unpleasant odor
	Floats on water		

[illegible]

Fire	Combustible Containers may explode in fire [illegible]
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms.** Methylstyrene
3.2 **Coast Guard Compatibility Classification** Olefin
3.3 **Chemical Formula** $CH_3CH_2CH=CH$
3.4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped)** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Disagreeable

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment** [illegible]
5.2 **Symptoms Following Exposure.** [illegible]
5.3 **Treatment for Exposure:** INHALATION [illegible] INGESTION do NOT induce vomiting [illegible] EYES [illegible] SKIN [illegible] soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value).** [illegible]
5.5 **Short-Term Inhalation Limits.** [illegible]
5.6 **Toxicity by Ingestion:** Grade 2 [illegible]
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** [illegible]
5.9 **Liquid or Solid Irritant Characteristics.** [illegible]
5.10 **Odor Threshold** 50 ppm

6 FIRE HAZARDS

6.1 **Flash Point.** [illegible]
6.2 **Flammable Limits in Air** [illegible]
6.3 **Fire Extinguishing Agents** Water fog, foam, carbon dioxide or dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products.** Not pertinent
6.6 **Behavior in Fire:** Containers may explode or rupture in a fire due to polymerization
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport.** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization** Slow [illegible] temperatures but when not may rupture container. Also polymerized by metal salts such as those of iron or aluminum
7.6 **Inhibitor of Polymerization** [illegible] 50 ppm [illegible]

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD)** Data not available
8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1. Borden Inc.
Borden Chemical D[illegible]
50 W. Broad St.
Columbus, Ohio 43[illegible]
2. Dow Chemical Co.
Midland, Mich. 48[illegible]
3. [illegible]
[illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere.** No requirement
10.4 **Venting** Open [illegible]

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-2

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** Combustible Liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	2
Health	
Vapor Irritant	[illegible]
Liquid [illegible]	
Poison	
Water Pollution	
Human Toxicity	
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemical	[illegible]
Water	0
Self Reaction	[illegible]

12.3 **NFPA Hazard Classifications.**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	[illegible]
Reactivity (Yellow)	

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization.** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition** Not pertinent
13.15 **Heat of Solution.** Not pertinent
13.16 **Heat of Polymerization** [illegible]

Continued on page 5 and 6

NOTES

REVISED 1978

VTS — VINYLTRICHLOROSILANE

Common Synonyms

Trichlorovinylsilane
Trichlorovinyl silane
Vinyltrichlorosilane

Liquid — Colorless to light yellow — Sharp choking odor

Reacts violently with water. Irritating gas is produced on contact with water.

Fire

FLAMMABLE
POISONOUS GASES MAY BE PRODUCED IN FIRE
Containers may explode in fire
Flashback along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

VAPOR
Irritating to eyes, nose and throat
Harmful if inhaled

LIQUID
Will burn skin and eyes.
Harmful if swallowed

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: high flammability, corrosive air contaminant
Restrict access
Disperse and flush with care

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Trichlorovinylsilane, Trichlorovinylsilane, Vinyltrichlorosilane
3.2 **Coast Guard Compatibility Classification:** Not applicable
3.3 **Chemical Formula:** $CH_2=CHSiCl_3$
3.4 **IMCO/United Nations Numerical Designation:** 1305

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to pale yellow
4.3 **Odor:** Sharp choking irritating hydrochloric acid

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Acid vapor type respirator, protective rubber gloves, chemical worker's goggles, other protective equipment as necessary to protect skin and eyes
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membranes. Vapor irritates eyes. Contact with liquid causes severe burns of eyes and skin. Ingestion causes burns of mouth and stomach
5.3 **Treatment for Exposure:** *Get medical attention following all exposures to this compound.* INHALATION: remove victim from exposure, give artificial respiration if required. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting, give large amounts of water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 2000 mg/kg (rats)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and severe injury to the eyes.
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 60°F (O.C.) 52°F (C.C.)
6.2 **Flammable Limits in Air:** 3.1% (LFL)
6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water, foam
6.5 **Special Hazards of Combustion Products:** Toxic chlorine and phosgene gases may be formed in fire
6.6 **Behavior in Fire:** Difficult to extinguish if ignition has occurred. Contact with water applied to adjacent fires produces irritating hydrogen chloride gas.
6.7 **Ignition Temperature:** 510°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 2.9 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously, evolving hydrogen chloride (hydrochloric acid)
7.2 **Reactivity with Common Materials:** Reacts with surface moisture to evolve hydrogen chloride, which will corrode common metals and form flammable hydrogen gas
7.3 **Stability During Transport:** Stable if protected from moisture
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution
7.5 **Polymerization:** May occur in absence of inhibitor
7.6 **Inhibitor of Polymerization:** Diphenylamine, Hydroquinone

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Union Carbide Corp., Chemicals and Plastics Division, 270 Park Avenue, New York, N.Y. 10017
2. Dow Corning Corporation, P.O. Box 592, Midland, Mich. 48640
3. Dynamit Nobel of America, Inc., 105 Stonehurst Court, Northvale, N.J. 07647

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 96+% (vs 5+%)
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

YO

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	4
Poisons	1
Water Pollution	
Human Toxicants	1
Aquatic Toxicants	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	2
Self Reaction	1

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 161.5
13.3 **Boiling Point at 1 atm:** 185°F = 90.6°C = 363.6°K
13.4 **Freezing Point:** −139°F = −95°C = 178°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.26 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 26.3 dynes/cm = 0.028 N/m at 25°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 5.61
13.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
13.12 **Latent Heat of Vaporization:** 88 Btu/lb = 49 cal/g = 2.0 × 10⁵ J/kg
13.13 **Heat of Combustion:** (est.) −4,970 Btu/lb = −2,400 cal/g = −100 × 10⁶ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Data not available
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5

NOTES

WCA	WAXES: CARNAUBA

Common Synonyms	Thick liquid (heated) Yellow to dark brownish green Odorless Floats on water and solidifies
[illegible]	
Fire	Combustible [illegible]
Exposure	LIQUID Will burn skin and eyes. [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Exter
3 3 **Chemical Formula:** Not pertinent
3 4 **IMCO United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Yellow to dark brownish green
4 3 **Odor:** None

5. HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Goggles or face, head, protective gloves and clothing for hot liquid wax
5 2 **Symptoms Following Exposure:** Hot wax can burn skin and eyes
5 3 **Treatment for Exposure:** SKIN OR EYE CONTACT: remove solidified wax from skin, wash with soap and water, if in eyes or if skin is burned, call a doctor
5 4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics.** Non volatile
5 9 **Liquid or Solid Irritant Characteristics:** Hot wax can burn skin and eyes
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** 540 F C C 595°F O C
6 2 **Flammable Limits in Air:** Not pertinent
6 3 **Fire Extinguishing Agents.** Water, foam, dry chemical or carbon dioxide
6 4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Data not available
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 Dura Commodities Corp
111 Calvert St
Harrison N Y 10528
2 W R Grace & Co
Cornelius Wax Refining Corp Division
50 National Rd
Edison N J 08817
3 Frank L Ross Co
6-10 Ash St
Jersey City N J 07304

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Shipped in a variety of grades depending on source of wax and intended use. All have about the same hazardous properties
10 2 **Storage Temperature:** Elevated
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-2

A T T

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation.** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** Not pertinent
13 3 **Boiling Point at 1 atm:** Very high
13 4 **Freezing Point:** 176 - 187°F = 80 - 86°C = 353 - 359°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 0 998 at 25°C (solid)
13 8 **Liquid Surface Tension:** 32 dynes cm = 0 032 N/m at 100°C
13 9 **Liquid-Water Interfacial Tension:** Data not available
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Data not available
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

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WPF	# WAXES: PARAFFIN

Common Synonyms Petroleum wax	Thick liquid (heated) Yellow to white Waxy odor Floats on water and solidifies

[illegible]

Fire	Combustible Extinguish with [illegible]
Exposure	LIQUID Will burn skin and eyes Remove wax [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Petroleum wax
3.2 **Coast Guard Compatibility Classification:** Saturated hydrocarbon
3.3 **Chemical Formula:** Not pertinent
3.4 **IMCO United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid to hard solid
4.2 **Color:** Yellow to white
4.3 **Odor:** Very weak

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Goggles or face shield, [illegible] and clothing; hot liquid wax
5.2 **Symptoms Following Exposure:** Hot wax can burn eyes and skin
5.3 **Treatment for Exposure:** SKIN OR EYE CONTACT [illegible] solidified wax, wash skin with soap and water [illegible] in eyes, call a doctor
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Not pertinent
5.5 **Short-Term Inhalation Limits:** Not pertinent
5.6 **Toxicity by Ingestion:** [illegible]
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** None [illegible]
5.9 **Liquid or Solid Irritant Characteristics:** None
5.10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** Not pertinent
6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. W. R. Grace & Co.
Cornelius Wax Refining Co. Division
[illegible] Rd
Edison, N.J. [illegible]
2. Exxon Chemical Co.
Houston, Tex. [illegible]
3. Sun Oil Co.
St. Davids, Pa. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Crude scale, refined
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

V I U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** Not pertinent
13.3 **Boiling Point at 1 atm:** Very high
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] at 20°C (liquid)
13.8 **Liquid Surface Tension:** [illegible] dynes/cm = 0.0306 N/m at 54°C
13.9 **Liquid-Water Interfacial Tension:** [illegible] dynes/cm = 0.035 - 0.050 N/m at 54°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** -18,000 Btu/lb = -10,000 cal/g = -430 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(continued on pages 5 and 6)

NOTES

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XLM	m-XYLENE

Common Synonyms
1,3-Dimethylbenzene
Xylol

Water: liquid Colorless Sweet odor

Floats on water. Flammable. Irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose, and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, or loss of consciousness.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Floating to shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG-446-4

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,3-Dimethylbenzene; Xylol
3.2 **Coast Guard Compatibility Classification:** Xylenes, technical grade
3.3 **Chemical Formula:** $C_6H_4(CH_3)_2$
3.4 **IMCO United Nations Numerical Designation:** 1307

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Low concentrations have a sweet odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Any respirator or air supply equipment and chemical resistant clothing should protect against hazards.
5.2 **Symptoms Following Exposure:** Vapor causes headache and dizziness. Liquid irritates eyes and skin. Breathing vapor causes nausea, vomiting, loss of consciousness, and rapid, shallow breathing. Prolonged exposure may cause severe lung damage, including pulmonary edema. Prolonged skin contact may cause redness, scaling, and dermatitis. Kidney and liver damage can occur.
5.3 **Treatment for Exposure:** INHALATION: Remove victim to fresh air. Give artificial respiration and oxygen. Seek medical attention. INGESTION: DO NOT induce vomiting. Give activated charcoal. EYES: Immediately flush with water. SKIN: Remove contaminated clothing. Wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5.5 **Short-Term Inhalation Limits:** 400 ppm for 1 hr
5.6 **Toxicity by Ingestion:** Grade 1 LD50 [illegible]
5.7 **Late Toxicity:** Kidney and liver damage
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes irritation of the eyes, nose, and throat. Vapor concentration of 200 ppm causes irritation in 1 hr. [illegible]
5.9 **Liquid or Solid Irritant Characteristics:** Moderately irritating to the eyes. Prolonged or repeated contact may cause redness, scaling, and dermatitis. [illegible]
5.10 **Odor Threshold:** 0.08 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 84°F (29°C)
6.2 **Flammable Limits in Air:** 1.1–7.0%
6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** None known
6.6 **Behavior in Fire:** Vapor may travel to a source of ignition and flash back. Containers may explode in heat of fire.
6.7 **Ignition Temperature:** 867°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** None needed
7.5 **Polymerization:** Not occurring
7.6 **Inhibitor of Polymerization:** None needed

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible] ppm for 96 hr
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** [illegible]
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

[illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Commercial, Technical, Pure
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open venting [illegible]

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG-446-3

X T I

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** [illegible]
12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	
Health	
Acute Toxicity	
Toxicity (Chronic)	
Physiological Response	
Water Pollution	
Harmful Effect	
Acute Toxicity	
Acute Toxicity	2
Reactivity	
Chemical Reactivity	2
Reactivity	
Stability	

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health (Blue)	
Flammability (Red)	
Reactivity (Yellow)	

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 106.16
13.3 **Boiling Point at 1 atm:** 139.1°C = 282.4°F = 412.2°K
13.4 **Freezing Point:** −47.9°C = −54.2°F = 225.3°K
13.5 **Critical Temperature:** 343.9°C = 651.0°F = 617.0°K
13.6 **Critical Pressure:** 35.6 atm = 3595 psia = 3.640 MN/m²
13.7 **Specific Gravity:** 0.8642 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 28.8 dynes/cm = 0.0288 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** 36.4 dynes/cm = 0.0364 N/m at 40°C
13.10 **Vapor (Gas) Specific Gravity:** 3.66
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** 1 Btu/lb = 0.556 cal/g = 2.32 kJ/kg
13.13 **Heat of Combustion:** −17,514 Btu/lb = −9,730 cal/g = −40.7 kJ/kg
13.14 **Heat of Decomposition:** None pertinent
13.15 **Heat of Solution:** None pertinent
13.16 **Heat of Polymerization:** None pertinent

Continued on next page

NOTES

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XLO	o-XYLENE

Common Synonyms
1,2 Dimethylbenzene
Xylol

Water: liquid Colorless Sweet odor

Floats on water. Flammable, irritating vapor is produced.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, or loss of consciousness.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Pertinent Materials Information CG 446-4)

Issue warning: high flammability.
Evacuate area.
Should be removed.
Chemical and physical treatment.

2. LABEL

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,2 Dimethylbenzene
3.2 **Coast Guard Compatibility Classification:** Aromatic hydrocarbon
3.3 **Chemical Formula:** $o\text{-}C_6H_4(CH_3)_2$
3.4 **IMCO/United Nations Numerical Designation:** 1307

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Benzene-like characteristic aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved canister or air supplied mask, goggles or face shield, plastic gloves and boots.
5.2 **Symptoms Following Exposure:** Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache and coma. Can be fatal. Kidney and liver damage can occur.
5.3 **Treatment for Exposure:** INHALATION: remove to fresh air, administer artificial respiration and oxygen if required, call a doctor. INGESTION: do NOT induce vomiting, call a doctor. EYES: flush with water. SKIN: wipe off, wash with soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
5.5 **Short-Term Inhalation Limits:** 300 ppm for 30 min
5.6 **Toxicity by Ingestion:** Grade 3 LD50: 5000 mg/kg
5.7 **Late Toxicity:** Kidney and liver damage
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes slight smarting of the eyes and respiratory system if present in high concentrations. The effects are temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard. If splashed in clothing and allowed to remain, may cause burning and reddening of the skin.
5.10 **Odor Threshold:** 0

6. FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** [illegible]
6.4 **Fire Extinguishing Agents Not to be Used:** [illegible]
6.5 **Special Hazards of Combustion Products:** [illegible]
6.6 **Behavior in Fire:** [illegible]
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** [illegible]
6.9 **Burning Rate:** [illegible]

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** [illegible]
7.2 **Reactivity with Common Materials:** [illegible]
7.3 **Stability During Transport:** [illegible]
7.4 **Neutralizing Agents for Acids and Caustics:** [illegible]
7.5 **Polymerization:** [illegible]
7.6 **Inhibitor of Polymerization:** [illegible]

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]
8.2 **Waterfowl Toxicity:** [illegible]
8.3 **Biological Oxygen Demand (BOD):** [illegible]
8.4 **Food Chain Concentration Potential:** [illegible]

9. SELECTED MANUFACTURERS

[illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Research, [illegible] Pure 99.7%, Commercial, [illegible]
10.2 **Storage Temperature:** [illegible]
10.3 **Inert Atmosphere:** [illegible]
10.4 **Venting:** Open flame, [illegible] pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

[illegible]

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	[illegible]
Health	
Acute Toxicity	
Liquid	[illegible]
Vapor	[illegible]
Water Pollution	
Human Toxicity	
Aquatic Toxicity	[illegible]
Acute Effects	[illegible]
Reactivity	
Other Hazards	
Water	[illegible]
Self Reaction	[illegible]

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** [illegible]
13.6 **Critical Pressure:** [illegible]
13.7 **Specific Gravity:** [illegible]
13.8 **Liquid Surface Tension:** [illegible]
13.9 **Liquid-Water Interfacial Tension:** [illegible]
13.10 **Vapor (Gas) Specific Gravity:** [illegible]
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** [illegible]
13.15 **Heat of Solution:** [illegible]
13.16 **Heat of Polymerization:** [illegible]

[illegible]

NOTES

REVISED 1978

XLP	p-XYLENE

Common Synonyms
1,4-Dimethylbenzene
Xylol

Water's liquid — Colorless — Sweet odor

Floats on water. Flammable; irritating vapor is produced.
Freezing point is 56° F

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Exposure

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, difficult breathing, or loss of consciousness.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, loss of consciousness.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Floating to shoreline.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

See Response Methods Handbook (CG 446-4)

Evacuate area. Fish flammables.
Evacuate area.
Should be removed.
Use recommended protective clothing.

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** 1,4-Dimethylbenzene
3.2 **Coast Guard Compatibility Classification:** Non-hydrocarbon
3.3 **Chemical Formula:** p-$C_6H_4(CH_3)_2$
3.4 **IMCO United Nations Numerical Designation:** 1307

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Characteristic aromatic

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved respirator or supplied air; goggles or face shield; plastic gloves and boots.
5.2 **Symptoms Following Exposure:** Vapor causes headache, nausea, dizziness, and drowsiness; at high concentrations nothing to drive, and vapor decomposes [illegible]. Ingested causes nausea, vomiting, diarrhea, [illegible]
5.3 **Treatment or Exposure:** INHALATION: remove to fresh air; [illegible] INGESTION: DO NOT induce vomiting; [illegible] SKIN: [illegible] soap and water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]
5.5 **Short-Term Inhalation Limits:** [illegible]
5.6 **Toxicity by Ingestion:** [illegible]
5.7 **Late Toxicity:** [illegible]
5.8 **Vapor (Gas) Irritant Characteristics:** Vapor causes slight smarting of the eyes and respiratory [illegible] at high concentration. The odor is [illegible]
5.9 **Liquid or Solid Irritant Characteristics:** Moderately irritating if splashed on clothing and allowed to remain [illegible]
5.10 **Odor Threshold:** [illegible] ppm

6 FIRE HAZARDS

6.1 **Flash Point:** [illegible]
6.2 **Flammable Limits in Air:** [illegible]
6.3 **Fire Extinguishing Agents:** [illegible] chemical, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor mixture with air is explosive [illegible]
6.7 **Ignition Temperature:** [illegible]
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** [illegible]

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** [illegible]
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0 lb/lb in 5 days
8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

Amoco Chemical Corp.
200 East Randolph Drive
Chicago, Illinois [illegible]

APCO Company
200 South Broad St.
Philadelphia, Pa. [illegible]

Chevron Chemical Co.
Industrial Chemicals Division
[illegible]
San Francisco, Calif. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Research 99.9%
Pure 99.5%, Technical 99.0%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester protection required)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CG 446-3)

X T I

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Damage	[illegible]
Liquid or Solid Damage	[illegible]
Poisons	[illegible]
Water Pollution	
Human Toxicity	[illegible]
Aquatic Toxicity	[illegible]
Aesthetics Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	[illegible]
Reactivity (Yellow)	[illegible]

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible]
13.4 **Freezing Point:** [illegible]
13.5 **Critical Temperature:** [illegible]
13.6 **Critical Pressure:** [illegible]
13.7 **Specific Gravity:** [illegible] at 20°C (liquid)
13.8 **Liquid Surface Tension:** [illegible] at 20°C
13.9 **Liquid-Water Interfacial Tension:** [illegible] at 20°C
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** [illegible]
13.12 **Latent Heat of Vaporization:** [illegible]
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

XYL	XYLENOL

Common Synonyms	Solid or liquid	Light yellowish brown	Sweet tarry odor
Dimethylphenol 2-6-Xylenol Cresylic acid 2-Hydroxy-m-xylene	May float or sink in water		

Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat Harmful if inhaled LIQUID OR SOLID Irritating to skin and eyes If swallowed or skin is exposed will cause nausea and vomiting
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Foaming to shoreline May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

2 LABELS

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:**

3.2 **Coast Guard Compatibility Classification:**

3.3 **Chemical Formula:**

3.4 **IMCO/United Nations Numerical Designation:**

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):**

4.2 **Color:**

4.3 **Odor:**

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:**

5.2 **Symptoms Following Exposure:**

Treatment for Exposure:

6 FIRE HAZARDS

6.1 **Flash Point:**

6.2 **Flammable Limits in Air:**

6.3 **Fire Extinguishing Agents:**

6.4 **Fire Extinguishing Agents Not to Be Used:**

6.5 **Special Hazards of Combustion Products:**

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:**

6.8 **Electrical Hazard:**

6.9 **Burning Rate:**

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:**

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:**

7.4 **Neutralizing Agents for Acids and Caustics:**

7.5 **Polymerization:**

7.6 **Inhibitor of Polymerization:**

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**

8.2 **Waterfowl Toxicity:**

8.3 **Biological Oxygen Demand (BOD):**

8.4 **Food Chain Concentration Potential:**

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 **Grades or Purity:**

10.2 **Storage Temperature:**

10.3 **Inert Atmosphere:**

10.4 **Venting:**

11 HAZARD ASSESSMENT CODE

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

12.3 **NFPA Hazard Classifications:**

Category	Classification

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:**

13.2 **Molecular Weight:**

13.3 **Boiling Point at 1 atm:**

13.4 **Freezing Point:**

13.5 **Critical Temperature:**

13.6 **Critical Pressure:**

13.7 **Specific Gravity:**

13.8 **Liquid Surface Tension:**

13.9 **Liquid-Water Interfacial Tension:**

13.10 **Vapor (Gas) Specific Gravity:**

13.11 **Ratio of Specific Heats of Vapor (Gas):**

13.12 **Latent Heat of Vaporization:**

13.13 **Heat of Combustion:**

13.14 **Heat of Decomposition:**

13.15 **Heat of Solution:**

13.16 **Heat of Polymerization:**

5 HEALTH HAZARDS (Cont'd)

5.4 **Toxicity by Inhalation (Threshold Limit Value):**

5.5 **Short Term Inhalation Limits:**

5.6 **Toxicity by Ingestion:**

Late Toxicity:

5.8 **Vapor (Gas) Irritant Characteristics:**

5.9 **Liquid or Solid Irritant Characteristics:**

5.10 **Odor Threshold:**

ZNA	ZINC ACETATE

Common Synonyms			
Zinc acetate dihydrate Dicarbomethoxyzinc Zinc diacetate Acetic acid zinc salt	Solid	White	Faint vinegar odor
	Sinks and mixes with water		

Fire	Not flammable
Exposure	ALL FOR MEDICAL AID DUST Irritating to eyes nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Acetic acid zinc salt Dicarbomethoxyzinc Zinc acetate dihydrate Zinc diacetate

3 2 **Coast Guard Compatibility Classification** Not listed

3 3 **Chemical Formula.** $Zn(C_2H_3O_2)_2$ or $Zn(C_2H_3O_2)_2 \cdot 2H_2O$

3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** Faint acetic acid

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment.** Bu Mines approved respirator rubber gloves chemical goggles

5 2 **Symptoms Following Exposure** Inhalation causes mild irritation of nose and throat coughing and sneezing Ingestion can cause irritation or corrosion of the alimentary tract, resulting in vomiting Contact with dust causes irritation of eyes and mild irritation of skin

5 3 **Treatment for Exposure:** INHALATION move to fresh air if exposure is severe get medical attention INGESTION induce vomiting, followed by prompt and complete gastric lavage cathartics and demulcents EYES flush with water for at least 10 min consult physician if irritation persists SKIN wash with soap and water

5 4 **Toxicity by Inhalation. (Threshold Limit Value)** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2, LD50 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products.** Not pertinent

6 6 **Behavior in Fire**

6 7 **Ignition Temperature** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity.** 0 88 ppm/96 hr fathead minnow TLm soft water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** Data not available

8 4 **Food Chain Concentration Potential:** Zinc is not considered to be bioconcentrative even though it accumulates in some organisms

9 SELECTED MANUFACTURERS

1 The Harshaw Chemical Co
19451 97 St
Cleveland Ohio 44106

2 Allied Chemical Corp
Specialty Chemicals Div
P O Box 1087R
Morristown N J 07960

3 Union Carbide Corp
Chemicals and Plastics Div
270 Park Avenue
New York N Y 10017

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent 99%
Commercial 98 4%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere.** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid

13 2 **Molecular Weight:** 219 49

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point.** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity** 1 74 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition** Not pertinent

13 15 **Heat of Solution:** (approx) −0 5 Btu/lb = −0 3 cal/g ≈ −0 03 × 10³ J/kg

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

ZAC — ZINC AMMONIUM CHLORIDE

Common Synonyms
Ammonium pentachlorozincate
Ammonium zinc chloride

Solid | White | Odorless

Sinks and mixes with water.

Avoid contact with solid and dust. Keep [illegible]
Stay upwind if possible.
Isolate and remove discharged material.
Notify [illegible]

Fire

Not flammable

Exposure

CALL FOR MEDICAL AID

DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.
If [illegible] and flush with plenty of water.
If breathing has stopped [illegible]
If breathing is difficult [illegible]

SOLID
Irritating to skin and eyes.
If swallowed will cause nausea and vomiting.
Remove contaminated clothing [illegible]
Flush affected areas with plenty of water.
IF IN EYES hold eyelids open and flush with plenty of water.
IF SWALLOWED induce VOMITING by swallowing drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim CONSCIOUS OR HAS NO CONVULSIONS induce vomiting [illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify [illegible] if not within [illegible]
Notify [illegible] if near water intakes.

1 RESPONSE TO DISCHARGE

(See Response Method Handbook CG 446-4)

Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Ammonium pentachlorozincate, Ammonium zinc chloride
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $ZnCl_2 \cdot 3NH_4Cl$
3 4 **IMCO/United Nations Numerical Designation.** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract. Contact with eyes or skin causes irritation.
5 3 **Treatment for Exposure** INHALATION remove from exposure, begin artificial respiration if breathing has ceased. INGESTION induce vomiting followed by prompt and complete gastric lavage, cathartics and demulcents. EYES flush with water for at least 15 min. SKIN flush with water.
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** No flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire.**
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** Data not available
8 4 **Food Chain Concentration Potential.** Zinc accumulates in some organisms but is not considered to be bioconcentrative

9 SELECTED MANUFACTURERS

1 Chemical and Pigment Co
600 Nichols Road
Pittsburg, Calif 94565

2 Pfaltz and Bauer, Inc
375 Fairfield Ave
Stamford, Conn 06902

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight:** 296.8
13 3 **Boiling Point at 1 atm** (sublimes) 644°F = 340°C = 613°K
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure** Not pertinent
13 7 **Specific Gravity:** 1.81 at 20°C (solid)
13 8 **Liquid Surface Tension:** No pertinent
13 9 **Liquid-Water Interfacial Tension.** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution.** Data not available
13 16 **Heat of Polymerization** Not pertinent

(Continue [illegible] pages [illegible])

NOTES

ZAR	ZINC ARSENATE

Common Synonyms	Solid	Colorless	Odorless
	Sinks in water		

AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID **DUST** *POISONOUS IF INHALED* Irritating to eyes, nose and throat *SOLID* POISONOUS IF SWALLOWED Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Issue warning poison water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2 LABEL

POISON

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** (approx.) $(ZnO)_4(As_2O_5)$
3 4 **IMCO/United Nations Numerical Designation:** 6 1/1712

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** Colorless
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask rubber gloves
5 2 **Symptoms Following Exposure:** Dust may irritate eyes. Ingestion or excessive inhalation of dust causes burning of mouth abdominal pain vomiting diarrhea with hemorrhage dehydration jaundice and collapse
5 3 **Treatment for Exposure:** EYES flush with water to remove dust INGESTION immediately induce evacuation of intestinal tract by inducing vomiting and giving gastric lavage and saline cathartic see physician at once consider development of arsenic poisoning
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0 5 mg/m
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion:** Data not available
5 7 **Late Toxicity:** May be carcinogenic. Arsenic poisoning may develop
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics.** Data not available
5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate.** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

Pfaltz and Bauer Inc
126-08 Northern Boulevard
Flushing, N Y 11368

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting.** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment handbook CG 446 3)

II

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Poisonous Class B
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm** Solid
13 2 **Molecular Weight:** 866 (approx.)
13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 3 31 at 15°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition.** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on pages 5 and 6

NOTES

ZBO	ZINC BORATE

Common Synonyms	Solid	White	Odorless
	Sinks in water		

[illegible]

Fire	Not flammable
Exposure	[illegible] DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446 4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** (approx.) $2ZnO\ 3B_2O_3\ 3\ 5H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Ingestion can cause gastrointestinal disturbances, convulsions, central nervous depressions, skin eruptions, shock, and death. Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: administer gastric lavage with warm tap water, saline catharsis, consult physician. EYES or SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value):** 10 mg/m³ (as boric oxide)
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion:** Grade 1, LD$_{50}$ 5 15 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Not pertinent

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential:** Zinc accumulates in some organisms but is not considered to be bioconcentrative

9 SELECTED MANUFACTURERS

1 U. S. Borax & Chemical Co.
3075 Wilshire Blvd
Los Angeles, Calif. 90010
2 Humphrey Chemical Corp.
P. O. Box 21
Edgewood Arsenal, Md. 21010
3 American Hoechst Corp.
Chemicals and Plastics Div.
Rt. 202 206 North
Somerville, N. J. 08876

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial grades contain 45 52% zinc oxide, 29 35% boric anhydride
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

II

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid
13 2 **Molecular Weight:** 434.75
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2.7 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution.** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

ZBR	ZINC BROMIDE

Common Synonyms	Solid	White	Odorless
	Sinks and mixes with water		

	[illegible]
Fire	Not flammable
Exposure	[illegible] DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning – water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification.** Not listed
3 3 **Chemical Formula.** $ZnBr_2$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Chemical goggles or face shield, rubber gloves, dust mask
5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract. If large amount is swallowed and not thrown up, drowsiness and other symptoms of bromide poisoning may occur. Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting followed by prompt and complete gastric lavage, catharsis, and demulcens. EYES or SKIN: wash immediately with large volumes of water
5 4 **Toxicity by Inhalation (Threshold Limit Value).** Data not available
5 5 **Short-Term Inhalation Limits** Data not available
5 6 **Toxicity by Ingestion:** Grade 2, LD_{50} 0.5 – 5 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air.** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire**
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard.** Not pertinent
6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD).** None
8 4 **Food Chain Concentration Potential** Zinc accumulates in some organisms but is not considered to be biomagnifying

9 SELECTED MANUFACTURERS

1 American Hoechst Corp
Chemicals and Plastics Div
Rt 202 206 North
Somerville, N J 08876

2 Michigan Chemical Corp
351 E Ohio St
Chicago, Ill 60611

3 Fisher Scientific Co
711 Forbes Ave
Pittsburgh, Pa 15219

10 SHIPPING INFORMATION

10 1 **Grades of Purity:** Technical 98+%
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 ***Code of Federal Regulations.*** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 225.18
13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature.** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 4.22 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

ZCL	ZINC CHLORIDE

Common Synonyms	Solid White solid Odorless Solid sinks and mixes with water
[illegible]	
Fire	Not flammable
Exposure	[illegible] SOLID OR SOLUTION Irritating to skin and eyes If swallowed will cause nausea or vomiting [illegible]
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Issue warning water contaminant
Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** No common synonyms
3 2 **Coast Guard Compatibility Classification:** Not applicable
3 3 **Chemical Formula:** ZnCl
3 4 **IMCO United Nations Numerical Designation.** 8 0 1840

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid
4 2 **Color:** White
4 3 **Odor:** Odorless

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment** Goggles or face shield
5 2 **Symptoms Following Exposure:** Solid or water solution is astringent and can irritate the eyes When ingested can cause intoxication severe irritation of stomach nausea vomiting and diarrhea
5 3 **Treatment for Exposure:** INGESTION give large volumes of water and induce vomiting repeat process call a doctor EYES wash with water for at least 15 min
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 1 mg m (dust)
5 5 **Short-Term Inhalation Limits:** Not pertinent
5 6 **Toxicity by Ingestion.** Grade 3 LD 50 to 500 mg kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Non volatile
5 9 **Liquid or Solid Irritant Characteristics.** Solid irritates skin on prolonged contact
5 10 **Odor Threshold:** Not pertinent

6. FIRE HAZARDS

6 1 **Flash Point.** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire:** Not pertinent
6 7 **Ignition Temperature** Not flammable
6 8 **Electrical Hazard:** Not pertinent
6 9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials.** No reaction
7 3 **Stability During Transport:** Stable
7 4 **Neutralizing Agents for Acids and Caustics.** Not pertinent
7 5 **Polymerization.** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:**
7 2 ppm 96 hr medium bluegill TLm fresh water
28 ppm 48 hr zebrafish TLm salt water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
Industrial Chemicals Division
Morristown N J 07960
2 Gould Marathon Batters Co
Wausau Wis 54402
3 Mallinckrodt Chemical Works
Industrial Chemicals Division
2nd and Mallinckrodt Sts
St Louis Mo 63160

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Reagent USP technical 80% solution in water
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere:** Not required
10 4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Corrosive Material
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 136 28
13 3 **Boiling Point at 1 atm:** Very high
13 4 **Freezing Point:** 541°F = 283°C = 556°K
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 2 91 at 25°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas)** Not pertinent
13 12 **Latent Heat of Vaporization:** Not pertinent
13 13 **Heat of Combustion.** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

continued on pages 5 and 6

NOTES

ZCR	ZINC CHROMATE

Common Synonyms			
Zinc chromate(VI) hydroxide Zinc yellow Buttercup yellow	Solid	Yellow	Odorless
	Sinks in water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4)

Should be removed

Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Buttercup yellow
Zinc chromate(VI) hydroxide, Zinc yellow

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** (approx.)
$4ZnO \cdot K_2O \cdot 4CrO_3 \cdot 3H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** Yellow

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Suitable respirator (for dusts), rubber gloves, chemical goggles or face shield

5 2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract, circulatory collapse, and toxic nephritis. Contact with eyes or skin causes irritation.

5 3 **Treatment for Exposure:** INHALATION: move to fresh air; if exposure has been severe, get medical attention. INGESTION: induce vomiting followed by prompt and complete gastric lavage, catharsis, and demulcents. EYES: flush with water. SKIN: wash thoroughly with soap and water.

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 0.1 mg/m³

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 - 5 g/kg

5 7 **Late Toxicity:** Possible lung cancer

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics.** Data not available

5 10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Not pertinent

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Both chromium and zinc are concentrated by some organisms but are not considered a hazard in a spill situation.

9 SELECTED MANUFACTURERS

1 Mineral Pigments Corp.
7011 Muirkirk Road
Beltsville, Md. 20705

2 Fisher Scientific Co.
711 Forbes Ave.
Pittsburgh, Pa. 15219

3 Pfaltz and Bauer, Inc.
375 Fairfield Ave.
Stamford, Conn. 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 100%

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446 3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 874 (approx.)

13 3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** 3.43 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

ZDP — ZINC DIALKYLDITHIOPHOSPHATE

Common Synonyms
Zinc dialkyldithiophosphate
Zinc dialkylphosphorodithioate

Solid or liquid — Straw yellow to green — Sweet, alcohol like odor

Sinks in water

Fire

Combustible
Irritating gases may be produced when heated

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

LIQUID OR SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning — Water contaminant
Does not dissolve
Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Zinc O,O-di-n-butylphosphorodithioate; Zinc dibutylthiophosphate; Zinc dibutylphosphorodithioate
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $[(RO)_2PSS]_2Zn$ where R = C4H9-
3.4 **IMCO/United Nations Numerical Designation:** 6.1 PG I

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid
4.2 **Color:** Straw yellow to yellow green
4.3 **Odor:** Sweet, alcohol like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, safety glasses or face shield, dust respirator for solid form
5.2 **Symptoms Following Exposure:** All commercially available members of this class have about the same health hazards. Inhalation of dust causes respiratory disorder. Ingestion causes irritation of mouth and stomach. Contact with eyes causes moderate to severe irritation. Contact with skin causes mild irritation
5.3 **Treatment for Exposure:** INHALATION: move from exposure. INGESTION: if large amounts have been ingested, induce vomiting. EYES: flush with clean water for 15 minutes. If irritation persists, consult a physician. SKIN: wash affected areas with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 LD50 5-50 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 300°F C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:**
6.5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur and phosphorus may form in fires
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Data not available
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction at ordinary temperatures
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Zinc accumulates in some organisms but is not considered to be bioconcentrative

9. SELECTED MANUFACTURERS

1. Exxon Corporation
P.O. Box 0166
Cleveland, Ohio 44109
2. Monsanto Company
800 N. Lindbergh Blvd
St. Louis, Mo. 63166

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical 62% on inert filler
10.2 **Storage Temperature:** Below 66°C (150°F)
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

(Liquid) X Y
(Solid) H

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid or liquid
13.2 **Molecular Weight:** 458 (approx.)
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.12–1.26 at 20°C (liquid); 1.6 at 20°C (solid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on page 5 and 6

NOTES

ZFB	ZINC FLUOROBORATE

Common Synonyms			
Zinc fluoborate solution	Liquid	Colorless	Odorless
	Sinks and mixes with water		

Fire	Not flammable
Exposure	LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1 RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Zinc fluoborate solution
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $Zn(BF_4)_2 \cdot H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Liquid
4 2 **Color:** Colorless
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Rubber gloves safety glasses or face shield
5 2 **Symptoms Following Exposure:** Ingestion may cause irritation or corrosion of the alimentary tract Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure:** INGESTION give gastric lavage cathartics and demulcents EYES flush with plents of water get medical attention SKIN flush with plents of water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** Data not available
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion:** Grade 2 LD_{50} 0.5 - 5 g/kg
5 7 **Late Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics:** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6 5 **Special Hazards of Combustion Products.** Not pertinent
6 6 **Behavior in Fire.**
6 7 **Ignition Temperature:** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD):** None
8 4 **Food Chain Concentration Potential** Zinc accumulates in some organisms but is not considered to be bioconcentrative

9 SELECTED MANUFACTURERS

1 Allied Chemical Corp
P O [illegible] 1087R
Morristown N J 07960
2 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Purified 41% solution in water
10 2 **Storage Temperature:** Ambient
10 3 **Inert Atmosphere.** No requirement
10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

A P

12. HAZARD CLASSIFICATION

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Liquid
13 2 **Molecular Weight:** 238.98 (solute only)
13 3 **Boiling Point at 1 atm:** (approx.) 212°F = 100°C = 373°K
13 4 **Freezing Point:** Data not available
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure:** Not pertinent
13 7 **Specific Gravity:** 1.45 at 20°C (liquid)
13 8 **Liquid Surface Tension:** Data not available
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization.** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition:** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

Continued on pages 3 and 5

NOTES

ZNT	ZINC NITRATE

Common Synonyms			
Zinc nitrate hexahydrate	Solid	White	Odorless
	Sinks and mixes with water		

Fire	Not flammable Will increase the intensity of a fire POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Disperse and flush

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Zinc nitrate hexahydrate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $Zn(NO_3)_2 \cdot 6H_2O$

3.4 **IMCO/United Nations Numerical Designation:** NA 1514

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White crystals

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5.2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract. Contact with the eyes causes irritation, which may be delayed. Contact with skin causes irritation.

5.3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: induce vomiting followed by prompt and complete gastric lavage, cathartics and demulcents. EYES: flush with water, consult a physician. SKIN: wash with soap and water.

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 1.7 mg/kg for rats

5.7 **Late Toxicity:** Causes enlarged liver, spleen, and bone marrow in rabbits

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire

6.6 **Behavior in Fire:** May increase intensity of fire when in contact with combustible material

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
[illegible] ppm 3 mo. tadpoles survived but no limb buds in water
[illegible] ppm 48 hr. barnacles [illegible] in salt water

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Zinc is accumulated in some organisms but is not considered to be biomagnifying

9 SELECTED MANUFACTURERS

1. The Harshaw Chemical Co.
[illegible] E. 97 St.
Cleveland, Ohio 44106
2. J. T. Baker Chemical Co.
Phillipsburg, N. J. 08865
3. Mallinckrodt Chemical Works
2nd and Mallinckrodt Streets
St. Louis, Mo. 63160

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

NS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations.** Solid oxidizing material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	[illegible]
Flammability (Red)	0
Reactivity (Yellow)	0
	OXY

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** [illegible]°F = [illegible]°C = [illegible]°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

ZPS	ZINC PHENOLSULFONATE

Other Synonyms Zinc p-phenolsulfonate Zinc sulfocarbolate Zinc sulfophenate Zinc phenolsulfonate octahydrate	Solid White Odorless Sinks and mixes with water
[illegible]	
Fire	Not flammable Irritating gases may be produced when heated.
Exposure	[illegible] DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing. [illegible] SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes [illegible]

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG 446-4

Issue warning - water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** p-Hydroxybenzenesulfonic acid zinc salt Zinc p-phenolsulfonate Zinc phenolsulfonate octahydrate Zinc sulfocarbolate Zinc sulfophenate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:** $(C_6H_4OCH_3SO_3)_2Zn \cdot 8H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped):** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask goggles or face shield protective gloves

5 2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat Ingestion of large doses has erratic and adverse effects can cause irritation or corrosion of the alimentary tract Contact with eyes causes irritation Contact with skin causes mild irritation

5 3 **Treatment for Exposure:** INHALATION move to fresh air INGESTION If large amounts have been swallowed induce vomiting followed by prompt administration of gastric lavage or laxatives and demulcents EYES or SKIN flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5 5 **Short-Term Inhalation Limits:** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 LD50 0.5 - 5 g/kg

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics:** Data not available

5 9 **Liquid or Solid Irritant Characteristics:** Data not available

5 10 **Odor Threshold:** Odorless

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6 5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur may form in fire

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard:** Not pertinent

6 9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials:**

7 3 **Stability During Transport:** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization:** Not pertinent

7 6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD)** Data not available

8 4 **Food Chain Concentration Potential:** Zinc is accumulated by some organisms Not is not considered to be bioaccumulative

9. SELECTED MANUFACTURERS

1 Allied Chemical Corp
Specialty Chemicals Div
P O Box 2057R
Morristown N J 07960

2 Mallinckrodt Chemical Works
2nd and Mallinckrodt Streets
St Louis Mo 63160

3 Pfizer Inc, Bauer Inc
235 E 42 Field Ave
Stamford Conn 06902

10. SHIPPING INFORMATION

10 1 **Grades or Purity:** Pattined

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere:** No requirement

10 4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3

NN

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** None

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm.** Solid

13 2 **Molecular Weight:** 455.5

13 3 **Boiling Point at 1 atm:** (decomposes) 248°F = 120°C = 393°K

13 4 **Freezing Point:** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** > 1 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization:** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

Continued on page 2 and 3

NOTES

ZPP	ZINC PHOSPHIDE

Common Synonyms

Solid — Grey to black — Faint odor

Sinks in water

Fire

Not flammable
Irritating gases may be produced when heated

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause dizziness, difficult breathing, or loss of consciousness

SOLID
POISONOUS IF SWALLOWED
Irritating to skin and eyes
If swallowed will cause dizziness, nausea, vomiting or loss of consciousness

Water Pollution

Toxic at low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook, CG 446-4

Isolate material, prevent water contamination
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

3 CHEMICAL DESIGNATIONS

3.1 **Synonyms:** No common synonyms
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** Zn_3P_2
3.4 **IMCO/United Nations Numerical Designation:** [illegible]

4 OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid
4.2 **Color:** Grey to gray black
4.3 **Odor:** Faint phosphorous

5 HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask or self-contained breathing apparatus, goggles, face shield, protective gloves
5.2 **Symptoms Following Exposure:** When inhaled or ingested, compound releases phosphine which causes faintness, weakness, nausea, vomiting, dizziness, false blood pressure, change in pulse rate, diarrhea, intense thirst, convulsions, paralysis, and coma. Contact with eyes or skin causes irritation
5.3 **Treatment for Exposure:** INHALATION: move to fresh air, give artificial respiration if required, get medical attention for phosphine poisoning. INGESTION: give one tablespoonful of mustard in a glass of warm water, repeat until vomit fluid is clear, avoid use of alcohol, call a physician immediately, have patient lie down and keep warm. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water
5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 4, oral LD_{50} = [illegible] mg/kg rat
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Use water [illegible] chemical on adjacent fires
6.4 **Fire Extinguishing Agents Not to be Used:** Avoid use of halogenated agents, carbon dioxide, or halogenated agents, which release phosphine at low and spontaneous flammable gas
6.5 **Special Hazards of Combustion Products:** Irritating oxides of phosphorus may be formed at fires
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts slowly with water, more rapidly with dilute acid to form phosphine gas, which is toxic and spontaneously flammable
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable unless exposed to moisture, forms phosphine gas, may then be released and collect in closed spaces
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** [illegible]
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Zinc is accumulated by some organisms but is not considered to be bioaccumulative

9 SELECTED MANUFACTURERS

[illegible] Chemical Corp
Industrial Chemicals Div
Niagara Falls, N.Y. [illegible]

2. American [illegible] Corp
Chemicals and Plastics Div
Rt 202, 206 North
Somerville, N.J. [illegible]

Fisher Scientific Co
711 Forbes Ave
Pittsburgh, Pa. [illegible]

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical [illegible]
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Not required
10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

II

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous solid, Class B
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** [illegible]
13.3 **Boiling Point at 1 atm:** [illegible] °C [illegible] K
13.4 **Freezing Point:** Undetermined [illegible] °C [illegible] K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** [illegible] (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** [illegible]
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

ZSI	ZINC SILICOFLUORIDE

Common Synonyms Zinc hexafluorosilicate Zinc fluosilicate Zinc silicofluoride hexahydrate	Solid — White — Odorless Sinks and mixes with water
Fire	Not Combustible Irritating gases may be produced when heated
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

See Response Methods Handbook CG-446-4

Issue warning - water contaminant
Dispersal Dust

2. LABELS

No hazard label required by Coast Guard
Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Zinc fluosilicate, Zinc hexafluorosilicate, Zinc silicofluoride hexahydrate

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $ZnSiF_6 \cdot 6H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** White, transparent

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust respirator, chemical goggles or face shield, neoprene gloves

5.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat causing sneezing, nasal discharge, and other symptoms. Inhalation causes severe pulmonary inflammation. Ingestion causes nausea, vomiting, severe abdominal cramps, and other symptoms. Prolonged or repeated contact with eyes or skin causes irritation or redness may develop

5.3 **Treatment for Exposure:** INHALATION: [illegible] INGESTION: [illegible] giving water or milk and induce vomiting. Have patient drink large quantities of water, if necessary give stimulant such as strong coffee. EYES: flush with water, call physician if necessary. SKIN: wash with soap and water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** [illegible]

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** [illegible] LD [illegible] strong agent

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not pertinent

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Fumes and [illegible] hydrogen fluoride and [illegible] may be produced

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Zinc is accumulated by some organisms but is not considered to be biomagnifying [illegible]

9. SELECTED MANUFACTURERS

W. R. Grace & Co.
Agricultural Chemicals Group
Baltimore, Md. [illegible]

2. Agrico Chemical
P.O. Box [illegible]
Pierce/Polk Counties, Fla. [illegible]

3. American Hoechst Corp.
Chemicals and Plastics Div.
Rt. 202, Six North
Somerville, N.J. [illegible]

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical [illegible]

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG-446-3

NN

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Decomposes [illegible]

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.10 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

Continued on page [illegible]

NOTES

ZSF	ZINC SULFATE

Common Synonyms			
White vitriol Zinc vitriol Zinc sulfate heptahydrate	Solid	White	Odorless
	Sinks and mixes with water		

Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** White vitriol, Zinc vitriol, Zinc sulfate heptahydrate, Zinc vitriol

3.2 **Coast Guard Compatibility Classification:** Not listed

3.3 **Chemical Formula:** $ZnSO_4 \cdot 7H_2O$

3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid

4.2 **Color:** Colorless

4.3 **Odor:** None

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective clothing

5.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract. Contact with eyes or skin causes irritation

5.3 **Treatment for Exposure:** INHALATION: move victim to air. INGESTION: induce vomiting followed by prompt and complete gastric lavage, cathartics and demulcents. EYE or SKIN: flush with water

5.4 **Toxicity by Inhalation (Threshold Limit Value):** Data not available

5.5 **Short-Term Inhalation Limits:** Data not available

5.6 **Toxicity by Ingestion:** Grade 2 LD50: [illegible] mg/kg

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Data not available

5.9 **Liquid or Solid Irritant Characteristics:** Data not available

5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:**

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Not reactive

7.2 **Reactivity with Common Materials:**

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
0.1 mg Zn/L/96 hr stickleback (ethal *
4.6 ppm/96 hr rainbow trout 14 [illegible] fresh water
*Water type not specified

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Zinc is accumulated by some organisms but is not considered to be bioaccumulative

9. SELECTED MANUFACTURERS

1. Chemetal and Pigment Co
[illegible]
Pomona, Calif 91769

2. Eagle Picher Industries, Inc
Agricultural Chemicals Division
P.O. Box [illegible]
Galena, Kansas [illegible]

3. J. T. Baker Chemical Co
Phillipsburg, N.J. 08865

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Reagent, Technical

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

XX

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** [illegible]

13.3 **Boiling Point at 1 atm:** Not pertinent, decomposes

13.4 **Freezing Point:** Decomposes [illegible] K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** [illegible] g/cm³ (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

ZCA — ZIRCONIUM ACETATE

Common Synonyms	Liquid	White	Weak vinegar odor
	Sinks and mixes with water		

Avoid contact with liquid. Keep people away.
Stop discharge if possible.
Isolate hazard area and deny entry.
Notify authorities if liquid enters sewers or public waterways.

Fire	Not flammable
Exposure	CALL FOR MEDICAL AID **LIQUID** **Irritating to skin and eyes** **Harmful if swallowed** Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids apart. Flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: Give several glasses of water to drink. IF SWALLOWED and victim is NOT CONSCIOUS OR HAVING CONVULSIONS: Do nothing except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify authorities if liquid enters sewers or public waterways.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3.1 **Synonyms:** Zirconium acetate solution
3.2 **Coast Guard Compatibility Classification:** Not listed
3.3 **Chemical Formula:** $Zr(C_2H_3O_2)_4 \cdot H_2O$
3.4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Weak vinegar

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Rubber gloves, chemical goggles or face shield
5.2 **Symptoms Following Exposure:** Has only a mild pharmacologic reaction. Contact with eyes or skin may cause irritation.
5.3 **Treatment for Exposure:** INGESTION: give large amount of water. EYES: flush with water for at least 15 min; consult a physician if irritation persists. SKIN: flush with water.
5.4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m³ (as Zirconium)
5.5 **Short-Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2 (LD_{50} 0.5 - 5 g/kg rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1. The Harshaw Chemical Co
   1945 E. 97 St.
   Cleveland, Ohio 44106
2. Gallard-Schlesinger Chemical Mfg. Co
   584 Mineola Ave.
   Carle Place, N.Y. 11514
3. Pfaltz and Bauer, Inc.
   375 Fairfield Ave.
   Stamford, Conn. 06902

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 25% solution in water
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A P

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 327 (solute only)
13.3 **Boiling Point at 1 atm:** Not pertinent
13.4 **Freezing Point:** Not pertinent
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 1.37 at 20°C (liquid)
13.8 **Liquid Surface Tension:** Data not available
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

Continued on next page

NOTES

ZIR — ZIRCONIUM NITRATE

Common Synonyms
Zirconium nitrate pentahydrate

Solid | White | Odorless

Sinks and mixes with water

Fire

Not flammable
Will increase the intensity of a fire
POISONOUS GASES MAY BE PRODUCED IN FIRE

Exposure

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if it enters water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning. Water contaminant
Disperse and flush

2 LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Zirconium nitrate pentahydrate
3 2 **Coast Guard Compatibility Classification:** Not listed
3 3 **Chemical Formula:** $Zr(NO_3)_4 \cdot 5H_2O$
3 4 **IMCO/United Nations Numerical Designation** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid
4 2 **Color:** White
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves
5 2 **Symptoms Following Exposure:** Has only a mild pharmacological action. Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation
5 3 **Treatment for Exposure.** INHALATION: move to fresh air. INGESTION: give large amount of water. EYES or SKIN: flush with water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** [illegible] (as zirconium)
5 5 **Short-Term Inhalation Limits:** Data not available
5 6 **Toxicity by Ingestion** Grade 2, oral LD_{50} = 2.5 g/kg (rat)
5 7 **Lute Toxicity:** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics:** Data not available
5 10 **Odor Threshold** Data not available

6 FIRE HAZARDS

6 1 **Flash Point** Not flammable but may intensify fire
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents:** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6 5 **Special Hazards of Combustion Products.** Toxic oxides of nitrogen may form in fire
6 6 **Behavior in Fire.** May increase intensity of fire when in contact with combustible materials
6 7 **Ignition Temperature.** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** Dissolves to give an acid solution
7 2 **Reactivity with Common Materials** Will corrode most metals
7 3 **Stability During Transport.** Stable
7 4 **Neutralizing Agents for Acids and Caustics** Flush with water
7 5 **Polymerization:** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:** Data not available
8 2 **Waterfowl Toxicity** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential** Data not available

9 SELECTED MANUFACTURERS

1 Vanderbilt Chemical Co
666 South Front Street
Elizabeth, N J 07202
2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514
3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford, Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Commercial 99+%
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12 HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations:** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight:** 429.3
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point:** Not pertinent
13 5 **Critical Temperature:** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** 2.1 at 20°C (solid)
13 8 **Liquid Surface Tension** Not pertinent
13 9 **Liquid-Water Interfacial Tension** Not pertinent
13 10 **Vapor (Gas) Specific Gravity:** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization.** Not pertinent

Continued on next page

NOTES

ZCO — ZIRCONIUM OXYCHLORIDE

Common Synonyms
Zirconyl chloride
Basic zirconium chloride
Zirconium oxychloride hydrate
Zirconium oxide chloride

Solid — White to yellow — Odorless

Sinks and mixes with water

[illegible]
Stop discharge if possible
[illegible]
Not [illegible] available on pollution [illegible]

Fire

Not flammable

Exposure

[illegible]

DUST
Irritating to eyes, nose and throat
If inhaled will cause coughing or difficult breathing
[illegible]

SOLID
Irritating to skin and eyes
If swallowed will cause nausea and vomiting
[illegible]

Water Pollution

Effect of low concentrations on aquatic life is unknown
May be dangerous if enters water intakes
[illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning — water contamination
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3 CHEMICAL DESIGNATIONS

3 1 **Synonyms:** Basic zirconium chloride, Zirconium oxide chloride, Zirconium oxychloride hydrate, Zirconyl chloride
3 2 **Coast Guard Compatibility Classification** Not listed
3 3 **Chemical Formula.** $ZrOCl_2 \cdot 8H_2O$
3 4 **IMCO/United Nations Numerical Designation:** Not listed

4. OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped).** Solid
4 2 **Color:** Yellow to white
4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Safety glasses or face shield, protective gloves, dust mask
5 2 **Symptoms Following Exposure:** Has only a mild pharmacological action. Inhalation of dust may irritate nose and throat. Contact with eyes or skin cause irritation
5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water. EYES or SKIN: flash with water
5 4 **Toxicity by Inhalation (Threshold Limit Value)** 5 mg/m³ (as zirconium)
5 5 **Short-Term Inhalation Limits.** Data not available
5 6 **Toxicity by Ingestion** Grade 2 oral LD_{50} = 1.5 g/kg (rat)
5 7 **Late Toxicity** Data not available
5 8 **Vapor (Gas) Irritant Characteristics** Data not available
5 9 **Liquid or Solid Irritant Characteristics** Data not available
5 10 **Odor Threshold** Data not available

6. FIRE HAZARDS

6 1 **Flash Point** Not flammable
6 2 **Flammable Limits in Air:** Not flammable
6 3 **Fire Extinguishing Agents.** Not pertinent
6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent
6 5 **Special Hazards of Combustion Products:** Not pertinent
6 6 **Behavior in Fire.**
6 7 **Ignition Temperature** Not pertinent
6 8 **Electrical Hazard** Not pertinent
6 9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction
7 2 **Reactivity with Common Materials:**
7 3 **Stability During Transport** Stable
7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7 5 **Polymerization** Not pertinent
7 6 **Inhibitor of Polymerization** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
240 ppm/96 hr/fathead minnow/TLm hard water
18 ppm/96 hr/fathead minnow/TLm soft water
8 2 **Waterfowl Toxicity:** Data not available
8 3 **Biological Oxygen Demand (BOD)** None
8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 SI Industries Inc
FAM Division
4511 Hyde Park Blvd
Niagara Falls, N Y 14305
2 Ventron Inc
P O Box 159
Beverly, Mass 01915
3 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical, Pure
10 2 **Storage Temperature.** Ambient
10 3 **Inert Atmosphere:** No requirement
10 4 **Venting** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed
12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12 3 **NFPA Hazard Classifications.** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid
13 2 **Molecular Weight.** 322.3
13 3 **Boiling Point at 1 atm.** Not pertinent (decomposes)
13 4 **Freezing Point** Not pertinent
13 5 **Critical Temperature** Not pertinent
13 6 **Critical Pressure.** Not pertinent
13 7 **Specific Gravity:** >1 at 20°C (solid)
13 8 **Liquid Surface Tension:** Not pertinent
13 9 **Liquid-Water Interfacial Tension:** Not pertinent
13 10 **Vapor (Gas) Specific Gravity.** Not pertinent
13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13 12 **Latent Heat of Vaporization** Not pertinent
13 13 **Heat of Combustion:** Not pertinent
13 14 **Heat of Decomposition** Not pertinent
13 15 **Heat of Solution:** Not pertinent
13 16 **Heat of Polymerization:** Not pertinent

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NOTES

ZCS — ZIRCONIUM SULFATE

Common Synonyms			
Disulfatozirconic acid Zirconium sulfate tetrahydrate	Solid	White	Odorless
	Sinks and mixes with water		

Avoid contact with solid and dust. Keep away from water.
Stop leak if safe to do so.
Isolate and remove leaking container.
[illegible]

Fire	Not flammable
Exposure	ALL FOR MEDICAL AID **DUST** Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing [illegible] quantity of water [illegible] **SOLID** Irritating to skin and eyes If swallowed will cause nausea and vomiting Remove [illegible] solid [illegible] water IF EYES: [illegible] water IF SWALLOWED: [illegible] INSTRUCTIONS [illegible] IF SWALLOWED: [illegible] CONSCIOUS OR HAVING CONVULSIONS [illegible]
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous to water intakes [illegible]

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook CG 446-4)

Issue warning: water contaminant
Disperse and flush

2. LABELS

No hazard label required by Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

3 1 **Synonyms.** Disulfatozirconic acid
Zirconium sulfate tetrahydrate

3 2 **Coast Guard Compatibility Classification:** Not listed

3 3 **Chemical Formula:**
$Zr(SO_4)_2 \cdot 4H_2O$

3 4 **IMCO/United Nations Numerical Designation:** Not listed

4 OBSERVABLE CHARACTERISTICS

4 1 **Physical State (as shipped)** Solid

4 2 **Color:** White

4 3 **Odor:** None

5 HEALTH HAZARDS

5 1 **Personal Protective Equipment:** Dust mask, goggles or face shield, protective gloves

5 2 **Symptoms Following Exposure:** Has only a mild pharmacological action. Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation

5 3 **Treatment for Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water. EYES or SKIN: flush with water

5 4 **Toxicity by Inhalation (Threshold Limit Value):** 5 mg/m³ (as zirconium)

5 5 **Short-Term Inhalation Limits.** Data not available

5 6 **Toxicity by Ingestion:** Grade 2 oral LD_{50} = 3.5 g/kg (rat)

5 7 **Late Toxicity:** Data not available

5 8 **Vapor (Gas) Irritant Characteristics.** Data not available

5 9 **Liquid or Solid Irritant Characteristics** Data not available

5 10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

6 1 **Flash Point:** Not flammable

6 2 **Flammable Limits in Air:** Not flammable

6 3 **Fire Extinguishing Agents:** Not pertinent

6 4 **Fire Extinguishing Agents Not to be Used.** Not pertinent

6 5 **Special Hazards of Combustion Products** Not pertinent

6 6 **Behavior in Fire:**

6 7 **Ignition Temperature:** Not pertinent

6 8 **Electrical Hazard.** Not pertinent

6 9 **Burning Rate** Not pertinent

7 CHEMICAL REACTIVITY

7 1 **Reactivity with Water:** No reaction

7 2 **Reactivity with Common Materials.**

7 3 **Stability During Transport** Stable

7 4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7 5 **Polymerization.** Not pertinent

7 6 **Inhibitor of Polymerization.** Not pertinent

8 WATER POLLUTION

8 1 **Aquatic Toxicity:**
14 ppm as Zr/96 hr fathead minnow/TLm soft water
145 ppm/96 hr fathead minnow TLm hard water

8 2 **Waterfowl Toxicity:** Data not available

8 3 **Biological Oxygen Demand (BOD):** None

8 4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1 Vanderbilt Chemical Co
666 South Front Street
Elizabeth, N J 07202

2 Gallard-Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place, N Y 11514

3 Pfaltz and Bauer Inc
375 Fairfield Ave
Stamford, Conn 06902

10 SHIPPING INFORMATION

10 1 **Grades or Purity:** Technical

10 2 **Storage Temperature:** Ambient

10 3 **Inert Atmosphere** No requirement

10 4 **Venting** Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12 1 **Code of Federal Regulations.** Not listed

12 2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12 3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13 1 **Physical State at 15°C and 1 atm:** Solid

13 2 **Molecular Weight:** 355.4

13 3 **Boiling Point at 1 atm** Not pertinent (decomposes)

13 4 **Freezing Point** Not pertinent

13 5 **Critical Temperature:** Not pertinent

13 6 **Critical Pressure:** Not pertinent

13 7 **Specific Gravity:** (approx) 3.0 at 20°C (solid)

13 8 **Liquid Surface Tension:** Not pertinent

13 9 **Liquid-Water Interfacial Tension:** Not pertinent

13 10 **Vapor (Gas) Specific Gravity:** Not pertinent

13 11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13 12 **Latent Heat of Vaporization.** Not pertinent

13 13 **Heat of Combustion:** Not pertinent

13 14 **Heat of Decomposition:** Not pertinent

13 15 **Heat of Solution:** Not pertinent

13 16 **Heat of Polymerization:** Not pertinent

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NOTES

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COMMANDANT INSTRUCTION M 16465.12

LIST OF EFFECTIVE PAGES

SUBJECT MATTER	PAGE NUMBERS	CHANGE IN EFFECT
Title Page	i (reverse blank)	original (Oct 78)
COMDTINST M 16465.12	iii (reverse blank)	original
Record of changes	v (reverse blank)	original
Table of Contents	vii to viii	original
1. Introduction	1-1 (reverse blank)	original
2. Components of CHRIS	2-1 to 2-2	original
3. Explanation of terms	3-1 to 3-19 (reverse blank)	original
4. Other Information systems	4-1 to 4-5 (reverse blank)	original
5. Conversion Factors	5-1 to 5-4	original
6. Selected Properties	6-1 to 6-4	original
7. Guide to Compatibility	7-1 to 7-17 (reverse blank)	original
8. Index of Synonyms	8-1 to 8-54	original
9. Index of Codes	9-1 to 9-14	original
10. Data sources	10-1 to 10-6	original
11. Chemical specific Information	11-1 (reverse blank) 11-3 to 11-903	original original