



W r i t i n g
S h i p y a r d R e p o r t s

J.C. Mathes and Dwight W. Stevenson

Program in Technical Communication
The College of Engineering
The University of Michigan

and

The University of Michigan
Transportation Research Institute
Marine Systems Division



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J.C. Mathes, Ph.D., Project Director
Program in Technical Communication
College of Engineering
The University of Michigan

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Designed by
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Table of Contents

List of Text Tables and Figures	v
Preface	vii

Text

1. Overview of the Report Writing Process	1
2. Understanding the Function of Shipyard Reports	11
3. Establishing the Basic Report Structure	23
4. Preparing the Summary	39
5. Selecting Information for the Discussion	57
6. Organizing the Discussion	71
7. Designing and Revising Paragraphs	89
8. Writing and Editing Sentences	101
9. Using Visual Aids and Formatting Devices	119

Reference Section

A. Checklists	135
B. Report Writing Guidelines and Sample Reports	149
Index	181

List of Tables and Figures

Tables

Table 1.	Types of Shipyard Reports	12
Table 2.	Three Types of Report Audiences	24
Table 3.	Complex Audience for a Report to NAVSEA	26
Table 4.	Parts of the Summary	40
Table 5.	Unclear Subject Lines	45
Table 6.	Clear Subject Lines	45
Table 7.	Statements of the Organizational Problem	48
Table 8.	Statements of the Technical Investigation	50
Table 9.	Statements of the Communication Purpose	51

Figures

Figure 1.	The Report Writing Process	3
Figure 2.	Sample Decision Making Report	14
Figure 3.	Sample Implementation Report	16
Figure 4.	Sample Minutes of a Meeting	20
Figure 5.	The Three Basic Components of a Technical Report	28
Figure 6.	Sample Recommendation Report Illustrating Use of a summary	30
Figure 7.	Sample Report Without a Summary: Negative Example	33
Figure 8.	Sample Report With Basic Structure That Moves From General to Specific	37

Figure 9.	Sample Letter to SupShips Illustrating the Heading Format	41
Figure 10.	The Organizational Problem Solving Process Provides the Three Elements of the Purpose Statement	49
Figure 11.	Report Summary Focusing on Conclusions Rather Than Detail	54
Figure 12.	Sample Report Limited to Essential Information	55
Figure 13.	Sample Implementation Report Containing Selective Detail	61
Figure 14.	Sample Status Report Focusing on Information	64
Figure 15.	Sample Procedures With Cover Memo	67
Figure 16.	Problem and Solution Pattern Outline	74
Figure 17.	Sample Implementation Report Using a Problem and Solution Pattern	76
Figure 18.	Persuasion Pattern Outline	77
Figure 19.	Analysis Pattern Outline	80
Figure 20.	Sample Implementation Report Illustrating the Analysis Pattern	82
Figure 21.	Process Pattern Outline	84
Figure 22.	Guidelines for Editing Paragraphs	92
Figure 23.	Sample Report Using Format Cues Rather Than Prose	122
Figure 24.	Sample Report Using Headings to Signal Content	124
Figure 25.	Sample Report On a Standard Form	128
Figure 26.	Sample Report In a Standard Format	129

P r e f a c e

Written communication is extremely important in increasing shipyard productivity. However, written communication also reduces productivity because reports take time to write and to read. Therefore, if reports can be written and read more efficiently, shipyard productivity can be increased.

Writing Shipyard Reports is intended to help shipyard managers, engineers, and other professionals to write more efficiently and to prepare reports that can be read more efficiently. The manual is divided into two sections, which serve two functions. The first section is a text for use with an in-house course in report writing. It also can refresh you about certain aspects of report writing. The second section is reference information for you to use when writing reports. It consists of checklists, guidelines, and sample reports. The two sections of Writing Shipyard Reports complement each other—the text explains the guidelines in the reference section.

There are, of course, many texts and references on technical writing. The advantage of Writing Shipyard Reports is that it discusses writing reports in shipyard terms. The guidelines, samples, and examples are from shipyard materials, not from many different industries and businesses. Furthermore, Writing Shipyard Reports addresses the concerns expressed by managers, engineers, and other professionals in shipyards during extensive interviews. Based on these interviews, this manual adapts generic report writing guidelines specifically to shipyard practices. Writing Shipyard Reports presents guidelines not available in other report writing texts.

We are indebted to managers, engineers, and others in U.S. shipyards

for their assistance in this project. We especially are indebted to those who took the time to be interviewed extensively. We are also grateful to people at NAVSEA in Washington, D. C., and several Supervisor of Shipbuilding offices at the yards visited.

We personally express our appreciation to the yards that participated in this project:

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Ingalls Shipbuilding
National Steel and Shipbuilding Company
Todd Pacific Shipyards Corporation (Los Angeles Division)

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For the most part *Writing Shipyard Reports* represents the suggestions and contributions of the shipyard industry itself. We hope these guidelines will help improve written communication practices in the yards and thereby increase shipyard productivity.

J.C. Mathes and Dwight W. Stevenson
Program in Technical Communication
College of Engineering
The University of Michigan



TEXT



1

Overview of the Report Writing Process

Although writing reports is time consuming, effective reports contribute to the efficiency of the ship construction process. Reports advance and complete the activities and stages of the design and construction process. For most managers, engineers, and other professionals, a primary function of their job is to write reports. If they do so effectively, they increase the productivity of the shipyard the decision and approval cycle is shortened, information is provided so that schedules are met, and resources are allocated appropriately.

To be effective, reports must contain the necessary information, be clearly written, and be received by the appropriate persons on time. This text presents guidelines to help you write effective reports efficiently. These guidelines should be especially useful for beginning professionals. One shipyard manager said “New engineers do not know what is expected of them and do not know what good writing is.” Although specific report writing practices vary depending on how a shipyard is organized, some basic principles of effective report writing apply to all yards. Based on these principles and illustrative shipyard practices, this manual presents guidelines that you can adapt to the report writing needs of any particular department or yard.

The report-writing process is based on the function of written communication in the department and shipyard. You write a report to introduce the results of your technical activities into the organization. Writing a report is

analogous to designing and constructing a product. The report is a product which is the result of activities that you can do systematically.

The report-writing process can be divided into two stages: (1) designing the report in terms of its function and then, (2) writing and editing the report (Figure 1). Writing a report is much easier if you clarify the purpose of the report and make design decisions before actually putting words on the paper or screen. In general, you can write more efficiently if you divide the process into these two stages rather than try to design, write, and edit a report simultaneously.

The discussion of the report-writing process that follows introduces the report-writing principles explained and illustrated in subsequent chapters. You should adapt this procedure to your own report writing.

1. Designing the Report

In this stage, you design the basic architecture of your report. You look at your readers' needs, not at your own work, to decide what the report should say. When you finish designing the basic architecture and know approximately what the report should say, you can write the paragraphs and sentences.

Designing the report consists of four steps which you should perform as deliberately as possible:

1. Define Your Communication Purpose
 2. Identify Your Readers
 3. Select Only Relevant Information
 4. Organize the Information Appropriately
-
-

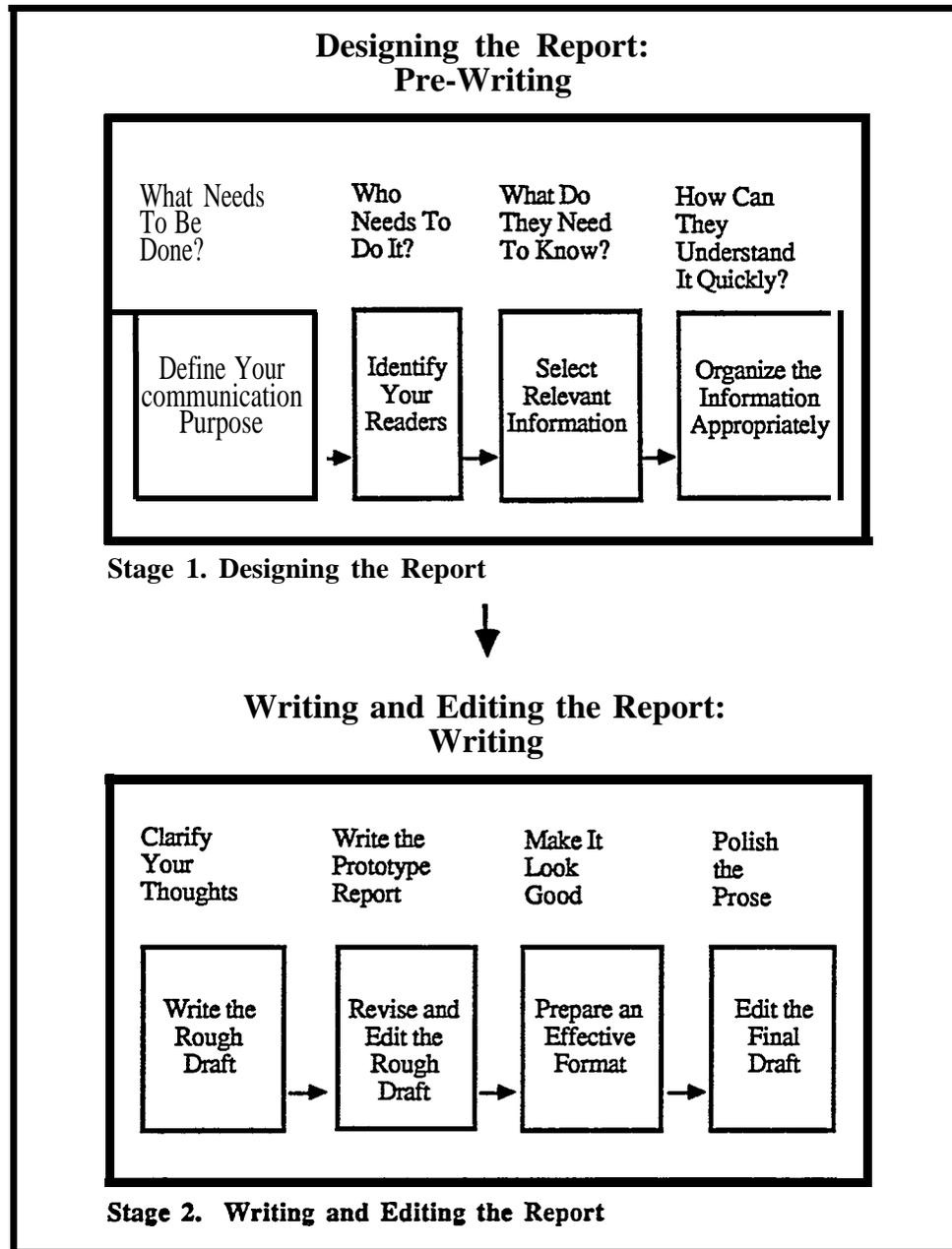


Figure 1. The Report Writing Process.

1.1. Define Your Communication Purpose

A report enables you and your department to interact with others in the shipyard to get something done or to provide information needed for operations to continue. The report should provide the information others need to perform a task or to change what is happening or is going to happen.

The report is a tool. You aren't writing about what you have done. Your purpose is to initiate or affect activities in the yard.

1.2. Identify Your Readers

In a shipyard, a report that leaves the writer's department has several—and usually many—readers. For a report to be effective, it must meet the needs of different readers.

First, identify your readers according to the purpose of your report. Given the actions that should occur when you issue your report, you identify the various persons who will act or be affected by those actions. Then characterize those readers by asking yourself questions such as, "What do they know about the technical content of the report?" and "What do they do on the job with regard to the purpose of your report?"

1.3. Select Only Relevant Information

Although you usually have considerable technical detail at hand to put into the report, include only the information that is absolutely necessary. You must determine what information your readers need. Present only what they need, not all that you know. To select the relevant information for a report, then, you must determine the purpose and readers of your report.

1.4. Organize the Information Appropriately

Organizing the information in a report is as important as selecting the information to include. Even well-selected information can be difficult to read if the main points aren't outlined appropriately. Usually, you can arrange the information according to the purpose of the report.

Organizing the information is a two-step procedure. First, establish the basic outline of your report; then sort and organize the information accordingly.

2. Writing and Editing the Report

When you have designed your report, in your mind or with an outline on paper or screen, you are ready to transform your design into words-to write paragraphs and sentences. To write the report efficiently, write it by parts and in at least three drafts.

Writing and editing the report consists of four steps:

1. Write the Rough Draft
2. Revise and Edit the Rough Draft
3. Prepare an Effective Format
4. Edit the Final Draft

Although you consider some of these aspects of the report when you design the basic architecture, most are matters of writing and editing.

2.1. Write the Rough Draft

For most report writers, the first or rough draft of a report is a process of thinking, not writing. They start their first draft with an idea of where the

report is going, but not a clear idea. As they write, what they're trying to say becomes clearer. When they finish the draft, they finally know what they are trying to communicate. Writers often end where they should begin.

To write the rough draft requires you to flesh out your basic design. If you have designed your report effectively, you should be able to generate prose that is functional and keeps to the point rather than digresses. In each section of the report, you should know what you are going to say and what information is needed to say it. Therefore, to write the rough draft, you should write with your purpose and audiences clearly in mind. Put the words on paper to implement or specify your basic design. At this step, don't worry about your style.

2.2. Revise and Edit the Rough Draft

Effective writers often spend as much time revising and editing the rough draft of a report as they do in writing it. When you revise and edit your rough draft, you revise the basic design and clarify the intermediate structures in the report.

Revising and editing the rough draft involves five activities, although different writers go about these activities in different sequences. To revise your rough draft, you need to clarify the purpose, revise the summary, delete unnecessary detail, rearrange the discussion, and create subordinate structures.

Clarify the Purpose. After you finish the rough draft, you can clarify the purpose of the report. When you write the rough draft, even after taking time to design the report, you might look forward to writing about the technical details rather than thinking about the impact you want the report to have.

To make the purpose of the report clear to the reader, you usually need

to revise the opening paragraph to be direct and concise. The opening paragraph in the rough draft often becomes overwritten because you haven't written the discussion yet. In revision, you need to eliminate detail from the opening paragraph or move detail to the beginning of the discussion.

Revise the Summary. Effective reports summarize the important information up front in the report. However, writers usually summarize ineffectively when writing the rough draft. When you write the summary before writing the discussion or analysis—the body of the report—you include too much analysis and too many results. That is, the summary in a rough draft often discusses conclusions rather than presents conclusions directly and precisely.

Revising the summary requires you to delete the subordinate results and explanations to focus on the primary conclusions and the most important results. The function of the discussion that follows the summary is to explain and document those conclusions and results.

Delete Unnecessary Detail. In general, you can eliminate thirty to fifty percent of the material in the discussion section of your rough draft. You can delete some of this text; you can move the rest to attachments.

The rough draft usually contains excessive detail because the writer becomes concerned with the technical material rather than the purpose of the report. This leads to the introduction of detail that is unnecessary for most readers. In revising, you need to delete unnecessary detail and to put subordinate detail of interest to only a few readers in attachments or appendices.

Rearrange the Discussion. Even after you spend time on your basic report design and have finished the rough draft, you often realize that the initial arrangement of the detail in the discussion is inefficient. When you delete some—or even considerable—detail, the skeletal structure becomes more apparent and can appear inappropriate.

To rearrange the discussion, you usually need to move blocks of text and then to rewrite introductions and transitions between the blocks to tie them together. At times, you can retain the original arrangement but have to write introductions and transitions omitted in the rough draft.

Establish Subordinate Structures. You usually have to establish subordinate structures when you revise the rough draft. First drafts of reports often mix main points and secondary points indiscriminately. When you revise the rough draft, you should clarify the hierarchical relationships among your points. That is, impose a two-level outline on them and make it apparent to the reader.

2.3. Prepare an Effective Format

Rough drafts of reports invariably have incomplete or ineffective formatting. Effective formatting—the use of headings, numbering, and layout devices—complements the design of a report and makes it easier to read. Although you should try to establish a standard format when you write your rough draft, you should reassess your format when you revise the rough draft.

Preparing an appropriate format requires attention to both consistency and effectiveness. When you prepare your rough draft, you usually introduce inconsistencies in the headings or numberings. You need to review your rough draft to make sure that your headings, subheadings, and numbering as well as the spacing and other format devices are consistent.

To format the report, you also need to reassess the effectiveness of those devices. White space and margins should enhance readability. The spacing between paragraphs and units should clarify the arrangement of the report, while headings and subheadings or numbering should clarify the relationships among its parts.

2.4. Edit the Final Draft

When all of the parts are in place, you are ready to edit and polish your report. Even experienced report writers have difficulty writing effective paragraphs and sentences in their rough drafts, especially as they struggle to put their ideas into words and onto paper. You usually can edit your report to make the paragraphs and sentences effective only after you first revise it at the larger levels—groups of paragraphs, sections, and the basic architecture as a whole.

Editing is a skill that requires attention as well as practice. Even an effectively designed report based on sound engineering can be ineffective if it is poorly written at the paragraph and sentence level. Many managers associate careless editing with careless engineering. You should try to be as precise in your editing as you are in your engineering or other professional tasks.

Effective editing requires attention to four areas of writing. First, you should evaluate each paragraph to make sure it makes your point effectively. Second, you should edit the sentences to fit into the paragraphs, as the syntax of each sentence depends on its context. Third, you should edit your sentences to be mechanically and grammatically correct. Fourth, you should revise your sentences to be stylistically effective.

Writing a report, then, is a process that consists of several stages which can be broken down into substages. Do not try to juggle all of these considerations at once. Instead, break them into manageable groups and then apply them sequentially.

Accordingly, this manual is divided into sections that correlate with the report-writing process. Chapter 2 discusses the purposes and readers of shipyard reports. Chapters 3 and 4 discuss the basic structure and the

summary of a report. Chapters 5 and 6 explain how to select and organize information in the discussion. Chapters 7, 8, and 9 discuss writing paragraphs and sentences and using visuals and formatting devices.

The reference section presents checklists, guidelines, and sample reports that summarize and illustrate the discussions in the manual. The guidelines and sample reports also provide a reference for your future report writing tasks.

2

Understanding the Function of Shipyard Reports

Reports serve different functions in a shipyard, according to their roles in the design and construction (or repair) process. They range from important problem-solving reports to routine and informational administrative reports. Reports affect construction activities in many ways, and vary in format and content according to their functions.

To make report writing easier, first think of reports according to function. When you group reports by function, you can see underlying similarities that yield guidelines for writing specific reports. For example, the following types of reports are similar: minutes of meetings, conference reports, telephone records, trip reports, sales contact reports, highlights of a contract, and summary of a document. Instead of writing seven different types of reports, you are faced with writing seven variations of the same type of report. The writing task should be easier.

Two basic categories of shipyard reports are problem-solving reports and administrative reports (Table 1). You occasionally may have to write other types of reports, such as proposals and technical reports. However, this manual discusses the everyday problem-solving and administrative reports that shipyard managers and engineers consider most important to the design and construction process—the reports you have to write daily or weekly. These reports are the letters and memos that should be “brief and to the point.”

Many “persons can’t write a brief report or memorandum,” according to the managers interviewed for this manual, so this chapter concerns these everyday documents.

Table 1. TYPES OF SHIPYARD REPORTS

<p><i>problem solving Reports</i></p> <p>Decision Making Reports</p> <p>Implementation Reports</p> <p>Recommendation Reports</p> <p><i>Administrative Reports</i></p> <p><i>Status Reports</i></p> <p>Minutes and Trip Reports</p> <p>Procedures and Instructions</p>
--

Although each shipyard has its own terminology for these reports, the functions of the reports are the same from yard to yard. This chapter discusses these functions and summarizes the characteristics of problem-solving and administrative reports. It provides a framework for the following chapters on how to design, write, and edit these various reports.

1. Problem Solving Reports

Problem-solving reports request, initiate, or implement changes in the design and construction process for a specific hull or contract. They are action-oriented. Different types of problem-solving reports have different functions and use different formats and content to accomplish their purpose. The problem-solving reports discussed here are decision-making reports,

implementation reports, and recommendation reports.

1.1. Decision Making Reports

A decision-making report formalizes decision making for non-routine changes. Its purpose is to define a problem or solution. It states a problem and begins the decision-making process or it states a decision to solve a problem. The result of a decision-making report is to advance the design and construction process. These reports often have economic and technical contract implications. The sample report, “Ballast Tank Drainage” (Figure 2), which is a response to an owner’s “defect notice,” illustrates a decision-making report with contract implications.

Decision-making reports address the person or persons who have to make decisions or act on some aspect of the design and construction process with regard to a specific hull. The distribution lists of decision-making reports are limited to persons involved in the decisions or subsequent actions. Only four persons received the “Ballast Tank Drainage” report, for example, but those persons are in Engineering and Contracts and are involved in the problem raised by the Owner.

Decision-making reports concentrate on interpreting technical information, which means the information that they contain is highly selective. They emphasize judgments based on facts and on the analysis of facts rather than dwell on technical details. The “Ballast Tank Drainage” report illustrates the focus of most decision-making reports, as the writer could have included a lot of unnecessary detail on trim and draft calculations. This report restricts itself almost entirely to conclusions and judgments.

Given the emphasis on interpretation, decision-making reports use a persuasive approach to present information. The “Ballast Tank Drainage” report explicitly argues that the “lack of full wing tank drainage is insignifi-

Atlantic Shipbuilding
MEMORANDUM

File No. 64-38C
Date: 5 August 1986

To: C. Frederick
Contracts Office

From: v. White /w
Quality Assurance

Subject: Ballast Tank Drainage, SWATH A-TSD, Contract Defect 28-ZX

References: (a) Memo C. Frederick to V. White, 28 July 1986
(b) Owner letter, Ref. No. 324-D-28-ZX, 15 July 1986
(c) owner defect form: Defect 28-ZX

Enclosure Memo L. Hernandez-V. White, 4 August 1986:
"Complete Wing Ballast Tank Drainage"

In your memo of 28 July 1986 (reference a), you requested that Quality Assurance evaluate contract defect 28-ZX (references b and c). Outfitting has analyzed the need for complete wing ballast tank drainage (enclosure). The amount of ballast left in the ballast tanks is not significant enough to warrant the incorporation of additional drainage. Thus, no action is warranted on the part of ASBC.

The Owner observes that there is no provision for complete drainage of the wing ballast tanks. Due to normal stern trim in service, a permanent wedge of water will be trapped because of the stepped design of the tanks.

This lack of full wing tank drainage is insignificant. The trim booklet calls for deballasting only at certain ports. The trim will be such that the total amount of ballast remaining will be 2.16 tons. The resulting change in trim and draft is so inconsequential that cargo carrying capacity will be unaffected.

Installing a means to provide for complete deballasting would incur unnecessary labor and material costs. Therefore, no action is warranted in response to contract defect notice 28-ZX.

cc: L Hernandez, Prod. Engineering, Outfitting
J. Andrulis, Prod. Engineering
A. Vaslo, Chief Naval Architect

Figure 2. Sample Decision Making Report.

cant.” Although the persuasive approach is a matter of tone, it also is a matter of how you select and arrange information.

Regardless of whether a decision-making report is internal within a shipyard or between a shipyard and owner or Navy, the purpose and writing style are the same. They are direct; they primarily communicate judgment.

1.2. Implementation Reports

Implementation reports implement changes in the design and construction of a specific hull. They either request a change or they authorize a change. In writing implementation reports, you can be completing a problem-solving process or requesting and authorizing a routine change without prior communication or decision making. In either case, these reports are routine and usually follow a standard organization and format. They support the way the yard is organized to design and construct ships.

The "RequestforEngineeringServices" report(Figure3)uses a standard organization and presents a standard routine decision-making procedure, which is part of the report format. The subject and purpose of the report indicate who should read the report. In fact, implementation reports often can have standard distribution lists.

The implementation report presents precise technical detail to explain a problem or a change. It does not need to persuade readers to take action. You draw the details from standard documentation, drawings, or activities familiar to you and your readers. The information in implementation reports can be very selective. Background information is unnecessary.

Therefore, you use implementation reports in repetitive report-writing situations for which responsibilities are clearly delineated. Decision making and authorization are implicit in an implementation report. The format of the report represents the authority and signals action.

Request for Engineering Services	
 Atlantic Shipbuilding	form - ME57.1
To: C. Cavanaugh Dept. Fdn. Design From: G. Hummell Dept. Design Eng. Date: 6/10/86 Subject: Drawing Change to Facilitate Installation of Ventilation System	Drawing No. LL100-86 Contract No. TY201-78 Shop No. WP/SN No.
<p>MESSAGE: Drawing No. LL100-86 specifies that the aft bulkhead in "propulsion repair aft" be watertight. However, the HVAC design for the ventilation system serving the aft engine room requires this bulkhead to be non-tight to facilitate installation of ductwork.</p> <p>RECOMMENDED SOLUTION: Make subject bulkhead non-watertight. Subdivision considerations do not require a watertight bulkhead at this location.</p> <p>SIGNED: <i>G. Hummell</i></p> <hr/> <p>REPLY: Will change subject bulkhead to non-watertight on drawing LL100-86.</p> <p>SIGNED: <i>C. Cavanaugh</i></p>	
PRODUCTION/PLANNING ACTION <input type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED REASON: SIGNED _____ DATE _____ <input type="checkbox"/> Production Drawing Changed SIGNED _____ DATE _____	DESIGN ENGINEERING ACTION <input type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED REASON: SIGNED _____ DATE _____ <input type="checkbox"/> Composite Drawing Changed SIGNED _____ DATE _____

Figure 3. Sample Implementation Report.

1.3. Recommendation Reports

Recommendation reports propose changes in standard design and construction practices in the shipyard as well as in standard management or administrative procedures. They address a problem that requires a management decision. While some recommendation reports suggest changes in a specific contract, many address generic operations in the shipyard.

Essentially, a recommendation report is an internal proposal that focuses on interpretation and judgment. You select the report readers and establish priorities among them when designing the report. You take a persuasive approach when defining the problem and arguing that your solution should be implemented. You usually do not present the information in highly technical terms: the technical material is subordinate to the management and administrative implications, although you need to supply some technical details for staff readers.

Although you may not write recommendation reports often, when you do they may seem difficult because of their importance. Of all the reports you write, recommendation reports require the most attention to all of the principles discussed in this text.

2. Administrative Reports

Administrative reports support the design, construction or production, and marketing process. Their purpose is administrative rather than technical, no matter how technical the subject. Administrative reports usually are written primarily to provide information. Collectively, they ensure efficient decision making and implementation in the yard, in the design and engineering process in general, and in the engineering and construction of a specific hull. Although some administrative reports are contract-specific, most

support management procedures across the yard as a whole. Status reports, minutes and trip reports, and procedures and instructions are the administrative reports that shipyard managers judge to be the most common or important.

2.1. Status Reports

Status reports inform management, engineering, and construction personnel of the status of projects across the yard or of an individual project. The readers for a status report can be quite diverse, ranging from the general manager to yard supervisors for some types of reports. Often, the audiences are departments rather than individuals. The list of readers for a status report is usually standard, based on the type of activity, contract, or project that the report discusses.

Status reports usually are periodic and provide information. Status reports even present action items as information-actions that will occur or have occurred. The information is highly selective. The primary purpose of these reports is not to present technical detail, but to summarize the progress of a project.

You organize the information in status reports by topic or project, usually in a standard format. Status reports compare actual activities to standards for a type of activity, such as dimensional control, or to milestones in a time frame or stages of a process, such as completion of bottom inserts. You present the material without explanation or interpretation, and often in graphic form.

2.2. Minutes and Trip Reports

Minutes and trip reports document the actions, decisions, and results of

a specific meeting, trip, or similar event. Similar in function are conference records, telephone records, and sales contact reports as well as the “Technical Communications Report” (CDRL-DID USI-A-23532). Although the primary purpose of minutes and trip reports is to communicate information, actions and decisions often are the focus of these reports. Documentation simply “for the record” is a secondary purpose.

You usually issue minutes in response to a specific event or occasion, so the readers are selected accordingly. The “Minutes of meeting with Coastal Shipping” (Figure 4), for example, is an internal report distributed to the shipyard persons who attended the meeting and to two others: the Assistant General Manager and a person in Purchasing who will be asked to have a vendor correct a part malfunction.

As the sample minutes (Figure 4) illustrate, minutes summarize important information rather than provide a transcript of an event. You provide documentation and details in attachments. The “Minutes of meeting with Coastal Shipping” present only the results, conclusions, or decisions on the meeting topics, not the details of the discussions themselves.

You usually organize minutes according to the topics or categories discussed rather than according to the chronology of the discussion. You summarize the important information in the beginning of the report, as in “Minutes of meeting with Coastal Shipping,” where the heading, “Action to be taken by,” signals the action items. The sample also illustrates how minutes are formatted with boxes and lines to distinguish separate kinds of information.

2.3. Procedures and Instructions

Procedures and instructions primarily explain tasks that need to be performed, although they provide information as well. They are designed to

Atlantic Shipbuilding MEMORANDUM									
To: Distribution Dept.	Date: 14 July 1986								
From: C. Frederick Dept. Contracts	File: 324/86-22								
	Page 1 of 2								
Subject: Minutes of meeting with Coastal Shipping to discuss unsatisfactory specification items on ASBC Hull No. 324	Contract: TY201 -78								
Place: 12 July 1986, Atlantic Shipbuilding									
Participant*									
R. Martin (CSC)	C. Frederick (Contracts)								
D. Edwards (CSC)	A. Vaslo (Chief Naval Architect)								
L. Moseby (CSC)	J. Andrulis (Production)								
	V. White (Quality Assurance)								
	F. Domino (Construction)								
Purpose:									
To discuss the contract specification items Coastal Shipping Corporation finds unsatisfactory with the construction of Hull No. 324 (letters of 12 June and 23 June). After discussion, appropriate actions were agreed upon and tasks assigned.									
Action to be taken by:	<table border="0"> <thead> <tr> <th><u>Department</u></th> <th><u>Item</u></th> </tr> </thead> <tbody> <tr> <td>Design Engineering</td> <td>E03. A11</td> </tr> <tr> <td>Construction</td> <td>E02. C16</td> </tr> <tr> <td>Purchasing</td> <td>C04</td> </tr> </tbody> </table>	<u>Department</u>	<u>Item</u>	Design Engineering	E03. A11	Construction	E02. C16	Purchasing	C04
<u>Department</u>	<u>Item</u>								
Design Engineering	E03. A11								
Construction	E02. C16								
Purchasing	C04								
Meeting Topics:									
1 E02	Noted that #1 control panel in pump mom has two damaged control switches. Construction will install new switches.								
Distribution									
S. Guthrie (Asst. General Manager)	A. Vaslo (Chief Naval Architect)								
C. Frederick (Contracts)	J. Andrulis (Production)								
W. Loman (Purchasing)	V. White (Quality Assurance)								
	F. Domino (Construction)								

Figure 4. Sample Minutes of a Meeting (1 of 2 pages).

Atlantic Shipbuilding MEMORANDUM	
To: Distribution Dept.	Date: 14 July 1986
From: C. Frederick Dept. Contracts	File: 324/86-22 Page 2 of 2
Subject: Minutes of meeting with Coastal Shipping to discuss unsatisfactory specification items on ASBC Hull No. 324	Contract: TY201 -78
<p>l E03 Noted that in the aft pump room all valves are not accessible. T-handles were suggested. Design Engineering to change.</p> <p>l All Noted that forward hydraulic supply hoses could chafe and pinch during the operation of #1 and #5 hatches. Rerouting will correct problem. Design Engineering, Outfitting Section will resolve.</p> <p>ž C04 Noted that the #2 emergency generator does not function properly. Problem appears to be in the governor. Purchasing to have vendor correct.</p> <p>l C16 Noted that Engine Control Room is dirty. Construction will dean after all engine mom work is completed.</p> <p>ž G01 Material Control received air conditioning units that had delayed some outfitting work.</p> <p>Refereces: Letter, Moseby (CSC) to Frederick, 12 June 1986 Letter, Moseby (CSC) to Frederick, 23 June 1986 Letter, Frederick to Moseby (CSC), 30 June 1986</p>	

Figure 4. Sample Minutes of a Meeting (2 of 2 pages).

enable people to construct, operate, maintain, or repair a piece of equipment or to perform some production task. However, they also document a procedure or test and keep managers and supervisors informed. Procedures and instructions include both repetitive and one-of-a-kind tasks.

A procedure focuses on the task to be performed. You design and write a procedure in a formulaic style so that it will be performed correctly, efficiently, and safely. Pay attention to specific detail, actions, and results. How much background information and detail you include depends on your analysis of your readers' needs.

Both routine and one-of-a-kind procedures have diverse readers with different needs. You should organize procedures in several parts to serve these diverse needs. Often, you prepare a cover memo for a supervisor and write the procedure itself in a format that the user can follow to do the tasks efficiently. Formats usually are standard for similar types of procedures, so a user familiar with the format can follow the procedure and perform the task efficiently.

The specific function of a report determines the guidelines to employ in applying report-writing principles to writing the report. When you determine the function of the report you are writing, you can define your communication purpose, identify the specific readers, and design the basic structure. Then you can determine the relevant information to include in the report and how to organize the information.

3

Establishing the Basic Report Structure

Shipyards reports vary in kind and format, within a shipyard as well as between shipyards. Even the same kind of report can have different names in different shipyards. However, the basic structure of various types of shipyard reports is the same as the basic structure of other technical documents.

Two basic principles underlie the structure of shipyard reports: reports have three parts and reports move from general to specific. When you design your report, you need to consider the needs of your readers and apply these two principles to make the structure of the report meet your readers' needs.

1. Types of Report Readers

An effective report meets the needs of its readers. Therefore, after you define the purpose of your report, you must identify your readers and determine what information they need. Then you prioritize the needs you have identified so that you know which needs are the most important.

As a group, the readers of your report have one important characteristic: they are diverse. They are in different departments, have different job responsibilities, and bring different concerns to your report. For example, the readers of a condition report (on a combat system) can include a program manager, a liaison person, and Navy representatives-most of whom are not

combat specialists. The "Ballast Tank Drainage" report (Figure 2, p. 14), was distributed to only four persons, but they were in Contracts, Production Engineering, and Design Engineering. Your readers' professional responsibilities complement, rather than duplicate or overlap, one another. Therefore, your readers will use your report for different purposes.

Not only are your readers diverse, they are not of equal importance. You should determine who your most important readers are so that you can design your report primarily to meet their needs.

To prioritize your readers, you classify them into three types of audiences (Table 2):

Table 2. THREE TYPES OF REPORT AUDIENCES

- | |
|---|
| <ol style="list-style-type: none">1. Primary: Act or Make Decisions2. Secondary: Affected by Actions and Decisions3. Nominal: Transmit, Forward, or File Reports |
|---|

1.1. Primary Audiences

Primary audiences are persons who must act or make the decisions needed for your report to accomplish its purpose. Most reports have only one person who is considered as the primary reader. You should be sure to identify this person to avoid confusion. As a shipyard manager explained "Three people were identified for action. They all got the report, but each thought the other was acting. The report fell between the cracks!"

Primary audiences often do not need much technical information—they only need to know "the bottom line." Attimes, identifying the primary reader can be difficult, either because you don't know that person or because protocol may require your report to address a secondary or nominal audience.

1.2. Secondary Audiences

Secondary audiences are persons who have to implement the decisions or who will be affected by the actions taken. These persons may not have to make the decision or take the initial action, but are responsible for making sure that the subsequent changes occur. These persons often need technical information to take the actions or make the changes. If you overlook a secondary audience, you might not include the information that person needs. A secondary audience might not even receive the report if you haven't put that person on the distribution list.

1.3. Nominal Audiences

Nominal audiences are persons who maintain lines of communication. They routinely forward reports to the appropriate people, the way the Supervisor of Shipbuilding forwards your reports to NAVSEA and the way a program manager forwards a report that has contract implications. Nominal audiences also file reports. Furthermore, nominal audiences often include protocol audiences. The term, "nominal," implies that these persons are not as important as the primary and secondary audiences to whom your report should be primarily directed.

Reports for the Navy usually have these three types of audiences, as shown in the analysis of a report requesting a change in contract specifications needed to replace a specified vendor part (Table 3). A project engineer in Program Management in a shipyard wrote the report. SupShips (a nominal audience) forwarded it to the Program Manager at NAVSEA (a secondary audience), who in turn transmitted it to a technical specialist in NAVSEA (the primary audience) responsible for analyzing and approving the request. The Program Manager for the shipyard is also listed as a nominal audience

Table 3. COMPLEX AUDIENCE FOR A REPORT TO NAVSEA

<p>Report Purposes:</p> <p>(1) To request deviation from a contract equipment specification. The request is necessary because the vendor no longer is able to provide the specified part (The decision probably has been reached unofficially as a result of oral communication.)</p> <p>(2) To initiate documentation to modify the contract so that there is no future disagreement over contract provisions and cost implications.</p> <p>Report Type:</p> <p>One-page letter with attached documentation, including vendor drawings and calculations, to justify the replacement part recommended</p> <p>Report Writer:</p> <p>Project Engineer in Program Management</p> <p>Primary Audiences</p> <p>Technical specialist at NAVSEA responsible for analyzing and approving the request</p> <p>Secondary Audiences:</p> <p>NAVSEA: Program (Contract) Manager Other technical specialists</p> <p>SupShips: Technical specialist, who will double-check the specifications</p> <p>Yard: Material Control, source of problem awareness and go-ahead to Purchasing Engineering (Machinery), source of alternative proposal Contracts, informational, but a change order might follow Purchasing, not copied but hold on purchase until authorized by Material Control</p> <p>Nominal Audiences:</p> <p>SupShips: Supervisor of Shipbuilding, the addressee by protocol</p> <p>Yard: Program Manager, copied (the writer's Manager)</p> <p>NAVSEA: Program (Contract) Manager, responsible for routing the letter</p>
--

because he routed the report to nominal management audiences in the yard and distributed it to numerous secondary audiences in the yard. As is customary, the report was addressed to the Supervisor of Shipbuilding, a nominal audience. Its most important readers, however, were technical specialists at NAVSEA.

To meet the needs of these diverse readers and enable them to get the information they need efficiently, a report must have an effective basic structure.

2. Technical Reports Have Three Components

Technical reports have three basic components (Figure 5). The first component is a summary or “overview,” which includes the heading; the second component is the discussion or “analysis;” the third component consists of the attachments or “supporting documentation.” Each of these components should be more or less self-contained. A technical report differs from other types of Written communication, such as an essay, which traditionally have three parts—a beginning, a middle, and an end. However, in these other types of communication, the beginning, middle, and end form one unit that is, each part is not self-contained.

Most of your audiences, especially management audiences, don’t have time to read an entire report. In a report that consists of self-contained units, the audience can read each part of the report independently and even selectively.

This three-component design enables your report to meet the needs of your different types of audiences by enabling readers to read only the information that they need

The “Ballast Tank Drainage” report (Figure 2, p. 14) illustrates this three-component structure. The first paragraph summarizes the report. No

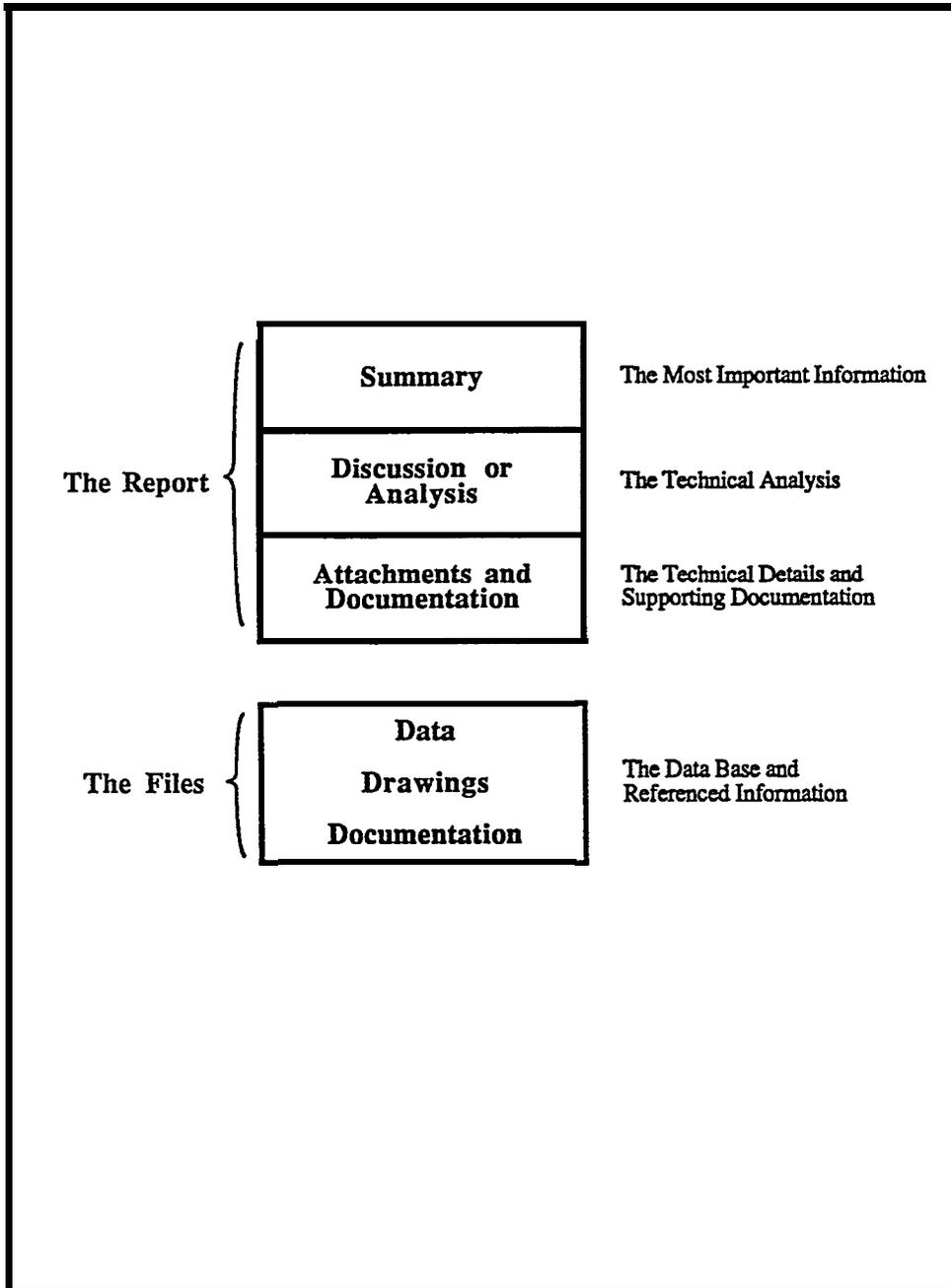


Figure 5. The Three Basic Components of a Technical Report.

reader has to read further to get the essential information. The next three paragraphs selectively present the analysis to support the conclusion in the summary that the “amount of ballast left in the ballast tanks is not significant enough to warrant the incorporation of additional drainage.” The documentation enclosed with the report, “Complete Wing Ballast Tank Drainage,” which contains the detailed technical analysis, also supports the conclusion.

2.1. The Summary

The summary of your document addresses your primary audience, management readers, although it also meets the needs of some secondary audiences. Few readers, especially managers, need particulars or details to understand your conclusions and recommendations and to make a decision or take action. Managers seldom read further in a report than is absolutely necessary.

Therefore, the summary presents only the most important information of the report, and focuses on the organizational implications of your conclusions rather than on the technical material. If you meet the needs of your primary readers in the one-paragraph summary (or one-page summary of a long report), you have communicated with them.

For other readers who will read other sections of your report, the summary provides an overview or road map that guides them to the information they need.

The summary also addresses nominal audiences. It indicates who should receive the report. Because the summary of a report focuses on the organization rather than on technical details, it helps nominal audiences to get the report to the right people for the appropriate decisions and actions.

The first two paragraphs in the sample recommendation report, “Proposal to Introduce Line-Heating Technology” (Figure 6), show an effective

Atlantic Shipbuilding
MEMORANDUM

File No. 12-5T
Date 3 July 1986

To: **S. Guthrie**
Assistant General Manager

From: **J. Andrulis, Manager**
Production Engineering

Subject: Proposal to Introduce Line-Heating Technology into
ASBC Production Procedures

At the present time, the technique of cold-forming shell plating limits our productivity and flexibility. The fact that we rely on this technique limits our competitiveness in some bid situations. I therefore propose that ASBC introduce line-heating technology in our facilities. This will enable us to stay competitive with other U. S. shipyards.

Line-heating technology will (1) increase our productivity, (2) facilitate more complex shell plate curvature and lower costs, and (3) improve production flow. Improved fabrication quality will result in the yard being more competitive. Implementation of line-heating technology will require approximately one year, including planning.

Limitations of cold-forming technique. Our facilities for cold-forming shell plating do not suit the needs of current designs. These facilities can only perform adequate shaping up to 3/4 inch thick plate and are not capable of giving plates longitudinal curvature. The specifications of our cold-forming facilities and optimal specifications for contract TY236-83 are listed in Attachment A.

Line-heating is the process of inducing curvature in structural shapes and plates by controlled heating and cooling. The process is also scientifically applied for fairing structural intersections and removing distortion due to thermally induced stress.

Advantages of line heating for forming curved shell plating. By employing line heating, we can eliminate the restrictions we now face in the forming of shell plating. The advantages of line heating are:

- 1) Increase in productivity, as seen in other U.S. shipyards (Attachment B).
- 2) Ability to accurately form shell plates with compound curvature (Attachment C itemizes parameters and dimensional control for plates on Hitachi Hull Y-14-2), which results in a cost savings.

Figure 6. Sample Recommendation Report Illustrating Use of a
Summary (1 of 2 pages).

Atlantic Shipbuliding
MEMORANDUM

- 3) Ability to fit curved parts to curved shell accurately with minimal force, which requires fewer man-hours than cold forcing.
- 4) Accommodation of larger plate sizes, thereby minimizing butts and seams.
- 5) Optimization of existing facilities through improved scheduling and elimination of bottlenecks.
- 6) Facilitation of subsequent assembly by eliminating distortion prior to forwarding an interim product to the next level of production.
- 7) Ability to accurately and productively fair structural intersections.
- 8) Enhanced worker safety.

Our statistical accuracy-control system would be modified to assure the normal process capability, including standard range and tolerance limits.

In conclusion line heating shapes material more accurately with less effort and provides more production flexibility.

Implementation of line heating. Introduction of line heating would be best accomplished by contracting with a Japanese firm to provide technical information and training. Our own shipyard would be responsible for the adaptation of existing equipment and the construction (and purchase) of new equipment needed for this method. Finally, ABS approval will be needed before this technique is used in actual production. The implementation of line-heating technology will require approximately one year.

Upon approval of this proposal I will prepare a detailed procedure and cost estimate for implementation of line-heating technology. Final cost estimates can be made after technical training with the Japanese firm. Qualitative benefits then can be calculated for selected proposals and contracts, based on the percentages of shell plates which could be formed in whole or part by line heating.

I have scheduled a meeting in the Administrative Conference Room for 0900, Wednesday, 16 July to discuss this proposal and implementation plans.

Attachments: A- Yard Specifications and Optimal Specifications, Contract

B- Effect on Productivity of Line-Heating Technology
C- Compound Shell Curvature for Hitachi Hull Y-14-2

cc: S. Guthrie, Asst. General Manager y. White, Quality Assurance
G. Landon, Prod. Engineering F. Domino, Construction
C. Shermisn Welding Engineering W. Loman, Purchasing
A. Vaslo, Chief Naval Architect

Figure 6. Sample Recommendation Report Illustrating Use of a Summary (2 of 2 pages).

summary. The first paragraph states the problem and the proposed solution. The second paragraph succinctly presents the conclusions, the reasons for the proposed solution, which are explained in the discussion of the report. This paragraph presents the conclusions in such a way that the reader does not have to read further in the report to get the main points.

Line-heating technology will (1) increase our productivity, (2) facilitate more complex shell plate curvature and lower costs, and (3) improve production flow. Improved fabrication quality will result in the yard being more competitive. Implementation of line-heating technology will require approximately one year, including planning.

In contrast to the "Line-Heating Technology" proposal, the "Reflag of Interlakes Shipping Corporation Ships" report (Figure 7) illustrates the need for a summary. Without a summary at the beginning of the report, the argument is very difficult to follow. Yet, on the second page, the report requests the Coast Guard to cancel an inspection requirement and accept the naval architect's conclusions. Most readers would have trouble stating the argument in the report without referring to the enclosures. In such a situation, the report usually fails to communicate effectively and cannot achieve its purpose without follow-up communication, both written and oral.

The summary of a report has different names: "executive summary," "summary," "overview," "brief," "opening component," "conclusions and recommendations," "abstract," and even "introduction." Regardless of what the summary is called, it presents the most important information in the report, and it appears at the beginning of the report.

2.2. The Discussion or Analysis

The discussion of your report addresses technical and staff persons interested in the technical aspects of your report. The discussion usually has

Pacific Design Co.
Naval Architects & Marine Engineers
22 Cove St. La Jolla, CA 92038

23 July 1986
File 786-86

Captain A. Silk
Commanding Officer
U.S.C.G., Marine Safety
Detroit, Michigan 46065

subject Reflag of Interlakes Shipping Corporation Ships
 at Atlantic Shipbuilding Corporation, Huron River Yard
 ASBC Hull 234, Alpena
 ASBC Hull 235, Saginaw
 ASBC Hull 236, Traverse City
 ASBC Hull 237, Marquette

Enclosures: (1) Atlantic letter, file 753-66, 12 May 1966
 (2) CCGD6(mmt) letter, Serial W3012, 26 June 1986
 (3) Atlantic letter, file 772-86, 16 July 1986

Dear Sir,

Enclosure (1) submitted to CCGD6(mmt) the hydraulic diagrams for the interior ramp covers and the watertight cargo doors. The intention of the submission was to comply with the technical requirements of 32 CFR 26.17.16.

The logic presented in the submission was that the ramp covers were "fail-safe" as defined in 32 CFR 26.17.16. The ramp covers were considered fail-safe due to the flow control devices in the hydraulic supply to the cylinders, which would provide for a controlled release of the cover should there be a hydraulic failure.

Since the hydraulic system for cargo doors, which are not opened except in port, is installed solely to provide the mechanical advantage necessary to operate them, it was assumed that 32 CFR 26.17.16 would automatically apply.

Figure 7. Sample Report Without a Summary: Negative Example
(1 of 2 pages).

Pacific Design Co.
Naval Architects & Marine Engineers
22 Cove St. La Jolla, CA 92038

Regardless, Enclosure (2) disagreed and required the submission of the complete details of the hydraulic systems and imposed the requirements of 32 CFR 23.16.3 to the hydraulic hose.

It is understood that concurrent with Enclosure (2) an inspection requirement has also been issued either to show that the hydraulic hose in these systems is in compliance with 32 CFR 23.16.3 or to replace the hose.

We do not agree with these requirements and under normal circumstances would respond to Enclosure (2) with sufficient additional information to substantiate our position. We have, in fact, already responded to the letter regarding the stern ramps (Enclosure (3)).

Due to the imminent delivery of the first two of the five vessels and the effect that these requirements could have on that delivery, it is requested that you have the installations on board inspected to verify the fail-safe design of the interior ramp covers, as described in this letter. Additionally, it is requested that you concur with our understanding that the cargo door system is not a regulated system.

If you are in agreement, it is requested that the inspection requirement for the hoses to be in conformance with 32 CFR 23.16.3 be cancelled as only those hydraulic systems in 32 CFR 27.17.1 require compliance with 27.17.4 through 27.17.8 which, in turn, invoke compliance with 32 CFR Part 23.

Thank you for your prompt attention to this problem. If additional information is needed, feel free to contact me.

Sincerely yours,

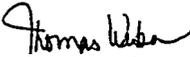

Thomas Weber
Atlantic Design

Figure 7. Sample Report Without a Summary: Negative Example
(2 of 2 pages).

diverse readers, such as:

- 1 Technical people who need the information for their own purposes, such as to revise a system component.
- 2 Other professionals, such as people who have to write specifications and contact vendors.
- 3 Staff people who have to analyze the technical information to advise the manager who must make the decision your report recommends.

The purpose of the discussion is to present your technical analysis, which proves or supports the conclusions and recommendations of your report. Your discussion should present your thinking, not the technical documentation. It should include only the details that support your reasoning and conclusions.

The "Line-Heating Technology" proposal (Figure 6, p. 30) illustrates the analytical focus of the discussion. After the first two paragraphs, which summarize the problem and conclusions, the report discusses four topics:

Limitations of cold-forming technique,
Line-heating technology.
Advantages of line heating for forming curved shell plating,
Implementation of line heating.

Despite the technical subject, the discussion of the first three topics is quite general—the details appear in the attachments. The report devotes more attention to the fourth topic, "Implementation of line heating" (which has organizational implications for the shipyard), than to the other three. The discussion of implementation presents the writer's thinking or analysis. It doesn't overwhelm the reader with technical detail.

2.3. The Attachments and Documentation

The third component of your report, the attachments (or enclosures if it is in letter format), presents documentation to support the information in the discussion. The attachments perform two functions. First, they contain the details that would clog the discussion and obscure the analysis. Second, they provide additional information for some readers without presenting unnecessary information to other readers.

The attachments of a report take many forms, such as reference memos, computer printouts, calculations, and parts lists. Often, attachments address specialists who don't need interpretation and explanation. Therefore, many attachments are formatted with several boxes and lines, and contain little prose.

The attachments provide supplementary information that isn't necessary for most of the readers to understand the analysis and accept the conclusions of your report. Therefore, you should select the attachments of your report for the convenience of some readers of the report. Put the complete documentation for your report in a file-cabinet or electronic-for future reference.

3. Technical Reports Move From General To Specific

The second basic principle of report structure is that the components move from general to specific. The summary presents the most general or bottom-line information. The discussion presents an analysis that uses details and results of calculations to formulate conclusions or generalizations. The attachments usually present detailed information.

"The Request for Documentation to Introduce Intermittent Welding" (Figure 8) illustrates how the information in a report moves from general to

Atlantic Shipbuilding
MEMORANDUM

File No. 64-22B
Date: 6 June 1986

To: A. Vaslo
Chief Naval Architect

From: F. Domino
Construction Engineering

Subject: Request for Documentation to Introduce Intermittent Welding

Enclosure: Report, "Intermittent Welding by Navy Requirements"

In my report (enclosed), I detail the intermittent welding requirements as imposed by the Navy. These requirements are for aluminum and steel. The purpose of this memo is to request that you prepare documentation that will permit the incorporation of U.S. Navy standards for intermittent welding into the production of the SWATH

Currently, ASBC documentation for intermittent welding is based on ABS specifications. However, intermittent welding specifications for steel and aluminum for the Navy differ from those for ABS. ASBC documents therefore need to be revised to incorporate Navy specifications for use of this technique. These documents should include cost and scheduling information as well.

Intermittent welding specifications for aluminum and steel for Naval surface Combatant Ships differ from ABS specifications in several respects. The Navy requires that the minimum volume of intermittent fillet weld material be identical to the minimum required volume of continuous fillet weld material. For example, with **Navy specifications the volumes of intermittent welds for a non-structural bulkhead aluminum stiffener are 75% greater than with ABS specifications, not counting any additional end welds.** In addition, the Navy requires significantly more double continuous end welding than does ABS. **The Navy specifications also differentiate between various strength steels.**

If you have any questions regarding the need for this documentation, please contact me. Thank you for your cooperation.

Frank Domino
Frank Domino

Copies: J. Andrulis, Production Engineering
D. Harper, Hull
C. Sherman, Welding Engineering

Figure 8. Sample Report With Basic Structure That Moves From
General to Specific

specific. After the first paragraph states the purpose of the report, the second paragraph states the conclusions that ABS specifications differ from Navy specifications for intermittent welding and that “ASBC documents therefore need to be revised to incorporate Navy specifications for use of this technique.” This implied recommendation is the most important statement in the report and is not explained in detail or restated. The third paragraph explains how ABS specifications differ from Navy specifications. The enclosure presents a detailed explanation.

A report with a three-level structure often contains redundancies. Conclusions appear in both the summary and the discussion. For example, a summary might present a cost estimate as a bottom-line number, while the discussion might break down the estimate in terms of basic cost categories. The same cost estimate might appear again in an attachment, with the costs itemized according to specific parts lists.

However, the general-to-specific structure is necessary because your report is addressing different readers. You are not expecting many, if any, of your readers to read your report in its entirety or straight through. Thus, the consequent repetition is not wordiness.

In sum, most technical reports have a similar basic structure despite a diversity of formats. The “Ballast Tank Drainage” memo (Figure 2, p. 14), the “Minutes of meeting with Coastal Shipping” (Figure 4, p. 20), and the “Line-Heating Technology” proposal (Figure 6, p. 30) represent different types of technical reports but have a similar basic structure. Other sample reports that appear later in this manual, such as procedures, have this structure as well.

When you have to write a report longer than a few sentences or paragraphs, first establish an effective basic structure. When your report has an effective basic structure, it meets the needs of different readers and you get your communication job done.

4

Preparing the Summary

With the basic structure of your report in mind, you can turn your attention to writing and editing. The next three chapters provide guidelines for organizing and writing your rough draft. This chapter explains how to prepare the opening summary of the report. Chapters 5 and 6 explain how to prepare the discussion.

The summary contributes the most to your report's communication effectiveness. If the summary is ineffective and doesn't attract the reader's attention, most people will not pay attention to the detail presented later in the report.

As one manager said, "I'm holding a report in my hand and I want to know right off why I need to read it." Another manager summarized the guidelines for preparing the summary by saying, "Don't dance around the problem. State it. And state what your solution is or what you want. Keep it simple and direct" 'We had damage from the hurricane. We're looking at it. We'll get back to you.' Bang. Put it up front in the first paragraph."

When you write your report, you have to decide what to "put up front." To decide what information to include in the summary, look at the three parts of the summary (Table 4): the heading (including the subject line), the purpose statement, and the conclusions and recommendations. The guidelines for writing these parts are derived from the basic principles introduced in the previous chapter.

Table 4. PARTS OF THE SUMMARY

- | |
|---|
| <ol style="list-style-type: none">1. Heading2 Purpose Statement3. Conclusions and Recommendations |
|---|

1. The Heading

The heading of a report contains standard information in a standard format. Many of the sample reports in this manual, such as the decision-making report (Figure 2, p. 14) and the recommendation report (Figure 6, p. 30), are in a standard memorandum format. These samples illustrate typical heading information: file information date of issue; audiences (readers) identified in the "To:" and the "cc:" or "distribution" areas; the writer and issuing department in the "From:" area and, in some formats, the printed memorandum heading itself; reference information the subject line (or title in some types of documents); and enclosures or attachments. At times, some heading information, such as the distribution list, appears at the end rather than the beginning of the report.

This heading information is also on standard forms and letters. Standard forms, such as a request for engineering services form (Figure 3, p. 16), format this information with boxes and lines and at times include check-off distribution lists.

Technical letters also contain this heading information, as shown in Figure 9, a letter to the Supervisor of Shipbuilding. Note that a technical letter is different from a business letter in that some business letter formats do not include most of the heading information that technical reports and letters contain. A technical letter that asks for a decision should always have a subject line so that it prompts the reader to action. The "Request for

Atlantic Shipbuilding Corporation
Huron River Yard
Ann Arbor, Michigan 48014

29 May 1986

Supervisor of Shipbuilding
New Construction.
Cleveland, OH 33715

Attention: _____
Project Manager, Code 481

**Subject Request for Resolution of Radar System Exceptions
Contract Problem Identification Report No. 24**

References: U.S. Navy Contract N-UM101-86-CB-1328
SWATH A-TSD, Atlantic Shipbuilding Corporation Hull 324
Minutes SWATH A-TSD Design Review Meeting 5-6 May 1986

Enclosures (a) ASBC Comments/SWATH A-TSD Proposal Evaluation -
Radar System, dated 29 April 1986
(b) Control Electronics, Notes applicable to quotation in
response to Radar System Invitation to Bid

Dear Sir:

During the SWATH A-TSD Design Review Meeting of 5-6 May 1986, ASBC advised the Navy of a potential problem concerning the COR specified Control Electronics radar system. _____ Electronics has taken exception to certain general requirements included in the purchase specifications in accordance with the COR. _____ of this letter is to ask for a decision on the disputed items by 6 June 1986 so as to avoid a delay in the delivery of Hull 324.

The details of the radar system and the exceptions of Control Electronics are summarized in enclosures A and B. As the minutes of the meeting a decision from the Navy was to be forthcoming. To date we have not received a reply.

We ask that you either waive the requirements that Control Electronics objects to or provide support to remedy the situation. If the situation is not resolved by 8 June 1986, the delay in equipment delivery will cause a delay in the delivery of Hull 324. This is due to the sixty (60) week delivery time quoted for the radar.

Your prompt attention to this problem would be greatly appreciated.

sincerely,

G. DeGraffoli
G. DeGraffoli
SWATH Program Manager

Figure 9. Sample Letter to SupShips Illustrating the Heading Format (1 of 2 pages).

Atlantic Shipbuilding Corporation
Huron River Yard
Ann Arbor, Michigan 48014

29 May 1986
File 16-18Y
page 2

DeGraffoli to Shapiro, Request for Resolution of Radar System Exceptions

cc: Frederick, Contracts
L. Hernandez, Prod. Engin., Outfitting
J. Andrulis, Prod. Engin.
S. Holmes, General Manager

Figure 9. Sample Letter to SupShips Illustrating the Heading Format
(2 of 2 pages).

Resolution of Radar System Exceptions” letter (Figure 9) does just that.

In writing the heading, you need to pay attention to three items: the format, titles and departments, and the subject line.

1.1. The Format of the Heading

The format of the heading usually is standard in a yard or a department. You should format the heading so that it contains the necessary information and clearly divides the different kinds of information.

When writing more than one of the same type of report for the same person, use the same heading format. A reader who sees a repetitive format knows where the information is and can respond quickly.

A standard form works similarly the form itself signals the type and purpose of the report. The “Request for Engineering Services” (Figure 3, p. 16) cannot be mistaken for any other type of report, so it will be routed directly and acted upon efficiently.

1.2. Titles and Departments in the Heading

Identifying by title and department all the people listed in the heading is a good report-writing practice. When you identify the titles and departments of everyone, you enable a reader to construct the communication context of the report immediately. Knowing the communication context is important for managers because they often need to know who received the report and what departments are involved.

In addition, titles are important when a report is retrieved later for contract purposes or documentation purposes; names frequently change, but positions tend to endure. A year later, a report from J. Andrulis may not be quickly identified if J. Andrulis has been promoted or transferred. However,

a report from J. Andrulis, Manager, Production Engineering, can be identified. Follow-up on reports usually is made to the position, not the person.

1.3. The Subject Line in the Heading

When readers first receive a technical document, they look at the subject line to see whether or not they should read the document. If the subject line is ineffective, readers might not pay attention to your report. An effective subject line is specific, suggests the purpose of the document, is direct, and is short.

A subject line should be specific. If the subject line simply says, "Heat Exchanger for Ocean Tug," the reader knows very little about the content of the report. That subject line is general; it could apply to any number of reports. However, if the subject line says, "Change in Vendor for Heat Exchanger: Contract AD501-65," the reader knows the report is about a heat exchanger vendor, not about maintenance, modification, or delivery of a heat exchanger. Therefore, write the subject line so that it represents your report, not other possible reports.

A subject line also should convey to the reader the purpose of the document. For example, the subject line, "Request for Change in Vendor for Heat Exchanger: Contract AD501-65," states the purpose of the report, not just what the report is about. The reader needs only to read this subject line to decide whether or not to read the report.

Subjectlines that do not state the topic and purpose of the report are quite common (Table 5). These subject lines tend to be shorthand for the writer and a few readers, but are not helpful for many readers. For example, the subject lines, "Insulation Removal" and "Accuracy Control," do not identify the specific topic and purpose of the reports.

Table 5. UNCLEAR SUBJECT LINES

Defect 2-68
Insulation Removal
Flame Spray of Pipe Hangers
Accuracy Control
Structural Design of Assy 316
Lifting-Magnet Repairs
HVAC Access Plates

Effective subject lines are direct. Key terms and concepts should come first in the subject line, not last (Table 6).

Table 6. CLEAR SUBJECT LINES

Drawing Change to Facilitate Installation of Ventilation System
Procedure to Protect Fan Coil Units
Request for Change in Vendor for Heat Exchanger
Request for Documentation to Introduce Intermittent Welding
Request for Resolution of Radar System Exceptions:
Contract Problem Identification Report No. 24
Proposal to Introduce Line-Heating Technology into ASBC Production Procedures

The first words in the subject line should be substantive nouns describing the purpose and topic of the report. If the report requests an action, the first words

should be nouns that suggest action, such as “Request for Change” or “Drawing Change.”

Phrases such as “report on,” “study of,” and “investigation of” put the important information at the end of the subject line. Furthermore, these phrases have little meaning and can be deleted.

Substantive nouns that specify the topic should come after the key terms and concepts. Secondary information, such as contract information or ship type, should come next or be in a subtitle.

Finally, subject lines should be brief. Make them ten words or less. Use phrases, not clauses or sentences. You can keep the primary subject line brief by using colons and subtitles.

2. The Purpose Statement

The first sentence or paragraph of your report should state the purpose of the report, not what the report is about.

The first paragraph of a report often is called the “introduction,” but the term “introduction” doesn’t suggest what information the paragraph should contain. Because the introduction should make the purpose of the report clear, this manual uses the term “purpose statement.”

Many writers have difficulty when writing the opening of a report. They either begin by writing a lot of background detail or they start writing the analysis or argument. The reader has to be patient and read to the end of the report to learn the purpose of the document. The impatient reader might quit reading before finding out that he or she is supposed to do something with the report. As one manager said, “with a lot of memos you can’t figure out why you need to read it.”

The following excerpt from the report on “Reflag of Interlakes Shipping Corporation Ships” (Figure 7, p. 33) illustrates how *not* to start a report:

Dear Sir,

Enclosure (1) submitted to CCGD3(mmt) the hydraulic diagrams for the interior ramp covers and the watertight cargo doors. The intention of the submission was to comply with the technical requirements of 32 CFR 26.17.16.

The logic presented in the submission was that the ramp covers were "fail-safe" as defined in 32 CFR 26.17.16. The ramp covers were considered fail-safe due to the flow control devices in the hydraulic supply to the cylinders, which would provide for a controlled release of the cover should there be a hydraulic failure.

Since the hydraulic system for the cargo doors, which are not opened except in port, is installed solely to provide the mechanical advantage necessary to operate them, it was presumed that 32 CFR 26.17.16. would automatically apply.

You have read three paragraphs into this report, but you still don't know why you're reading it or whether to continue to read it. However, the seventh paragraph, which is on the second page, opens with this sentence:

Due to the imminent delivery of the first two of the five vessels and the effect that these requirements could have on that delivery, it is requested that you have the installations on board inspected to verify the fail-safe design of the interior ramp covers, as described in this letter.

You finally discover the purpose of the report in the middle of the second page, but how many readers will read that far? Therefore, state the purpose of your report in the first paragraph.

When writing the purpose statement of your report, remember that your document does not exist in a vacuum. It is part of an organizational problem-solving process. Readers often need to understand the organizational context of your report to understand the purpose of your document.

If the organizational context is apparent from the format of the report, the purpose statement can be one sentence. If the organizational context isn't

immediately clear, the purpose statement should be a paragraph of several sentences to establish the context and state the purpose.

The organizational problem-solving process that leads to the report provides the three elements of a complete purpose statement (Figure 10). Shipyards have problems and needs which require you to perform technical tasks and then to write reports to communicate information to enable readers to address those problems and needs. The propose statement, therefore, presents three concepts: the organizational problem, the technical investigation, and the communication purpose.

2.1. The Organizational Problem

Readers often understand the purpose of a report when they understand the organizational problem or need that led you to write the report (Table 7). If there were no problem, there would be no need for the report. Thus, you cannot state the purpose of a technical report effectively unless you state the organizational problem behind the report.

Table 7. STATEMENTS OF THE ORGANIZATIONAL PROBLEM

At the present time, the technique of cold-forming shell plating limits our productivity and flexibility. The fact that we rely on this technique limits our competitiveness in some bid situations.

Purpose: (from the minutes of a meeting)

To discuss the contract specification items that Coastal Shipping Corporation finds unsatisfactory with the construction of Hull No. 324.

Recently, corrosion in fan coil units in the production staging area has caused concern.

Contract equipment specifications for the ocean tug heat exchanger were written in terms of the Barfield Corporation product line. However, the current Barfield heat exchanger does not meet the precise specifications for this vessel.

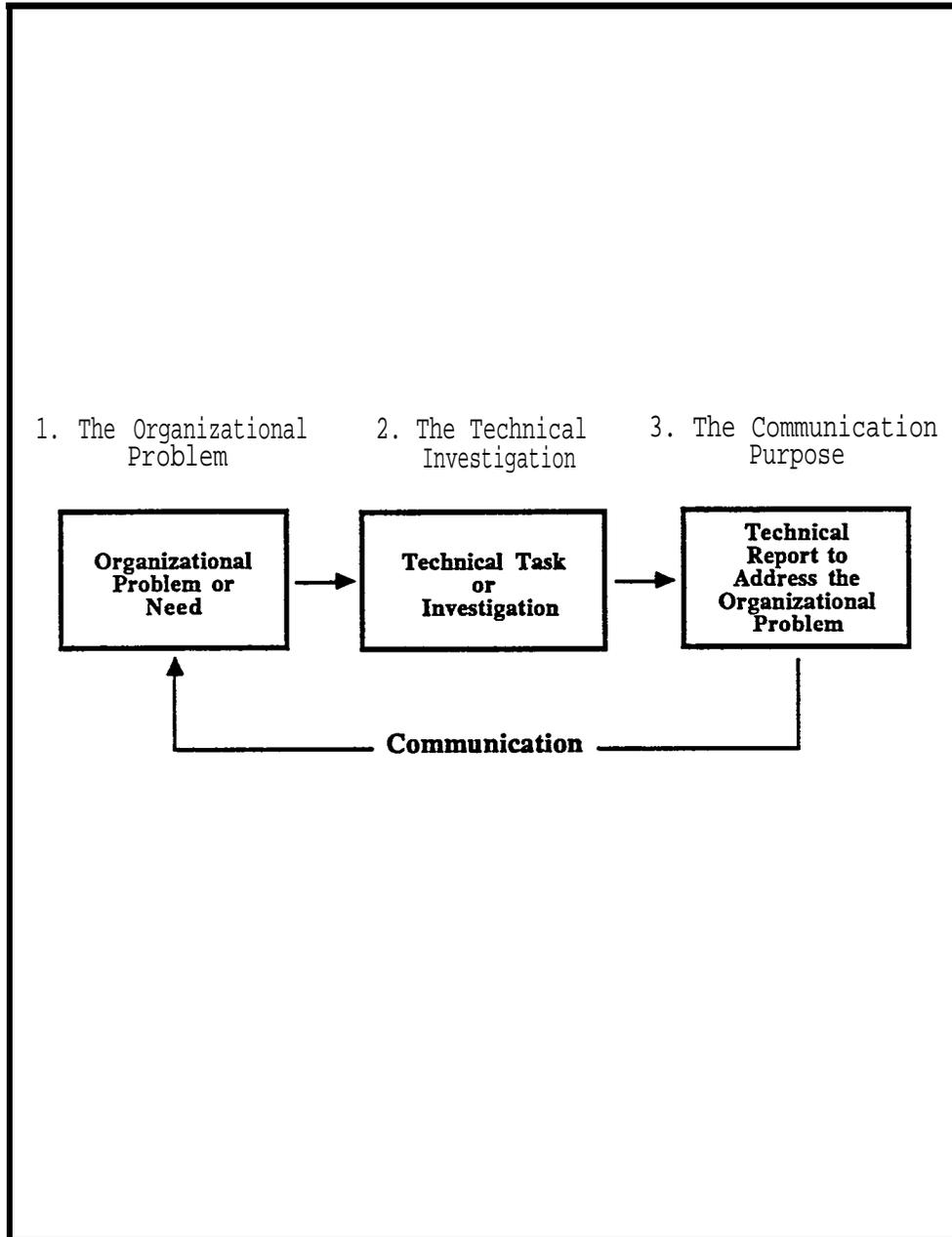


Figure 10. The Organizational Problem Solving Process Provides the Three Elements of the Purpose Statement.

Stating the organizational problem is difficult for some writers. An ineffective statement presents background material rather than the immediate problem behind the report. Ineffective statements are often too detailed or discuss the technical problem rather than the organizational problem. The opening of the "Reflag Report" (Figure 7, p. 33) is an example of a report that opens with background material.

To state the problem effectively, keep the statement short—one, or at most, two sentences. Background material and details of the problem belong in the discussion of the report. Any reader in a shipyard can understand a problem stated succinctly in organizational terms.

2.2. The Technical Investigation

In response to an organizational problem or need you have done some engineering or other professional task that has led to the report you are writing. A statement of the technical investigation also enables a reader to understand the purpose of your report.

Statements of the technical investigation summarize the objective or conclusion of the technical investigation in one sentence (Table 8).

Table 8. STATEMENTS OF THE TECHNICAL INVESTIGATION

Outfitting has analyzed the need for complete wing ballast tank drainage.

The welding procedures were not in violation of ASBC Procedure Index 13B-455.90 (reference c).

In my report (enclosed), I detail the intermittent welding requirements as imposed by the Navy.

Henceforth, all units stored in the open should be protected from rain and moisture.

However, after you state the objective of your technical investigation, you might be tempted to go into detail rather than to use it to lead into the statement of communication purpose. Do not discuss your investigation in detail here. If you state the technical investigation, do so in one sentence.

2.3. The Communication Purpose

The most important element of the purpose statement is the statement of communication purpose—that is, a statement of the objective of the report. Statements of the organizational problem and of the technical investigation help to make the purpose of the report clear. When you state your communication purpose, you are telling your readers how to respond to the report (Table 9). If the necessary actions don't occur, you haven't communicated. The statement of communication purpose is what motivates readers to respond.

Table 9. STATEMENTS OF THE COMMUNICATION PURPOSE

I therefore propose that ASBC introduce line-heating technology in our facilities. (This requests a decision.)

The attached Work Standard has been adopted for protection of fan coil units throughout the yard. (This tells how to perform an activity.)

This is a request for the United States Coast Guard to designate its representatives at the deadweight survey of Hull 324.... (This requests a response.)

The purpose of this memo is to request that you prepare documentation that will permit the incorporation of U.S. Navy standards for intermittent welding into the production of the SWATH-A-TSD. (This requests an action.)

We request a change in authorized vendor to White Heat Control Company. (This requests a decision.)

Therefore, the first paragraph of your report presents a purpose statement. The statement can be restricted to just the statement of communication purpose, or it can include statements of the organizational problem and technical investigation as well. If you present a complete purpose statement, make it succinct, as in the following example:

Atlantic Shipbuilding Corporation takes exception	organizational
to the incidents cited in SOSCO Quality Deficiency	problem
Reports TY-201-78-86-13 and TY-201-78-86-15	
(references a and b). The welding procedures	technical
were not in violation of ASBC Procedure Index	investigation
13B-455.90 (reference c). Accordingly, the contractor	communication
requests that these QDRs be retired.	purpose

A complete purpose statement tells your primary audience what you want done and why.

3. Conclusions and Recommendations

After you state the purpose of your report, you present the most important information. This part of the summary usually consists of conclusions and recommendations, but also can include bottom-line results, cost information, or schedule information.

This part of your report can summarize information presented in the discussion or analysis of the report itself or it can summarize information presented in the attachments, depending on the length of the report. In any report over a page long, as with the "Proposal to Introduce Line Heating Technology" (Figure 6, p. 30), this second paragraph should summarize the information that is presented in the report itself. In reports less than a page long, as with the "Request for Resolution of Radar System Exceptions" (Figure 9, p. 41), the second paragraph often summarizes information presented in attachments.

The conclusions and recommendations support your purpose statement presented in the first paragraph. The "Insulation Protection and Removal, Incident Response" report (Figure 11), states the conclusion of the investigation in the opening paragraph, as shown in the following excerpt:

The welding procedures were not in violation of ASBC Procedure Index 13B-455.90 (reference c).

This conclusion is supported by the argument in the second paragraph, which summarizes information in the enclosures:

The precautions addressed in Procedure Index 13B-455.90 apply to flammable materials. However, the specifications for the insulation installed in the SWATH A-TSD are that it be non-flammable. This insulation is MIL-I-631-E Type II, which is not flammable. Thus, Procedure Index 13B-455.90 does not apply to the incidents cited in SOSCO QDR TY-201-78-86-13 and SOSCO QDR TY-201-78-86-15.

These sentences focus on conclusions and interpretations of the technical information. They do not discuss technical detail. The sample report on "Request for Change in Vendor for Heat Exchanger" (Figure 12) also illustrates how an effective summary discusses only essential information and conclusions.

When you put the important information in the heading, purpose statement, and conclusions and recommendations at the beginning of your report, you enable readers to read efficiently. Most persons need to read no further than your purpose statement and conclusions and recommendations. No matter how many pages your report contains, you should summarize the most important information in the first two or three paragraphs.

This discussion of how to prepare a summary explained the principles that determine what information to present in the summary and presented

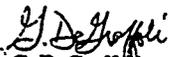
Atlantic Shipbuilding Corporation Huron River Yard Ann Arbor, Michigan 48014	
Supervisor of Shipbuilding New Construction, USN Cleveland, OH, 33715	File TY201-78 Date: 18 June 1986
Attention: K. Shower, Quality Assurance	
Subject: Insulation Protection and Removal, Incident Response	
References:	(a) SOSCO QDR TY201-78-86-13 (b) SOSCO QDR TY201-78-86-15 (c) ASBC, Procedure Index 13B-455.90
Enclosure	(1) "Effects on Insulation of Heat Due to Welding" ASBC Test Report W86-32N, 13 May 1986
<p>Atlantic Shipbuilding Corporation takes exception to the incidents cited in SOSCO Quality Deficiency Reports TY-201-78-86-13 and TY-201-78-86-15 (references a and b). The welding procedures were not in violation of ASBC Procedure Index 13B-455.90 (reference c). Accordingly, the contractor requests that these QDRs be retired.</p> <p>The precautions addressed in Procedure Index 13B-455.90 apply to flammable materials. However, the specifications for the insulation installed in the SWATH A-TSD are that it be non-flammable. This insulation is MIL-I-631-E Type II, which is not flammable. Thus, Procedure Index 13B-455.90 does not apply to the incidents cited in SOSCO QDR TY-201-78-86-13 and SOSCO QDR TY-201-78-86-15.</p> <p>However, the contractor recognizes that massive welding on one side of a bulkhead may deteriorate the insulation on the opposite side of the bulkhead. In such cases, the contractor removes and reinstalls the insulation on the opposite side of the bulkhead. This is done on a case-by-case basis. It is not done when the welding is minor, such as for tack-welding of brackets.</p> <p>These case-by-case determinations are based on a thorough study of the effects of welding on the opposite side of insulated bulkheads. A copy of this study, ASBC Test Report W86-32N, is enclosed.</p> <p>Thank you for your cooperation.</p> <p style="text-align: center;">  G. DeGraff SWATH Program Manager </p>	

Figure 11. Report Summary Focusing on Conclusions Rather Than Detail.

Atlantic Shipbuilding
MEMORANDUM

File No. 36-508
Date: 3 May 1986

To: Mr. R. Sweetman
Project Manager
Harbor Tugs Inc.
Baltimore, Md. 22002

From: C. Webster, Manager
Design Engineering, section
Atlantic Shipbuilding Corporation
Ann Arbor, MI 48104

Subject: Request for Change in Vendor for Heat Exchanger
ASBC Contract AD501-65:
OceanTug, Repair and Overhaul

Reference: **Appendix F, p. F-12.**

Enclosure: White Heat Control Company Bulletin 326D: Heat Exchangers

Contract equipment specifications for the ocean tug heat exchanger were written in terms of the Barfield Corporation product line. However, the current Barfield heat exchanger does not meet the precise specifications for this vessel. Specifically, the double-walled design specification is not met. We request a change in authorized vendor to White Heat Control Company.

The White Heat Control Company model H-1420 meets all of the design requirements for this heat exchanger. The technical specifications and cost data for this model are listed in the enclosed Bulletin. The cost differential is negligible.

If Harbor Tugs Inc. approves this change in vendor, please sign below and return this memo to us. We will then proceed accordingly. Thank you for your assistance.

C. Webster
C. Webster
Design Engineering, Outfitting

Approved: _____

Date: _____

cc: A. Vaslo, Chief Naval Architect
C. Frederick, Contracts
W. Loman, Purchasing

Figure 12. Sample Report Limited to Essential Information.

some guidelines by which to write the parts of the summary.

Most of the guidelines have been applied to sample reports that involve considerable writing, not to reports in standard format that contain little prose. However, the principles also apply to reports in standard formats. The “Request for Engineering Services” (Figure 3, p. 16) essentially is a selective summary of information. The format directly presents heading information, a purpose statement, and a conclusion. The “Minutes of meeting” (Figure 4, p. 20) has a complete basic structure, with summary and discussion, despite being formatted with several lines and boxes. The “Actions to be taken by:” item is the summary of the important conclusions of the meeting, which are explained in the “discussion” under the heading, “Meeting Topics.”

When you start writing your report, first think about these basic principles for determining what information to include in the summary. Then, apply them as appropriate. Above all, be direct and succinct.

5

Selecting Information for the Discussion

When you begin to write a report, you usually have a lot of information available. If you have done any analysis or calculations, such as determining the impact on trim and draft of ballast remaining in the engine room wing ballast tanks, you may have considerable technical detail. You might also have detail from the documents related to the hull, such as drawings, specifications, the contract, and Navy and ABS regulations. These documents usually are supplemented by memos, reports, and letters that provide background on the problem you are addressing. Related yard documents as well, such as procedures, minutes, and status reports, might also be available. In general, then, you have considerable information with which to work.

You now have to decide what information to include in your report. To do so, you must first determine the purpose of your report and needs of your various audiences. You must also keep in mind the principle: keep the report short and to the point. Don't immerse the reader in technical detail, although specific, precise technical detail is required.

Two general guidelines help you select detail. First, formulate the two, three, or four conclusions that will form the basic outline of your report. Use these conclusions to select the details that directly support them. Second, from the detail you select, present only the results of the analyses that support those conclusions. "Be specific on the subject" and "provide technical back-up for the report," as managers suggest. However, you can refer to or attach

background and supplemental information, including data and calculations. Leave irrelevant detail out of the report.

The report on "Ballast Tank Drainage" (Figure 2, p. 14) illustrates these two general principles. In the following excerpt, notice how the report presents only conclusions and results of calculations:

The Owner observes that there is no provision for complete drainage of the wing ballast tanks. Due to normal stem trim in service, a permanent wedge of water will be trapped because of the stepped design of the tanks.

This lack of full wing tank drainage is insignificant. The trim booklet calls for deballasting only at certain ports. The trim will be such that the total amount of ballast remaining will be 2.16 tons. The resulting change in trim and draft is so inconsequential that cargo carrying capacity will be unaffected.

Installing a means to provide for complete deballasting would incur unnecessary labor and material costs....

This information is very selective. For the details, it relies on another report titled "Defect 28-2X," a trim booklet, and a memo with trim and cost calculations. This memo on "Ballast Tank Drainage" presents the writer's thinking.

The functions of specific types of reports indicate other factors you should consider when selecting information. For the various problem-solving and administrative reports, you select different kinds of information.

1. Problem Solving Reports

These three types of problem-solving reports differ significantly in the kind of information they should include. Decision-making and recommendation reports present generalizations, whereas implementation reports present details.

1.1. Decision Making Reports

A decision-making report focuses on interpretation and judgment and presents conclusions that have been made about a technical problem or solution. In the report, specific results of technical analyses might support the interpretation and judgment. However, the report refers to most of the technical detail, while selective technical detail is attached. A decision-making report asks for a decision or communicates a decision to others. Thus, it usually is the result of prior communication, often oral, which provides a background and context that need only be referred to in the report. The principal persons involved have agreed that a problem exists and on the exact nature of the problem, or they have agreed on a solution. The report formalizes the decision and leads to actions implementing the solution.

A decision-making report usually has a diverse audience, so the report presents the conclusions in a form comprehensible to management and non-specialist audiences. It is addressed to persons who need to know of changes in design or construction, usually related to a specific hull, and of the implications of those changes. Because the decision-making report presents conclusions, it usually is short—often only one page.

The decision-making report should be direct and the content limited to the point at issue. The “Ballast Tank Drainage Report (Figure 2, p. 14) is a typical decision-making report.

1.2. Implementation Reports

An implementation report primarily presents detail. The detail is limited to that necessary and sufficient for a reader to make a change or take an action. The report succinctly states the reason for the change or the problem addressed, and does so in technical terms. Justification for the

change usually is unnecessary. For example, the “Engineering Change Notice” (Figure 13) has only five sentences or phrases of specific technical information.

The technical detail in an implementation report comes from standard documentation familiar to the readers. Therefore, although the detail is precise and complete for the topic of the report, you choose your detail very selectively. Background material and interpretation usually are unnecessary. The report refers to any supporting documentation, which is attached only when necessary for the readers.

The information in an implementation report is technical because implementation reports address engineers, specialists, and other staff professionals who are familiar with the subject and will take the necessary action.

1.3. Recommendation Reports

A recommendation report is similar to a decision-making report in that it addresses a problem and proposes a solution. However, it has significant differences that require a different focus. A recommendation report often initiates a decision-making process rather than relies on prior conclusions and communication. It requires a decision to be made rather than assumes that a decision has been made or will be made. A recommendation report requests a change in a policy or procedure rather than a change in a given design. Furthermore, it often applies to several contracts rather than to one contract in particular.

A recommendation report must be persuasive. It has to establish the criteria to support the recommendation. It presents an argument based on administrative or organizational information as much as on technical information, unlike the decision-making report that usually presents a technical argument. The “Proposal to Introduce Line-Heating Technology” (Figure 6,

Engineering Change Notice

Atlantic Shipbuilding

form TI-104

Originator: Design Engin.	Date: 6/14/86	ECN: RM-222	
Dept. Approval: <i>JM</i>	Dwgs: PR100-238 PR100-347	Hull No: 324	

Engineering Change
Rerouted hydraulic lines to hatches #1 and #5.

Drawing Changes

DWG. No. PR100-238

Added brackets 4191TC15, 16, & 27
4191PR19 & 20

Deleted brackets 4191PR08, 14, 16, 03, 04

DWG No. PR100-347

Added brackets 4191PJ22, 23, & 28

Deleted brackets 4191PT04, 14, & 18

REASON				MATL ENGIN APVL	Division Composite Signoff appvd <i>CB</i>	To be incorporated No <input type="checkbox"/> Yes <input checked="" type="checkbox"/>
CODE	SIZE	DESCRIPTION	QTY	MATERIAL	SPEC	REMARKS

DISTRIBUTION		APPVD	OWNER	ABS	USCG	SUPSHIP	
Administration	___	Design Engineering	___	Production/Planning	___	Owner	___
General Manager	___	Hull	___	Production	___	ABS	___
Marketing	___	Outfitting	___	Planning	___	USCG	___
Estimating	___	Technical	___	Material Control	___	SupShip	___
Contracts	___	Quality Assurance	___	Construction	___		
Purchasing	___	Quality Control	___	Welding	___		
Program Office	___			Trades/Shops	___		

page 1 of 5

Figure 13. Sample Implementation Report Containing Selective Detail.

p. 30) illustrates how a recommendation report focuses on interpretation and judgment rather than on technical detail:

Advantages of line heating for forming curved shell plating. By employing

line heating, we can eliminate the restrictions we now face in the forming of shell plating. The advantages of line heating are:

- 1) Increase in productivity, as seen in other U.S. shipyards (Attachment B).
- 2) Ability to accurately form shell plates with compound curvature (Attachment C itemizes parameters and dimensional control for plates on Hitachi Hull Y-14-2), which results in a cost savings.
- 3) Ability to fit curved parts to curved shell accurately with minimal force, which requires fewer man-hours than cold forcing.

.....

Implementation of line heating.

Most technical detail is omitted, and the report presents the management and administrative implications of the proposal. In this sample report, the section titled "Implementation of line heating" receives as much attention as the section titled "Advantages of line heating."

Therefore, a recommendation report includes the following information:

- 1 A convincing statement of the problem or a need for change.
- 1 A clear statement of the recommendation and the justification or support for the recommendation.
- 1 An outline of the organizational implications of adoption of the recommendation, such as cost implementation, schedule, departments impacted, contract, and bid.

Remember that the recommendation report presents this information as conclusions, not in detail.

2. Administrative Reports

Administrative reports present selected technical detail (or administrative detail if the subject of the report is an administrative procedure). Usually, the purpose of this detail is to inform readers, although it may signal or state necessary action. The type of detail presented varies among status reports, minutes, and procedures.

2.1. Status Reports

A status report summarizes the progress or status of a project. It summarizes decisions, activities, and changes rather than goes into technical detail.

Status reports present specific, quantitative information—data and results—usually without detailed analysis, explanation, or interpretation. The readers decide how they should act on the information in the report. The reports present facts of activities that occurred and compare these facts to the standards for those activities. They present decisions and actions as facts.

A status report provides specific information. The “Project Summary” status report (Figure 14) specifies the actions started and completed, and then compares the actual progress to the scheduled progress. Then the report itemizes the status of three critical work actions. It also includes a two-sentence comment, the only prose in the report.

A status report usually consists of the following types of information selected according to the purpose of the report

- A quantitative description of activities within a period or to date.
 - Decisions and actions within a period or to date.
-
-

Atlantic Shipbuilding Project Summary		Planning <u>L. Duke, Supervisor</u> <u>Scheduling</u>		
Project: SWATH A-TSD		Date: 17 June 1986		
Contract: TY201-78				
<hr/>				
Work Action Status As of 17 June 1986				
	<u>actual</u>	<u>scheduled</u>	<u>percentage</u>	
Work Actions (started)	101	140	72.1	
Work Actions (completed)	185	220	84.1	
<hr/>				
Delivery Date Status As of 17 June 1986				
	<u>actual</u>	<u>scheduled</u>		
Current progress	60%	65%		
Delivery date	October 9	September 28		
<hr/>				
Critical Work Actions As of 17 June 1986				
<u>Work Action No.</u>	<u>Description</u>	<u>Sch. Comp.</u>	<u>% comp</u>	<u>Req. Manowr</u>
380	Outfit block 1790	7-20-86	25%	32
291	Install heat exch.	6-19-86	78%	10
894	Rework piping	6-23-86	43%	15
<hr/>				
Comments: Reworking piping, WA 894, required some redesign. This was accomplished by the Design Engineering Outfitting Section.				
Distribution:				
S. Holmes (General Manager)		Production Engineering and Planning		
S. Guthrie (Asst. General Manager)		Design Engineering		
Contracts		Quality Assurance		
Program Office <u>Navy</u>		Production and Construction		

Figure 14. Sample Status Report Focusing on Information.

-
-
- 1 Decisions and actions that will occur.
 - 1 The plan or schedule for the next period.
 - 1 A framework of standards, expectations, schedule, or milestones.

Status reports usually are in standard formats. If you have to write a status report for which there is no standard format, devise an appropriate format that presents most of the information in tables or graphics.

2.2. Minutes and Trip Reports

Minutes and related types of reports document the results of a specific activity. This type of report should not be a transcript of that activity. If the details of the activity need to be documented, such as for legal or contractual purposes, the documentation should be done separately.

Present the framework of meeting minutes by the format, not in prose. The "Minutes of meeting" (Figure 4, p. 20) has standard headings. Even though these minutes are on a generic memorandum form, they look as if they are in a standard form specifically designed for minutes.

The heading information of meeting minutes should have the standard file and reference information the subject, place, and date of the meeting; the participants (and missing participants if relevant) by name and role; and a distribution list. The background information should be selective, but includes the purpose of the meeting, the importance or organizational implications of the meeting, and the agenda or topics of the meeting if they aren't clearly itemized in the discussion.

The minutes summarize important information. They state the important conclusions, decisions, agreements, solutions, and actions required. They present the bottom-line results of discussions only they do not present

the details. Meeting minutes present supporting detail only when necessary for the readers to understand or accept a conclusion, decision, or action. Any detailed documentation required for the readers to understand or to implement decisions and actions is attached. Specific references and documentation are keyed to specific items.

The term “minutes” implies a report that you write after a group meets in a conference room. However, similar documents include reports of several related activities: a telephone record, a trip report, a sales contact report, a summary of a contract, highlights of a document, a conference record, and even announcements of a meeting. You select information for all of these kinds of documents according to the same criteria.

2.3. Procedures and Instructions

The primary purpose of a procedure is to provide specific information so that the reader can perform an action. However, a secondary purpose is to inform others, such as supervisors, of the action to be performed. Thus, a procedure presents specific details and actions as well as incorporates general information. Both kinds of readers need to know the purpose of the procedure to perform it or have it performed effectively.

The “Procedure to Protect Fan Coil Units” (Figure 15) is in two sections: a cover memo with the general information and a “work standard” with the specific information. The information on the work standard sheet is quite limited, giving the reader selected information about each action in the procedure.

Procedures include five types of information

- Ž A statement or explanation of the purpose or function of the procedure. This statement often includes an explanation of the output or results of the procedure.
-
-

Atlantic Shipbuilding MEMORANDUM		
To: Construction Engin. Material Control	Trades and Shops Quality Assurance	Date: 8 June 1986
From: L. Hernandez/# Dept. Production and Construction		File: 10-28E
Subject: Procedure to Protect Fan Coil Units		Page 1 of 1
		Contract: Generic

Recently, corrosion in fan coil units in the production staging area has caused concern. Henceforth, all units stored in the open should be protected from rain and moisture. The attached Work Standard has been adopted for protection of fan coil units throughout the yard.

Work Standard #A5-23/10 is issued to alert all shops and trades to the procedure for protection Fan Coil Units. It explains when and how to protect these units. Material Control is responsible for assuring that all units released to Construction are adequately protected.

Supervisory personnel should review this WS with the affected trades and shop personnel at the next Work Procedure meeting.

Attachment Work Standard, A5-23/10

Distribution

S. Guthrie (Asst. General Manager)	Electricians
Shipfitters	Machinists
Joiners	Pipefitters
Sheetmetal Workers	Tool Room
Riggers	Transportation
Laborers	Crane Operators
Painters	
welders	

Figure 15. Sample Procedures With Cover Memo (1 of 2).

Atlantic Shipbuilding Work Standard	form ST-78 Subject: Fan Coil Unit Protection No. A5-23/10 Date: 23 June 1986 Page: 1 of 1
<p>1.0. Purpose</p> <p>This work standard presents a procedure for protecting fan coil units from corrosion.</p> <p>2.0. General</p> <p>21. The fan coil units are designed for indoor use. They should not be exposed to rain and moisture without proper protection.</p> <p>22. Material Control is responsible for assuring that all units released to Construction are adequately protected against moisture damage.</p> <p>3.0. Action</p> <p>3.1 All fan tail unite to be transported and stored in the open must be covered to protect against rain end moisture.</p> <p>3.2 Unite must be covered prior to removal from the warehouse. Plastic (4 mil min.) or similar wrapping material should be used.</p> <p>3.3. Temporary storage sites at assigned production staging areas must be above standing water levels.</p> <p>3.4. Units must be examined during regular preventive maintenance to assure continued protection. Any damaged covering must be replaced.</p> <p>3.5. Units must remain covered against moisture until they no longer are exposed to weather conditions. UNITS MUST REMAIN COVERED WHEN REMOVED FROM THE PRODUCTION STAGING AREA AND TAKEN TO THE CONSTRUCTION AREA.</p> <p>3.6. Quality Assurance is responsible for inspection of fan coil unit protection in the production storage area.</p>	
<p>Issued by: <u>L. Hernandez, Production and Construction</u></p> <p>Approved by: <u>V. White, Quality Assurance</u></p>	

Figure 15. Sample Procedures With Cover Memo (2 of 2 pages).

-
-
- A statement of the distribution of responsibilities of the persons involved in the task.
 - Statements and explanations of any warnings and precautions to be observed in performing the task.
 - Descriptions of any equipment and explanations of any terms and concepts necessary to use or know before performing the task.
- Ž Specific instructions on how to perform the procedure.

Although procedures are routine reports, they can be difficult to write. When you write a procedure, your purpose is to present specific instructions on how to perform the procedure. You also need to present other information so that the reader can perform the procedure efficiently. As a writer, you constantly are making trade-offs between supplying detail so that the reader understands and eliminating detail so that the actions are not obscured. Effective formatting, as with “Procedure to Protect Fan Coil Units,” is one device to use to resolve the conflict between the need for detail and the need for limited detail.

To select information for the discussion of your report requires you to understand the function of the report you are writing. You select the information according to criteria suggested by whether the function of the report is to solve a problem or to communicate administrative information. Additional criteria are suggested by the specific type of report it is, as discussed in this chapter. The basic structure of your report establishes divisions that also suggest criteria for selecting information, as with the “Procedure to Protect Fan Coil Units” report.

However, the basic principle is simple: be selective.

6

Organizing the Discussion

After you establish the basic structure and select your information, you must decide how to organize the information. According to managers in shipyards, many writers do not organize the information in the discussion very clearly. "The logic needs to be clear. You need to walk the reader through it. Too often the engineer's mind is way out ahead of the reader, and all over the map." The following guidelines explain how to organize the information in your discussion according to the purpose of your report. Just as you design a ship, you design a report according to its mission.

The information you select for your report can generate possible means of organization. Some information has an inherent order based on its source, such as the agenda for a meeting or a list of project status items. Some information has an order based on the content such as an investigation or trip. You usually can arrange a set of information in several ways.

However, you do not necessarily organize the information according to the content, such as by a numbered sequence of work actions. To organize the information, you should first consider the purpose of the report and how the readers will use the information. Furthermore, you usually do not organize the information according to what you did such as how you went about collecting and analyzing the information. If you find yourself putting stars next to information or making comments in the margin to draw the reader's attention to important information, then you may have arranged the informa-

tion inappropriately.

The report is not a story: it is an action item. You should organize the information according to the purpose of the report. Technical reports have repetitive or familiar patterns by which writers arrange the information in the various parts of their documents. You even arrange your paragraphs according to these patterns. Most ship yard reports can be organized according to one of four primary patterns of organization

Problem and Solution

Persuasion

Analysis

Process

You might also encounter and use other patterns, such as cause and effect or investigation.

When you use these familiar patterns to select and organize information, writing reports will be easier and more efficient. Your reports will also be easier for readers, because the patterns are also familiar to them.

You should arrange problem-solving reports according to a problem and solution pattern or a persuasion pattern. The purpose of most decision-making reports is to resolve non-routine problems. They present a solution to be implemented or they recommend a solution to be approved. If the purpose of a decision-making report is to request a decision, the report might need a straightforward persuasive pattern. A recommendation report typically takes a persuasive approach.

Implementation reports usually are action-oriented. Because their purpose is to implement changes in the design and construction process, many implementation reports also are arranged according to a problem and solution

pattern. However, the purpose of some implementation reports is to provide information. When implementation reports are primarily informational, you should arrange them according to an analysis pattern.

The purpose of administrative reports, except for procedures, usually is to provide information. Therefore, you should arrange status reports and meeting minutes according to an analysis pattern. You should arrange procedures and instructions according to a process pattern.

1. The Problem and Solution Pattern

You use a problem and solution pattern to show that you have solved a problem or to implement a solution to a problem.

The basic problem and solution pattern follows an outline which you can adapt to any specific situation (Figure 16). You summarize the problem, state the criteria or specifications for a solution, and then present the solution. To explain the solution, you might need to introduce a subpattern, such as cause and effect or persuasion. To complete the argument for the solution, you also might have to dismiss plausible alternative solutions or discuss implementation of the solution to prove that it is feasible.

The “Ballast Tank Drainage” report (Figure 2, p. 14) illustrates the problem and solution pattern. The summary paragraph opens the report, and the second paragraph summarizes the problem:

The Owner observes that there is no provision for complete drainag of the wing ballast tanks. Due to normal stern trim in service, a permanent wedge of water will be trapped because of the stepped design of the tanks.

The third paragraph argues the solution, in this case that no action is needed:

This lack of full wing tank drainage is insignificant.

PROBLEM AND SOLUTION PATTERN

<i>1. Problem</i>	Statement of the problem or issue.
<i>2. Criteria</i>	Criteria or specifications for the solution.
<i>3. Solution</i>	Explanation of the solution, which often has a subpattern, such as cause and effect.
<i>4. Alternatives</i>	Dismissal of alternatives, if necessary.
<i>5. Implementation</i>	Discussion of implementation so that it can be done. If implementation is part of the argument for the solution, it is the final point of step 3.

Figure 16. Problem and Solution Pattern Outline.

The next paragraph argues against the alternative, “complete debal-
lasting would incur unnecessary labor and material costs,” and restates the
conclusion, which essentially is a negative implementation item “no action
is warranted.”

Implementation reports often follow truncated problem and solution
patterns. That is, they don’t need much detail and they don’t need to be
persuasive. Their purpose is to implement changes. The “Request for
Engineering Services” (Figure 3, p. 16) follows a straightforward problem-
solution-implementation format. The “Problem Correction Report” format
(Figure 17) also follows the problem and solution pattern.

The problem and solution pattern has the additional advantage of not
only stating what you did but also stating why you did it. It explicitly relates
an action—a change or a decision—to the reason for the action.

2. The Persuasion Pattern

You use a persuasion pattern to support and justify a recommendation
or request.

The basic persuasion pattern (Figure 18) follows an outline that you
adapt to the purpose and audiences for any specific report. First state the
primary conclusion on which the recommendation or request is based, and
present the appropriate details. If necessary, you also summarize the problem
which the recommendation or request addresses or you specify the criteria,
specifications, or premises on which you base your argument. Then you
present the primary support for your conclusion. Present the support in
descending order of importance—most important point first. Limit the
support to primary justification, not incidental justification—perhaps no
more than three significant reasons.

After you support your conclusion, you might have to anticipate and

Construction and Production Engineering
Problem Correction Report



form TO-99

Contract No.	Drawing No.	Part No.	WP/SN No.
N-001/006	K1-550	A-9000 series	845
Problem Description		Corrective Action Required	
Part numbers A-9000 to A-9200 were in excess of required length by 1.25 inches.		Parts were cut to proper length.	
Sub-plan does not show to hold 1.25 in.		Revise <i>sun-plan</i> .	
fwd. end.			
<i>RM 6/12/86</i>			
Remarks		Corrective Action Taken	
Contacted Mold Loft 6/12/86		Correct dimension was added to sub-plan.	
Signed <i>Bruce Moore</i> Date <i>6/12/86</i> Signed <i>[Signature]</i> Date <i>6/28/86</i>			
Distribution:			
Mold Loft	<input checked="" type="checkbox"/>	Welding	<input type="checkbox"/>
Quality Assurance	<input checked="" type="checkbox"/>	Trades/Shops	<input type="checkbox"/>
		Production Eng.	<input checked="" type="checkbox"/>
		Material Control	<input type="checkbox"/>
		Planning	<input type="checkbox"/>
		Design Eng.	<input type="checkbox"/>

Figure 17. Sample Implementation Report Using a Problem and Solution Pattern.

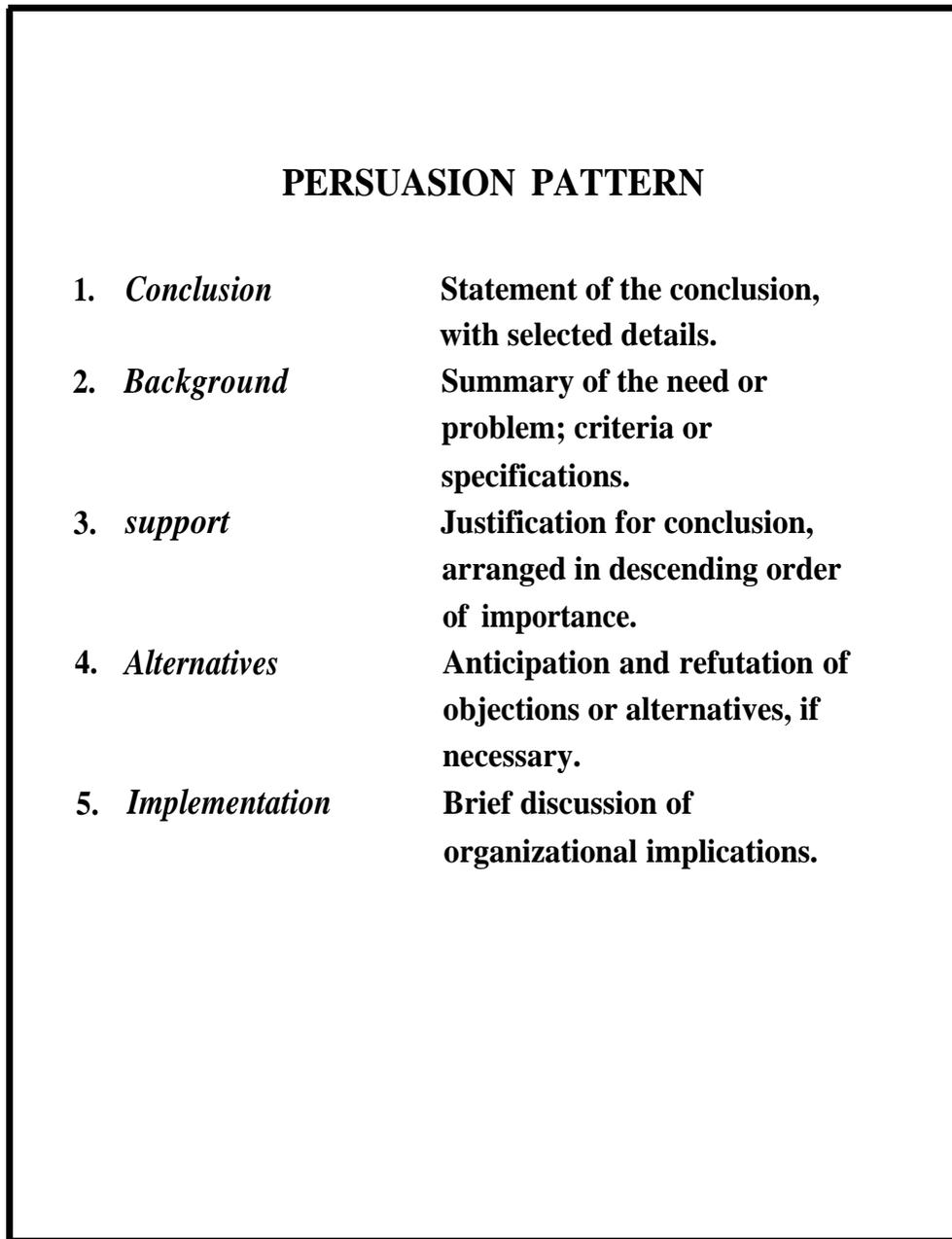


Figure 18. Persuasion Pattern Outline.

refute objections or alternatives to your argument. This, of course, depends on how you anticipate your readers will respond to your argument. You conclude with a brief discussion of what will happen when the recommendation or request is approved. This step is especially important with recommendations to management. In some recommendation reports, the “implementation” section is a discussion that implies that the recommendation is organizationally and economically feasible.

The “Proposal to Introduce Line-Heating Technology” (Figure 6, p.30) illustrates the persuasion pattern in a recommendation report. After the purpose paragraph, which states the recommendation, thereport follows this pattern:

1. Line heating technology will (1) increase our productivity and (2) facilitate more complex shell-
2. Limitations of cold - forming technique
3. Line -heating technology
4. Advantages of line heating for forming curved shell plating.
5. Implementmn of line heating

The second paragraph, item 1 on the outline, summarizes the conclusions in favor of line-heating technology. The second item, “Limitations of cold forming technique,” states the problem the recommendation addresses. Notice that this statement of the problem introduces some criteria for the justification.

The third item “Line-heating technology,’ is a variation on the persuasion outline. It provides background information and defines line-heating technology. The fourth item, “Advantages of line heating:’ presents the support for the recommendation, in descending order of importance. (This

item presents more than three points of support but the eight points perhaps could have been grouped under three or four main points.)

The final section of the report “Implementation of line heating;” discusses the organizational implications of the recommendation. This report does not anticipate or refute objections or alternatives.

Several of the other sample reports in this manual also have persuasive patterns. The “Insulation Protection and Removal” report (Figure 11, p. 54) presents a deductive argument in support of the recommendation. It then anticipates an objection and, in fact, devotes more attention to the anticipated objection than to the positive argument. The report does so because the writer anticipated the primary audience’s actual concern.

The “Request for Change in Vendor for Heat Exchanger” (Figure 12, p. 55) has an elliptical persuasion pattern. It summarizes two points of support—that the proposed model meets design requirements and has negligible cost implications. The report concludes with a statement explaining how the reader can approve the recommended change.

You should consider a persuasive pattern for certain reports. Don’t use an informative approach when the purpose of your report is to persuade. As one engineer said “you have to sell the results of your project—from the waterfront to the president.”

3. The Analysis Pattern

When you use an analysis pattern, you explain a concept by breaking it down into its components.

The analysis pattern usually consists of two items: an overview of the concept or object under analysis and a point-by-point presentation of the components of the whole (Figure 19). If your report is analyzing an object, you often introduce a figure or graphic before the point-by-point explanation.

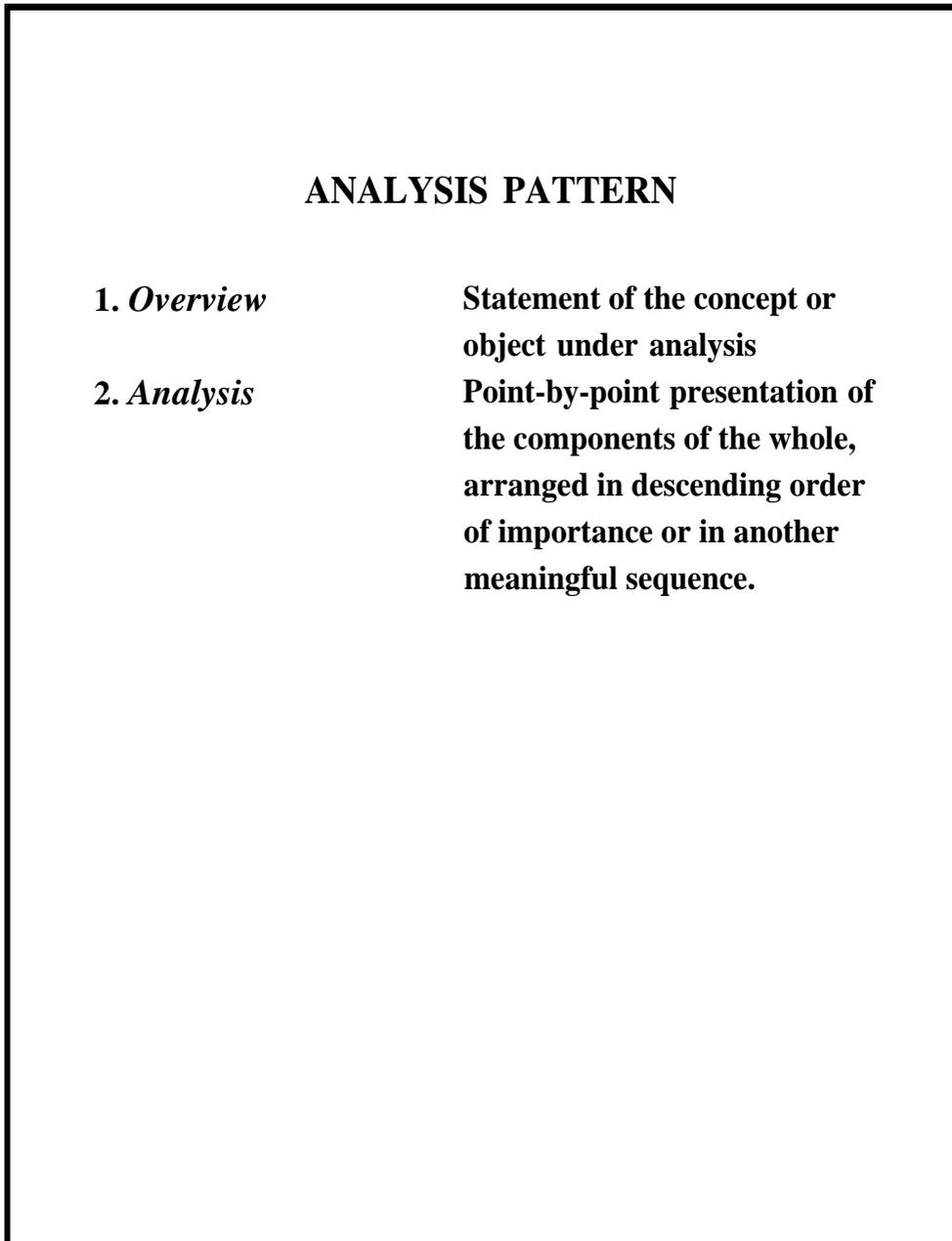


Figure 19. Analysis Pattern Outline.

With this pattern, the point-by-point presentation is either in descending order of importance or in some other meaningful sequence. A typical alternative sequence is an order based on a logical relationship among the parts, such as an explanation of the arrangements of a ship.

The “Request for U.S. Coast Guard Representatives...at Deadweight Survey” report (Figure 20) illustrates the analysis pattern. After the purpose statement, the report presents three types of information in descending order of importance. First, it presents an overview of the survey: “The deadweight survey will determine...gravity.” Then it presents schedule information covering the week of February 11 to 15. Finally, it presents the location of the survey.

Other sample reports in this manual also illustrate the analysis pattern. The “Minutes of meeting” (Figure 4, p. 20) is arranged according to the categories of meeting topics, based on the order of discussion at the meeting. The writer could have arranged the topics according to their importance, with the action items first.

The “Engineering Change Notice” (Figure 13, p. 61) presents details about engineering and drawing changes, with the analytic pattern designed into the report format. The “Request for Documentation to Introduce Intermittent Welding” (Figure 8, p. 37) also seems analytic, despite its persuasive purpose. The details essentially summarize an analysis of how Navy specifications for intermittent welding differ from ABS specifications.

The “Status Report” (Figure 14, p. 64) presents information in three categories. This report presents the information from general to specific, which might not correspond to decreasing order of importance, depending on the reader. The section titled “Work Action Status” summarizes the progress of all of the work actions, and seems to be the most general information. “Delivery Date Status” summarizes the progress against the delivery date, which is still general information. However, the “Critical Work Actions”

Atlantic Shipbuilding Corporation		
Huron River Yard		
Ann Arbor, Michigan 48014		
Design Engineering		Mail Stop C184
<hr/>		
February 6, 1987		
Commander (mmt) Third Coast Guard District Governors Island New York, NY 10004		
Attn: Lt. P. Jackson		
Subject: Request for U. S. Coast Guard Representatives at Deadweight Survey of S.S. Johnson, ASBC Hull 324		
Ref: Contract No. SB-324-02		
Attachment: Instructions for Deadweight Survey: S.S. Johnson		
This is a request for the United States Coast Guard to designate its representatives at the deadweight survey of Hull 324 to be conducted by Atlantic Shipbuilding Corporation the week of February 11, 1987.		
Purpose of Survey. The deadweight survey will determine the lightship weight and the location of the longitudinal center of gravity. As previously agreed upon, the vertical center of gravity will be assumed to be that of sister vessel, Hull 323. The vessel will be as nearly upright and complete as possible at the time of the survey (see attachment for detailed survey instructions and activities).		
Survey Schedule.		
0800 Monday, 11 February 1987	Start inspection and signing off of tanks.	
0900 Wednesday, 13 February 1987	Start dunnage survey.	
0900 Friday, 15 February 1987	Reading of drafts and checking of dunnage sheets.	
Survey Location. Left Bank Basin, Huron River Yard, ASBC.		
Your comments on the procedure would be appreciated.		
Sincerely,		
 Robert Young Section Chief Design Engineering		
xc: General Manager, Mail Stop A123 Program Manager, Mail Stop A234 Contract Administrator, Mail Stop A 202 Chief Naval Architect, Mail Stop C150 Yard Superintendent, Mail Stop G21 Hull Superintendent, Mail Stop G13 Rigging Department Superintendent, Mail Stop F12 Mr. Paul Adler, Owner's Representative, Hurst Shipping Company		

Figure 20. Sample Implementation Report Illustrating the Analysis Pattern.

section contains specific information about three items. The “Comments” section also presents several details.

When you use the analytic pattern, you need to group your details logically and then arrange the groups according to the principle most appropriate for your purpose.

4. The Process Pattern

You use a process pattern to explain a sequence of events or actions.

Reports that follow a process pattern can be difficult to write because you are tempted to immerse your readers in details without providing them with a clear idea of the overall flow of the details. Thus, you should present process information according to the items in the process pattern outline (Figure 21).

Start a procedural report by stating the objective of the procedure. This statement is a functional overview—a statement of the purpose or output. It also identifies the basic stages of the procedure. When readers understand the purpose and the basic stages, they are less likely to get lost in the details.

Next, present important background information. This material can consist of various types of information presented analytically, such as an overview of the method a statement of any warnings or precautions, a description of the equipment or tools necessary, an explanation of the theory or concepts necessary to understand the process, and an explanation of the distribution of participants’ responsibilities. You present this information second so that you don’t have to interrupt your step-by-step explanation of the procedure itself. (You should interrupt the explanation of the procedure only with specific warnings and precautions, for safety and product liability considerations.)

Finally, you present a step-by-step sequence of actions necessary to

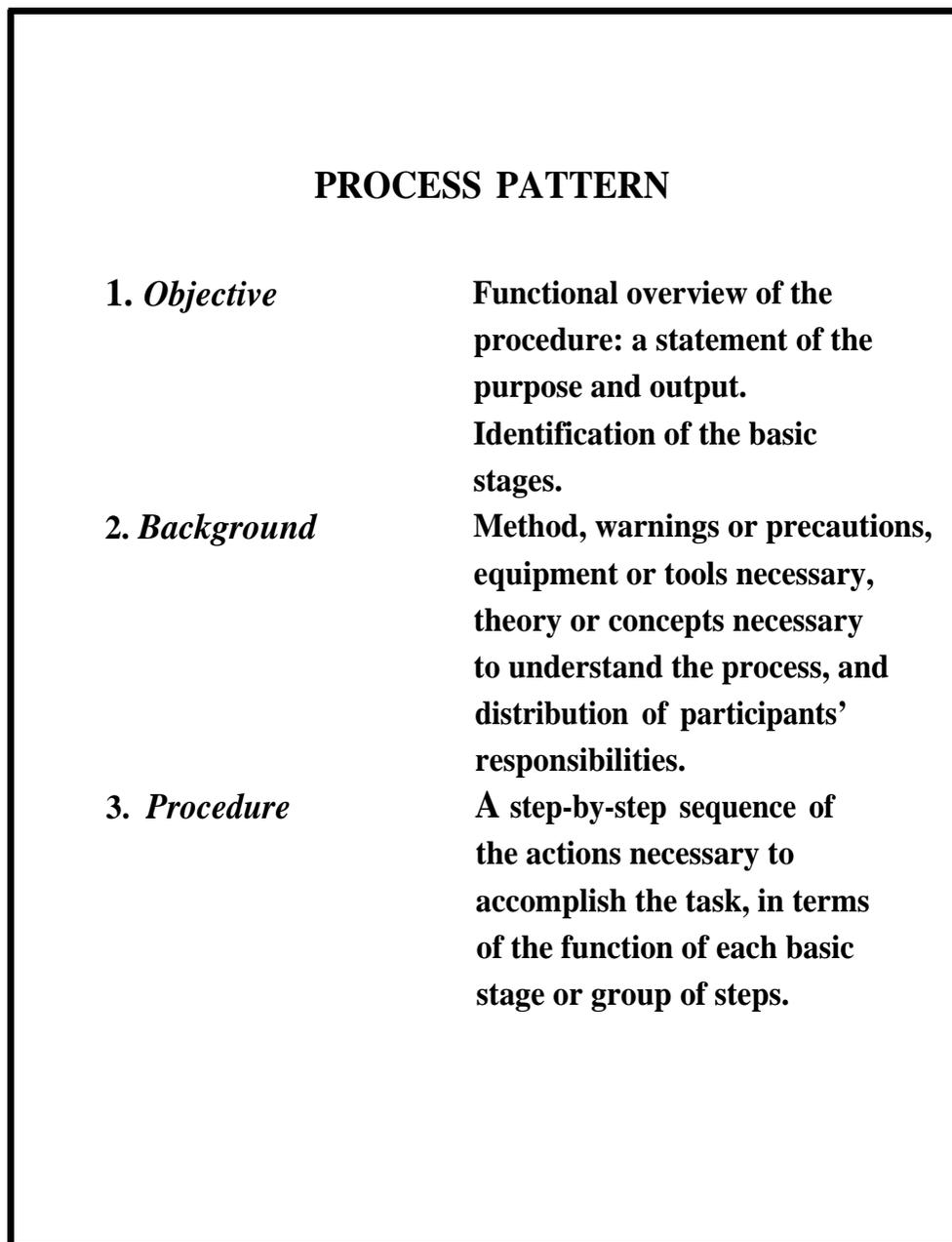


Figure 21. Process Pattern Outline.

accomplish the task. You should present this step-by-step sequence in terms of the basic stages first introduced. This approach often forms mini-process patterns. That is, each stage or group of steps often has its own objective, background, and step-by-step sequence structure.

The "Fan Coil Unit Protection" procedure illustrates the process pattern (Figure 15, p. 67). The procedure itself follows the outline:

- 1.0. Purpose
- 2.0. General
- 3.0. Action

The "Purpose" section states the objective of the procedure with direct problem and solution statements. The "General" section presents general information. The "Action" section then presents the step-by-step sequence of actions that the reader must take. Although these six steps are not broken down into stages, they could be. The first two steps discuss wrapping the unit before removing it from the warehouse. The next four steps discuss caring for the unit at the staging area. The sixth step is a generalization similar to 2.2. It could have been included under "2.0. General" or made a separate 4.0. section.

You use a process pattern in a report that tells someone how to do something or explains how an object functions. If you need to explain what you did which is rare, you use the investigation pattern explained on the following pages.

5. Other Patterns

In addition to these four patterns, you occasionally need to use other

patterns in technical reports. Two of these other patterns are cause and effect and investigation. As with all of the patterns, you can use the cause and effect and the investigation patterns for an entire report or for sections or even paragraphs of a report.

You use a cause and effect pattern to explain the causes of an effect or to state the effects of an action. That is, you are arguing a cause or predicting an effect.

The cause and effect pattern has the following outline:

1. Statement of the issue and the conclusion.
2. Analysis of causes or effects in descending order of importance or probability.
3. Anticipation or refutation of alternative possibilities.

You would use a cause and effect pattern to argue that the effect of trapped ballast would be negligible, for example, as in the following paragraphs:

The consequences of carrying an additional 2.78 tons of ballast would be negligible. This would increase the immersion of the ship by .007 inches and would increase the aft trim by .056 inches. These insignificant changes in draft and trim would not be detectable during loading operations. Thus, there would be no loss of cargo carrying capacity as a result of the trapped wedge of water.

To incorporate piping to dispose of the trapped water would entail a significant amount of labor and material. The owner proposes-

The first paragraph forms a cause and effect pattern. Additionally, the “refutation of alternative possibilities” paragraph also uses a cause and effect pattern to explain the effects of two alternatives the owner proposes.

The cause and effect pattern is a variation of the persuasive pattern. As

such, you will use it frequently in various sections of your reports.

You use the investigation pattern to document the results of a test or an analysis. This pattern has the following outline:

1. Objective of the investigation.
2. Background and specifications.
3. Equipment and methodology.
4. Presentation of results.
5. Analysis of results.
6. Conclusions of the analysis.

A test report on welding on the opposite side of insulated surfaces, for example, would open with the scope of the test. Then it would present the test assembly, the welding process, the equipment and the material specifications. The detailed discussion would present the results of the tests to draw conclusions about the effect of welding on the opposite side of insulated surfaces.

Most professionals are familiar with the method of investigation pattern. However, you will use it only occasionally because the purposes of most reports suggest that the readers don't need to know how you performed an analysis. All they want to know is the result of your analysis.

Information that you organize effectively complements information that you select effectively. An appropriate pattern of organization suggests some information you should select as well as some information you should omit or deemphasize. When you organize your report effectively, your reader can read efficiently as well as selectively.

To organize information effectively, don't tell the reader what you did tell the reader what to do or what he or she needs to know. An effective organization makes a report functional.

7

Designing and Revising Paragraphs

When you have mastered the basic principles of report design, you will be able to produce a reasonably coherent and focused rough draft. However, you still may have a way to go to satisfy a manager. The effectiveness of your reports depends on how well you revise, edit and format them. In these later stages of the report writing process you must pay particular attention to paragraphs and sentences.

Effective paragraphs make your reasoning clear to the reader. In fact, some managers comment that the “biggest need is at the paragraph level.” They urge you to break your ideas down “into small clusters” of points and to avoid long, run-on paragraphs that are difficult to read. Their point is well taken. A rough draft is likely to contain rambling paragraphs which cause your readers to think that your reasoning is fuzzy or confused.

We have some suggestions for writing and revising paragraphs. You can apply these as you are writing your rough draft. And you can apply them systematically when you revise your rough draft.

1. The Paragraph

The paragraph is a group of sentences organized to express a central idea. It is a conceptual unit with two basic characteristics: it has a central idea, and the sentences are organized to explain this central idea. For example, in

the following paragraph, the first sentence states the main idea and all of the other sentences develop and support that idea:

Intermittent welding specifications for aluminum and steel for Naval Surface Combatant Ships differ from ABS specifications in several respects. The Navy requires that the minimum volume of intermittent fillet weld material be identical to the minimum required volume of continuous fillet weld material. For example, with Navy specifications the volumes of intermittent welds for a non-structural bulkhead stiffener and for an aluminum stiffener are 75% greater than with ABS specifications, not counting any additional end welds. In addition, the Navy requires significantly more double continuous end welding than does ABS. The Navy specifications also differentiate between various strength steels.

To signal the boundaries of this unit, the sentences are separated from the surrounding text by spacing or indentation.

A paragraph in a technical document often has an additional characteristic: it is formatted as a “paragraph cluster.” The conceptual paragraph is broken down into a set of smaller units formatted as individual paragraphs, some of which consist of a single sentence. A paragraph cluster is simply a conceptual paragraph formatted so that the reader can identify the central idea and the supporting information efficiently.

For example, the paragraph above could be formatted so that the reader could quickly spot the central idea and follow the explanation efficiently. Formatted as a paragraph cluster, the paragraph scans easily

Intermittent welding specifications for aluminum and steel for Naval Surface Combatant Ships differ from ABS specifications in several respects.

The Navy requires that the minimum volume of intermittent fillet weld material be identical to the minimum required volume of continuous fillet weld material. For example, with Navy specifications the volumes of intermittent welds for a non-structural bulkhead stiffener and for an aluminum stiffener are 75% greater than with ABS specifications, not counting any additional end welds.

The Navy requires significantly more double continuous end welding than does ABS.

Navy specifications differentiate between various strength steels.

This format isolates the central idea as well as the three items of supporting information.

2. Guidelines for Writing and Revising Paragraphs

Guidelines for writing and revising paragraphs (Figure 22) address the core idea or generalization, the organization of the information explaining the generalization, the sentences, and the formatting.

2.1. Formulate the Topic Sentence

You should formulate a topic sentence for each conceptual paragraph to state its central idea. Although this seems self-evident, paragraphs in technical documents often lack topic sentences. The writer presents the particulars, but leaves it to the reader to draw his own conclusion about what the main idea is. For example, the following paragraph lacks a topic sentence:

The drawing calls for A-12 collars when B-12 collars are all that is required. The difference between them is that A-12 is welded tight to the plating while B-12 has a one inch gap. The advantage of the gap is that it permits drainage of rain water during construction. As a temporary fix, it probably will be necessary to cut drain holes in the transverses to allow drainage during construction.

Perhaps the writer felt that the main idea was obvious, or perhaps he simply did not want to “stick his neck out” Regardless, he stopped short of stating the point of the paragraph:

GUIDELINES FOR WRITING AND REVISING PARAGRAPHS

- 1. Formulate the core idea or generalization in a “topic sentence.”**
- 2. Place the topic sentence at or near the beginning to provide an overview.**
- 3. Arrange the particulars according to a logical and appropriate pattern.**
- 4. Maintain effective subject focus and subject - verb - object relationships.**
- 5. Use transitions and other devices to move clearly, logically, and smoothly from sentence to sentence.**
- 6. Format the paragraph or paragraph cluster for efficient reading.**

Figure 22. Guidelines for Editing Paragraphs

The collars in the transverse frames were misdesigned, which results in standing water after rain.

This generalization, which should have been the first sentence in the original paragraph, states the conclusion that the particulars explain.

When you revise paragraphs so that they each have a topic sentence, you often have to break up a paragraph into several paragraphs. Rough draft paragraphs frequently contain several important ideas, each of which deserves its own paragraph

To assure proper protection, the face piece fit shall be checked by the employee each time he puts on his respirator. To check the respirator, he should place his hand over the discharge valve and exhale. The face piece should not leak air. Appropriate supervision shall periodically check the respirator fit of all employees. If an improper fit is observed, the employee shall be removed from the work area by his supervisor until a proper fit is attained and demonstrated to the supervisor. Proper maintenance, cleaning, and storage are as essential as selecting the respirator for a proper fit. Failure to follow through on these parts of the program makes the respirator protective devices worthless and, in fact potentially dangerous. A poorly maintained respirator gives a false sense of security to the user.

This paragraph should be broken up into at least two paragraphs. The content suggests several topics: what the employee should do; what the supervisor should do; how to select the proper respirator and ensure a proper fit; how respirators should be maintained.

Without a topic sentence, the reader has difficulty in interpreting the passage. For example, who is responsible for the maintenance program, the employee or the supervisor? Formulation of a topic sentence helps the writer clarify his thinking and enables the reader to get the intended message.

2.2. Put the Topic Sentence First

Once you have formulated your topic sentence, you should place it at the beginning of the paragraph. Frequently this is merely a matter of moving a topic sentence from the end of the paragraph to the beginning. Writers often end with the topic sentence because that is how they think in writing the rough draft. Instead of starting with a generalization, they start with the particulars and work up to a generalization.

For example, in the following rough-draft paragraph the topic sentence comes near the end of the paragraph. Thus, revision is a simple matter of moving the sentence to the front and editing the transitional phrases as necessary

Previously, the carriers we have delivered to ACL had provisions for water-washing of all of the ventilation air entering the machinery space and quarters in order to remove dust particles. The owner did not realize that such scrubbing equipment had been installed on the previous carriers, and is not certain that they are desirable on the proposed vessel. He has instructed us to omit any provisions for scrubbing equipment on the proposed vessel. If at a later date he decides that ventilation air scrubbers are desirable, he will request a price quotation.

In this paragraph, the topic sentence is:

The owner has instructed us to omit any provisions for ventilation air scrubbing equipment on this vessel.

With this sentence as the topic sentence, the remaining three sentences can be left in their current order:

The owner has instructed us to omit any provisions for ventilation air scrubbing equipment on this vessel. Previously, the carriers we delivered to ACL had provisions for water-washing of all of the ventilation air entering the machinery space and quarters in order to remove dust

particles. However, the owner did not realize that such stubbing equipment had been installed on the previous carriers. He is not certain that they are desirable on the proposed vessel. If at a later date he decides that ventilation air scrubbers are desirable, he will request a price quotation.

Only minor changes for transition and continuity are required.

When it appears first the topic sentence establishes a general-to-specific structure. It provides a generalization which enables the reader to understand and interpret the details. Usually, the topic sentence is the first sentence of a paragraph. Occasionally, it is the second sentence, with the first sentence providing a transition from the preceding paragraph or section.

2.3. Arrange the Particulars

After you have clarified your central idea and formulated your topic sentence, you arrange your particulars according to a logical and appropriate pattern. Most paragraphs are organized according to one of the patterns discussed in the previous chapter, “Organizing the Discussion.” In paragraphs, these patterns just assume an abbreviated form. For example, the “Intermittent welding requirements” paragraph illustrated above has an analysis pattern. The topic sentence says that Navy specifications differ from ABS specifications. The paragraph then details three differences.

The following paragraph has a persuasion pattern:

A physical-chemical plant seems inappropriate for the Hospital Ship. This system would require the storage and replacement of large quantities **of two types of chemicals that could be burdensome, especially when the ship is deployed.** It would also require sludge storage whenever the ship is **within territorial limits, which would often be the case.** **However, the plant is a small unit with modest power requirements.**

This pattern is often used when trade offs among several options are evaluated.

(This paragraph was part of a larger persuasion pattern in which the advantages of an electrocatalytic plant were argued against the disadvantages of a physical-chemical plant and of a biological plant.)

Similarly, you can use all of the other patterns mentioned in the previous chapter to organize paragraphs: problem and solution, process, cause and effect, and investigation.

2.4. Establish Appropriate Sentence Structures

After you have provided a topic sentence and established an effective pattern, you edit your sentences to fit the pattern. This is a matter of establishing appropriate subject focus or logical subject- verb- object relationships.

To establish appropriate subject focus you examine the grammatical subjects of the sentences to assure that they are consistent with the topic of the paragraph. In the following paragraph, for example, the topic is “intermittent welding.” However, the subjects of the sentences stray from the main idea

Intermittent welding has important advantages. Most significant are the economic advantages. Intermittent welding uses 10-25% less labor in the welding proces. Also, considerably less distortion is produced in the plating, and consequently much less locked-in stress. The distortion can be removed by flame straightening, but at an additional cost. In addition, there are fewer feet of intermittent weId to inspect, generally resulng in a more thorough inspection. Finally, the larger welds are easier to make and have better penetration and soundness.

The topic sentence is about “intermittent welding;’ but the following sentences jump around to “significant [advantages],” “intermittent welding,” “distortion;’ “distortion,"feet” and “welds.” This indicates that the writer has not maintained effective subject focus. Although the reader can follow the writer’s reasoning because the paragraph is well unified around its topic

sentence, the reader cannot read as efficiently as he could if the writer had maintained consistent focus on the topic. It would have been more effective to put the phrase, “intermittent welding;” a synonym, or the pronoun, “it,” in the subject slot of most of the sentences.

The paragraph on the “physical-chemical plant” maintains consistent subject focus, with “plant” or a synonym or pronoun referring to the plant as the subject of every sentence. Similarly, the paragraph on “ventilation air scrubbers” maintains subject focus except for a logical shift to “carriers” as the subject of the second sentence.

With some patterns you focus on the relationships among subjects, verbs, and objects rather than solely on the subjects of your sentences. In a causal pattern, the focus is on the shift from object to subject in successive sentences. Such a paragraph essentially has the pattern: A causes B; B causes C; C causes D; D causes E. For example, in the following paragraph, the writer maintains a focus on the cause-effect sequence by carefully shifting an object in the predicate to the subject of the following sentence:

During a storm in the North Pacific Ocean in the early hours of 19 December 1969, the SS Michigan sank because its cargo of bombs exploded. The storm caused the vessel to experience heavy rolling (up to 50°). The rolling created excessive loading forces on the cargo securing system from the palletized bombs. The cargo securing system failed, permitting a complete row of palletized bombs to shift. When the palletized units shifted, numerous 2,000 lb. bombs broke loose and slid and rolled in number five hold. This resulted in an impact detonation which ruptured the starboard side shell plating and damaged the forward bulkhead. Progressive flooding occurred. The SS Michigan was abandoned by her crew and eventually sank

The pattern is not mechanically implemented however. As you see, there is considerable stylistic variation that provides effective continuity and emphasis.

You should edit your sentences so that the sentence structures are

appropriate for the particular paragraph pattern you have established. Some patterns suggest a consistent subject focus; others suggest a systematic shift from subject to object to subject. Still others, such as problem and solution, suggest a focus on a first subject and then a definite shift to a focus on a second subject. Careful editing will improve the readability of your paragraphs considerably.

2.5. Use Effective Transitional Devices

As the paragraph about the SS *Michigan* illustrates, you use several transitional devices within a paragraph to move smoothly from sentence to sentence and to clarify the relationships among the ideas. In this paragraph the primary device is a systematic repetition of key nouns, such as “rolling” and “cargo securing system.” This repetition ties a sentence to the previous sentence. The sentence structures are also varied, with adverbial and participial phrases replacing the basic subject - verb - object sentence structure to express the cause-effect relationships.

The “intermittent welding” paragraph illustrates how you use transitional words to connect sentences so that they flow smoothly:

Intermittent welding has important advantages. Most significant are the economic advantages. Intermittent welding uses 10-25% less labor in the welding process. Also, considerably less distortion is produced in the plating, and consequently much less locked-in stress. The distortion can be removed by flame straightening, but at an additional cost. In addition, there are fewer feet of intermittent weld to inspect, generally resulting in a more thorough inspection. Finally, the larger welds are easier to make and have better penetration and soundness.

The italicized words aren't intrinsic to the points being made. However, they tie the sentences together and help overcome the lack of subject focus in the paragraph.

Transitional words and phrases serve another important purpose. They are cues to the pattern of arrangement in the paragraph—to your logic. In the above paragraph, the words, “most,” “also:” “in addition:” and “finally:” are cues to an analysis pattern in which the writer moves from most to least important. In the paragraph on the “physical-chemical plant,” the transitions signal the persuasion pattern”

A physical-chemical plant is appropriate for the HospitalShip. This system would require the storage and replacement of large quantities of two types of chemicals that could be burdensome, especially when the ship is deployed. It would *also* require sludge storage whenever the ship is within territorial limits, which would often be the case. However, the plant is a small unit with modest power requirements.

The “also” signals the second statement in support of the conclusion, and implies one less important than the first. The “however” signals the shift to the discussion of alternatives.

In short, transitional words and phrases both connect your sentences and clarify your logic for the reader.

2.6. Format for Efficient Reading

Our final suggestion for writing and revising paragraphs is to format the paragraph or paragraph cluster for efficient reading. Subordinate indentation, such as that used in the “intermittent welding specifications” paragraph, is a big help. It breaks up a conceptual paragraph, highlights the topic sentence, and shows the relationships among the specifics.

Additional formatting devices include subheads and numbering. Although these devices are typical of reports in an outline format, such as a minutes of a meeting, if not overused they can increase the effectiveness of a report with standard paragraphing. The “Proposal to Introduce Line-

Heating Technology” (Figure 6, p. 30) illustrates how heads and numbered lists can increase the communication efficiency of a report. If that report were all in prose without headings and lists, its argument probably would not be as effective.

For most writers, effective paragraphing is a matter of revision. As you become more proficient at revision, your rough draft paragraphs will also begin to improve. When you pay attention to these guidelines for writing and revising paragraphs as you are writing your rough draft, you will think more clearly. You will be systematic and logical from the very beginning.

8

Writing and Editing Sentences

We have devoted much of our attention to issues of report design beyond the sentence, but much of the success of your reports will depend on how effectively you write and edit sentences. Good engineering requires attention to both design and detail, and so does good writing.

Managers and supervisors are concerned about style and about grammar, punctuation, and spelling, as these comments indicate:

- “The engineer’s writing is full of ambiguities.”
- “I get tired of having to recycle my engineers’ reports when they are too wordy-or when they are too blunt and aggressive. They need to be to the point, but they also need to be diplomatic, technically correct, contractually correct, and precise.”
- “Simple declarative sentences are needed---with a minimum of modifying phrases and clauses. Just say it.”
- “Write for the user---no flowery language. Give the basics. Go directly to the subject.”
- “The wording must be precise and standard.”

In this chapter we provide suggestions for improving your technical writing style and eliminating common grammatical problems.

1. Be Direct

Make your sentences simple and direct by shortening them and eliminating unnecessary words.

1.1. Limit Sentences to Few Clauses and Phrases

Technical documents are full of compound sentences with numerous subordinate clauses and phrases. Consequently, the sentences are overloaded with ideas:

It should be noted that there are other conditions listed in the trim booklet where these tanks are empty with an aft trim more severe than 1.65 feet but this occurs only after the departure trims and thus the quantity of the trapped wedge already will have been established by those departure trims.

Continuous operation in sea state five can be accomplished with the bow and stern thruster units if it is accomplished with the vessel positioned with an optimum heading with respect to the wind, current, and waves.

These long sentences should be broken up into shorter, simpler units.

Note that in the trim booklet there are other conditions where these tanks are empty with an aft trim more severe than 1.65 feet, but these occur only after the departure trims. Thus, the quantity of the trapped wedge already will have been established by the departure trims.

Continuous operation in sea state five can be accomplished with the bow and stern thruster units. This requires the vessel to have an optimum heading with respect to wind, current, and waves.

Most of your sentences should be simple, declarative sentences with one main clause and no more than one modifying clause or phrase.

However, you should make sure that each sentence really deserves treatment as a main clause. To treat every sentence as a short, simple sentence will create a choppy style and obscure subordinate relationships. Thus, at times you should establish a subordinate relationship rather than make two sentences:

The fan coil units are designed for indoor use and should not be subjected to rain without proper protection.

The editing decision depends on what you really want to say:

The fan coil units are designed for indoor use. They should not be subjected to rain without proper protection.

Because the fan coil units are designed for indoor use, they should not be subjected to rain without proper protection.

Either of these versions seems preferable to the original double sentence, but the second sentence seems to be more effective by identifying the subordinate relationship.

With some compound or double sentences, the conjunction “and” between the main clauses is imprecise:

The stern ramp hydraulic system is being defined as a miscellaneous fluid power system and this review encompasses only the requirements listed in 46 CFR 58.30-30.

The coordinating conjunction, “and,” should be eliminated to clarify the meaning:

The stern ramp hydraulic system is being defined as a miscellaneous fluid power system. Therefore, this review should be based only on the

requirements listed in 46 CFR 58.30-30.

Because the stern ramp hydraulic system is being defined as a miscellaneous fluid power system, this review should be based only on the requirements listed in 46 CFR 58.30-30.

Revision of a compound sentence creates two sentences or establishes a subordinate relationship.

1.2. Eliminate Indirect Constructions and Unnecessary Words

Most technical prose can be tightened considerably. Rough drafts contain indirect constructions, superfluous phrases, and unnecessary words to express an idea that could be stated simply. When editing sentences you eliminate as many words as possible.

Indirect constructions add unnecessary words and put the important information in secondary positions. This is often the case with requests and recommendations:

It is our recommendation that you switch vendors.

It is, therefore, requested that this office be furnished with a priced proposal for any adjustment expected to result in event the change is adopted.

Requests and recommendations should be stated directly:

We recommend that you switch vendors.

Atlantic Shipbuilding recommends that Harbor Tugs switch vendors.

This office requests a priced proposal for any adjustment expected to result if the change is adopted.

ASBC should give this office a priced proposal for any adjustment if the change is adopted.

You should review your report and edit outmost “it is . . . that” and “there are” constructions as well as “that are” subordinate clauses:

***There are* several reasons favoring the use of these heat exchangers.**

Those systems ~~that~~ *are* demonstrated to be "fail-safe" will be accepted as miscellaneous fluid power and control systems.

***It is* presumed ~~that the~~ submitted information, in conjunction with the preceding explanation, is sufficient for you to accept the system as fail-safe.**

These indirect constructions can be edited in several ways:

Several reasons favor the use of these heat exchangers.

Several reasons favor these heat exchangers.

These heat exchangers are favored for several reasons.

These heat exchangers have three advantages.

Those systems demonstrated to be "fail-safe" will be accepted as miscellaneous fluid power and control systems.

We assume the submitted information, in conjunction with the preceding explanation, is sufficient for you to accept the system as fail-safe.

This information, along with our explanation, should be sufficient for the system to be accepted as fail-safe.

In addition, delete unnecessary phrases and words:

Statistical controls would have quickly identified *a fundamentally* predictable process which produced largely unacceptable results.

This office requests *a priced* proposal for any adjustment *expected to result in event the change is* adopted.

All units stored open to the atmosphere will be covered to protect for all possible weather conditions.

Some of these italicized words seem unnecessary others seem technically imprecise. They can be eliminated or shortened:

Statistical controls would have identified a predictable process which produced unacceptable results.

This office requests a proposal for any adjustment if the change is adopted.

Units stored in the open will be covered to protect against the weather.

Deleting excess words makes your prose more precise as well as more direct.

1.3. Avoid Passive Constructions When Possible

The passive construction weakens the verb, thus making a sentence less direct. In addition, it often puts the intended subject of a sentence in an object position and the object in the subject position

The remaining proportions were worked out on the basis of space and load requirements.

A panel is installed on the bridge console with complete instrumentation to monitor the engine and gearbox functions.

Fewer personnel are required to operate this equipment.

Immediate analysis would have been initiated to determine the impact of achieved inaccuracy on subsequent production.

Approximate1y 8500 feet of new piping will be required for the conversion.

When the paragraph pattern allows, passive constructions should be changed

to active constructions:

Space and load requirements determined the remaining proportions.

The bridge console has a panel to monitor the engine and gearbox functions.

This equipment requires fewer operating personnel.

The program immediately would have determined the impact on production.

The conversion will require approximately 8500 feet of new piping.

Sometimes passive constructions are necessary to maintain subject focus and appropriate subject - verb - object relationships in some paragraph patterns. However, technical writers often drop into the passive voice unnecessarily, making their reports indirect, wordy, and imprecise.

1.4. Use Direct Subjects and Verbs

You can make your prose direct by putting the intended subject in the subject slot of the sentence and the intended verb in the verb slot of the sentence. In the following sentences, the actual subjects and verbs are buried

An evaluation of these displays will be made during the design stage.

Testing is performed on the units when they are installed.

The change results in simplification of the installation.

These sentences should be revised to be direct:

The displays will be evaluated during the design stage.

The units are tested when they are installed.

The change simplifies the installation.

You should examine several of your rough draft paragraphs to determine whether or not you are prone to burying subjects and verbs. Highlight the grammatical subjects and verbs of the sentences. Then analyze each sentence to determine whether or not these are your intended subjects and verbs.

1.5. Use Conventional Word Order

Occasionally, writers use unconventional word order in some of their sentences. This can be a problem with modifying phrases. At times it is a problem with putting all of the information before the verb.

At the outfitting berth the remaining installation, mate-up, and tie-in will be completed and tested.

This sentence should be revised to put the modifying phrase after the verb.

The remaining installation, mate-up, and tie-in will be completed and tested at the outfitting berth.

Conventional word order is based on two principles. First, standard sentence structure is: subject - verb - object/modifier. Second, modifying phrases are placed next to the part of the sentence they modify.

2. Be Precise

Clear writing requires you to use words and phrases carefully. Rough

drafts usually contain expressions that don't state exactly what the writer intended.

2.1. Avoid Ambiguous Usage and Constructions

Ambiguity results when words and phrases are used imprecisely:

Finally, the larger welds are easier to make with better penetration and soundness.

The question here is: does "with better penetration and soundness" modify the welding process or does it modify the welds that are made?

Since damage is a consideration that cannot be ignored or too easily circumvented, the design incorporates a minimum of one-compartment damage stability throughout.

The question here is: can a consideration of damage be "easily circumvented" or not?

Recent rust and corrosion in fan coil units has caused concern.

Does the writer mean "recent" or "recently"?

The program immediately would have determined the impact of achieved inaccuracy on production.

Does the writer really want to "achieve" inaccuracy?

2.2. Eliminate Dangling and Unclear Modifiers

A specific form of ambiguity results from a grammatical construction called the "dangling modifier." A dangling modifier is a participial phrase

that modifies the subject illogically. A participial phrase at the beginning of a sentence should modify the subject of the main clause. That is, the phrase describes an action with an unstated agent. The unstated agent grammatically is the subject of the sentence.

A dangling modifier results when the participial phrase does not actually modify the subject of the sentence:

After removing the larger pieces of insulation, all small bits and pieces and all dust must be cleaned from the piping, machinery, and decks.

With this sentence, "removing" grammatically modifies "bits and pieces" and "dust." In other words, the sentence actually says that bits and pieces and dust are removing insulation. That, of course, is illogical. In this instance, the phrase probably should be changed

After the larger pieces of insulation are removed, all small bits and pieces and all dust must be cleaned from the piping, machinery, and decks.

With this revision, the agent of the passive verbs in each clause, "are removed" and "must be cleaned," is the same.

2.3. Make Pronoun References Obvious

Pronouns and similar words such as "this" and "that" often have unclear references. The readers should be able to draw a mental arrow from the pronoun to its referent immediately. When you edit your rough draft, you should circle each pronoun and draw an arrow to its referent. If you can't, your statement probably is unclear. In addition, if you use the same pronoun in a paragraph, such as "it: the arrows from the "its" should go to the same referent. If two "its" refer to two different nouns, then you momentarily might

confuse the reader.

Referents are not easily determined in the following sentences:

The operators are responsible for running the tests and reporting upon their day-today operation.

The question is, does “their” refer to the “operators” or to the “tests”?

Following the removal of slag, all welded surfaces should be suitable for test without grinding if this does not interfere with interpretation of test results.

The question is, what does “this” refer to?

The crack propagated through the shaft in a brittle-intergranular manner until it reached the point at which it could no longer support the load.

The question is, what do the two “its” refer to?

Whenever you are in doubt, you can use a noun rather than a pronoun.

3. Be Correct

Finally, sentence editing is a matter of correct grammar and mechanics. Of course, the possibilities here are innumerable, and every writer has his or her own particular set of problems. However, some problems appear more frequently than others. Agreement, parallelism, and comma use challenge many writers.

3.1. Make Subjects and Verbs Agree

Subject - verb agreement often is a problem because subjects and verbs

are separated in sentences. In these cases, the lack of agreement does not result because you don't know that singular subjects require singular verbs. Rather, it results from separation of the subject from the verb. For example:

Analysis of the failures of the welds indicate that there are two possible causes.

Here the writer naturally used a plural verb, "indicate," after the plural nouns, "failures" and "welds." However, the actual subject, "analysis," is singular.

In addition, there is fewer total feet of piping to inspect.

In this case, the writer probably was anticipating the singular noun, "piping," rather than the plural noun, "feet." The result was a lack of subject - verb agreement.

As you can see, lack of subject - verb agreement usually results from careless writing, not poor grammar. When it appears in a report, it signals poor editing.

3.2. Use Parallel Constructions

Another problem is the use of non-parallel grammatical constructions when a parallel construction is required. A parallel construction signals parallel ideas. The shift to a non-parallel construction signals a change. At times the lack of parallel construction appears to be the result of careless writing. At other times it appears to result from a mistaken urge for variety.

A parallel construction would strengthen the following sentence:

A typical aluminum bolted access cover is secured by 20 bolts, and a steel unit has 40 bolts.

Here, the shift from “is secured” to “has” is awkward because the ideas are parallel. The parallelism should be reinforced by parallel constructions, such as:

A typical aluminum bolted access cover has 20 bolts, and a steel unit has 40 bolts.

Or: A typical aluminum bolted access cover is secured by 20 bolts, and a steel unit by 40 bolts.

Or even A typical aluminum bolted access cover is secured by 20 bolts, but a steel cover by 40 bolts.

Parallel constructions often clarify the meaning:

A possible field fix would be the addition of angle iron to each lip of the cross member and isolating the center bearing bracket.

This shift from “addition” to “isolating” suggests sequential actions, but the writer meant them to be parallel actions: “addition” and “isolation.”

This provides a 28.2% design margin with 10% for wave interference and the other 18.2% is for a service margin due to the low wave environment, hull surface roughness, and engine selection.

The lack of parallel construction creates an illogical double sentence, which should be eliminated

This provides a 28.2% design margin: 10% for wave interference and 18.2% for a service margin. The service margin provides for the low wave environment, hull surface roughness, and engine selection.

When a parallel construction is established, additional information

sometimes has to be put in a separate sentence in order to make the parallelism clear.

3.3. Eliminate Comma Faults

A variety of what usually are called "comma faults" appears in technical reports. The comma is a logical mark of punctuation, not a signal of intonation to insert whenever you take a breath when reading a sentence aloud.

Commas separate main clauses only when used with a coordinating conjunction, usually "and" or "but," but also "or," "for," "so" and "yet." Without a coordinating conjunction, a semicolon or a period must be used. The commas in these sentences carry a load they cannot bear:

However, the supervisor stated that he was not prepared to recommend rescreening at this time, thus all disputed trial cards must be resolved at the meeting next week.

Each system is fully independent of the other, therefore, if one system breaks down, the other system is not affected.

The sentence structures require a coordinating conjunction, a semicolon, or a period:

However, the supervisor stated that he was not prepared to recommend rescreening at this time, and thus [or only "so" without "and"] all disputed trial cards must be resolved at the meeting next week.

However, the supervisor stated that he was not prepared to recommend rescreening at this time; thus, all disputed trial cards must be resolved at the meeting next week.

However, the supervisor stated that he was not prepared to recommend rescreening at this time. Thus, all disputed trial cards must be resolved at the meeting next week.

Each system is fully independent of the other, and, therefore, if one system breaks down, the other system is not affected.

Each system is fully independent of the other; therefore, if one system breaks down, the other system is not affected.

Each system is fully independent of the other. Therefore, if one system breaks down, the other system is not affected.

Commas are used within a clause or sentence to set off modifying phrases, such as an introductory or concluding phrase or a phrase in the middle of the sentence. Commas also set off items in a series. Commas are correctly used in the following sentences:

Based on these specifications, the technique will be satisfactory for naval ship superstructures.

Slower puddle cooling permits more gas to escape before entrapment, thus increasing the density.

The cracks may be internal, such as laminations, or external, such as weld surface cracks.

The decks will be cleared of temporary equipment tools, and tool boxes.

Commas set off words and phrases to establish the basic subject-verb - object structure of the sentence. In the following sentences, the comma illogically breaks up this basic sentence structure:

The panel was damaged upon disassembly, and replaced.

The comma after “disassembly” is illogical because it separates the verb, “replaced,” from the subject, “panel.”

When you set a phrase off in the middle of a sentence you have to do so completely. That is, you have to have a second comma to close the parenthetical phrase:

For a short period during the installation period, yet to be determined the ship will be drydocked for approximately six weeks.

The phrase, “yet to be determined” is a parenthetical comment that needs to be set off by a comma at each end.

A comma should not be used to set off a phrase essential to the meaning of the sentence. This is perhaps the most difficult comma skill to master. It requires that you distinguish between what are called “restrictive” and “non-restrictive” modifiers. “Restrictive” modifiers restrict the meaning of the sentence. “Non-restrictive” modifiers are parenthetical comments.

This problem often occurs With “which” clauses. Each of the following “which” clauses should be set off by a comma (or else the sentence has an unintended meaning):

Fatigue may develop when a location experiences cyclic stress removal which tends to open and close a crack constantly. (But not the cyclic stress removal that does not tend to open and close a crack constantly.)

Frequent cleanings required to prevent a build-up of greases which could be a fire hazard. (But not of grease which is not a fire hazard.)

This is accomplished in the ramp winches when there is sufficient pressure to sequence valve 29 to operate directional valve 30 which releases the brakes. Similarly, sequence valve 29 must sense sufficient pressure to operate valve 31 which releases the brakes on the section-two winches. (But not to operate the other valves 30 and 31.)

The comma sets off a phrase as anon-restrictive modifier that adds additional information to the sentence. This information does not change the meaning of the main clause.

Without a comma, the modifying phrase restricts the meaning of the main clause:

The heat exchanger in the separation system needs repair.

In this sentence, “in the separation system” is not set off by commas. That phrase restricts the meaning of the sentence by identifying which heat exchanger needs repair—the one in the separation system, not the one in the fuel supply system.

Commas, therefore, serve a logical function. They separate items that should be separated from the basic sentence structure. They clarify the meaning of the sentence.

We have introduced only some of the common problems writers have with style, grammar, and mechanics in technical reports. To supplement our brief discussion you should use standard references to improve your skills in writing and editing sentences. We suggest in particular:

The Harbrace College Handbook (10th Edition), J. C. Hodges and M. E. Whitten (New York: Harcourt Brace Jovanovich, 1986).

Style: Ten Lessons on Clarity and Grace, Joseph M. Williams (Glenview, Illinois: Scott Foresman, 1985).

Many other references will also be helpful. For technical writing, choose those that stress writing simply and directly in plain English.

Improvement will come with practice and with constructive feedback. In addition to refreshing your knowledge about style, grammar, and mechanics, you should actively solicit feedback from your colleagues, your supervisors, and even your secretaries. Make a note of recurrent concerns, and then edit your reports with those in mind.

9

Using Visual Aids and Formatting Devices

Writing is a conceptual process, but it produces a product with physical characteristics that should complement the conceptual design.

Several managers mentioned how the physical design enhances a report. First, it helps a report make a positive impression. “Appearance is important and needs to be taken seriously.” Even for internal reports, a good guideline to follow is: “it should be in a form to go to the customer.” Second, it helps the reader. “Use formatting such as bold face type and indenting to help the reader.” Effective format signals the intellectual structure of a report to the reader. Third, it reinforces and implements standard procedures. The format often “needs to be proper in terms of established procedures, both government and internal.”

The physical design of a report also should be based on a reader’s capabilities for reading and assimilating information. If you do not know these capabilities, you risk discouraging or defeating your readers. Essentially, a poor report format overtaxes the readers’ information processing abilities.

1. Report Format Considerations

We have five suggestions for making the prose of a report easy to read.

1.1. Character Size

Readers perform best when they read type in the range of 10-point to 12-point, although with some fonts 10-point type is almost too small. Type smaller than 8-point is difficult for the average reader to see. Type larger than 12-point does not get read efficiently. Consequently, type smaller or larger than 10- or 12-point in sustained passages of text reduces comprehension and encourages skipping.

1.2. Character Type

Readers respond best to upper and lower case plain type. They uniformly have difficulty in reading all-capital letter text except for isolated phrases. They also have difficulty in reading italic type. Moreover, they seem to have a slightly greater ability to read serif print rather than san-serifprint. (Apparently, the little curley-cues on the ends of serif print help readers to distinguish letters from one another.)

1.3. Line Length

Readers read efficiently when the length of the lines of prose is between 50 and 70 characters. Lines greater than 70 characters tend to cause readers to lose their places along the line or when they move from one line to the next. Similarly, lines with fewer than 50 characters require excessive eye motion to move through a text. A 60 or 65 character line is appropriate for a report, memorandum, or letter in prose format.

1.4. Line Spacing

Readers of technical documents prefer single-spaced text to double-

spaced and triple-spaced text, at least when the text has cues such as headings, indentation, and numbering. They prefer double space between paragraphs, however. Space-and-a-half text is a compromise between single- and double-spaced text.

Readers respond to single-spaced text although there is little difference in reading performance between single-spaced text and double-spaced text. In fact, single-spaced text may be slightly slower to read. The advantage of single-spaced text is that it provides a sense of overview: related items aren't spread out over several pages. Single-spaced text also is conventional. Triple-spaced text is significantly less clear to readers. They have trouble with eye motion and with retaining an overall concept of what is being presented.

1.5. Justification

Readers both prefer and perform best with "ragged right" margins, although the use of wordprocessing programs has made justified (straight) right margins common. Apparently readers deal with differential white space well if it is at the ends of lines; they deal with it less well if it is between words and letters along a line.

2. Format Cues

Effective document design requires the use of format cues to signal the structure and content of a report to the reader. On the surface, format cues distinguish the appearance of a report from other types of writing. These format cues can be used individually or in combination. At the extreme, the report is in a format based on these cues rather than in a prose format, as the status report (Figure 23) is. These cues can be used in prose reports as well.

Atlantic Shipbuilding Project Summary		Planning	
		<u>L. Duke, Supervisor</u> <u>Scheduling</u>	
Project: SWATH A-TSD	Date: 17 June 1988		
Contract: TY201-78			
<hr/>			
Work Action Status As of 17 June 1985			
	<u>actual</u>	<u>Scheduled</u>	<u>percentage</u>
Work Actions (started)	101	140	72.1
Work Actions (completed)	185	220	84.1
<hr/>			
Delivery Date Status As of 17 June 1988			
	<u>actual</u>	<u>Scheduled</u>	
Current progress	60%	65%	
Delivery date	October 9	September 28	
<hr/>			
Critical Work Actions As of 17 June 1985			
<u>Work Action No.</u>	<u>Description</u>	<u>Sch. Comp.</u>	<u>% comp</u> <u>Req. Manpower</u>
380	Outfit block 1790	7-20-86	25% 32
291	Install heat exch.	6-19-86	78% 10
894	Rework piping	6-23-86	43% 15
<hr/>			
Comments: Reworking piping, WA 894, required some redesign. This was accomplished by the Design Engineering Outfitting Section.			
Distribute			
S. Holrnes (General Manager)	Production Engineering and Planning		
S. Guthrie (Asst. General Manager)	Design Engineering		
	Production and Construction		
Program Office <u>Navy</u>			

Figure 23. Sample Report Using Format Cues Rather Than Prose.

2.1. White Space

White space, a wholly visual cue of structure, is the most powerful format cue. It signals relationships among ideas, either that they are related or coordinate or that they are hierarchical or subordinate.

White space is vertical (between lines) or horizontal (within lines or from the margins). Vertical white space as a format cue involves more than spacing between paragraphs. It involves additional spacing between major units of the report. This is a signal that a new group of ideas is coming up. Horizontal white space involves additional indentation, often of paragraph clusters, to signal subordinate relationships. The reformatted paragraph cluster (Chapter 7, p. 90) illustrates effective use of horizontal white space.

2.2. Headings and Subheadings

Headings and subheadings also are powerful format cues. They signal the divisions in the report, the coordinate and subordinate relationships among ideas, and the content. They function like a table of contents superimposed on the text, quickly revealing its content and arrangement.

Headings and subheadings are most effective when they are substantive headings rather than topic headings or generic headings. A substantive heading signals content, as the headings on the recommendation report (Figure 24) illustrate. Topic headings, such as “Limitations” and “Advantages,” would have been less effective. Generic headings such as “Discussion” or “Analysis,” which are transportable from report to report, are least desirable because they do not signal the specific content of any particular document.

Atlantic Shipbuilding
MEMORANDUM

File No. 12-5T
Date 3 July 1986

To: **S. Guthrie**
Assistant General Manager

From J. Andrulis, Manager
Production Engineering

subject: Proposal to Introduce Line-Heating Technology into

At the present time, the technique of cold-forming shell plating limits our productivity and flexibility. The fact that we rely on this technique limits our competitiveness in some bid situations. I therefore propose that ASBC introduce line-heating technology in our facilities. This will enable us to stay competitive with other U.S. shipyards.

Line-heating technology will (1) increase our productivity, (2) facilitate more complex shell plate curvature and lower costs, and (3) improve production flow. Improved fabrication quality will result in the yard being more competitive. Implementation of line-heating technology will require approximately one year, including planning.

Limitations of forming technique. Our facilities for cold-forming shell plating do not suit the needs of current designs. These facilities can only perform adequate shaping up to $\frac{3}{4}$ inch thick plate and are not capable of giving plates longitudinal curvature. The specifications of our cold-forming facilities and optimal specifications for contract TY236-83 are listed in Attachment A.

Line-heating technology Line heating is the process of inducing curvature in structural shapes and plates by controlled heating and cooling. The process is also scientifically applied for fairing structural intersections and removing distortion due to thermally induced stress.

Advantages of line heating for forming curved shell plating. By employing line heating, we can eliminate the restrictions we now face in the forming of shell plating. The advantages of line heating are:

- 1) Increase in productivity, as seen in other U.S. shipyards (Attachment B).
- 2) Ability to accurately form shell plates with compound curvature (Attachment C itemizes parameters and dimensional control for plates on Hitachi Hull Y-14-2), which results in a cost savings.

Figure 24. Sample Report Using Headings to Signal Content (Page 1 only).

2.3. Numbering

Numbering reinforces use of white space and headings. That is, numbering usually is a redundant cue, although it sometimes is used without these other cues. Unlike these other cues, it signals where the reader is in the report.

Numbering provides a very effective information search and reference tool as well. Currently, the standard is to use the all-Arabic numbering system (1., 1.1., 1.1.1.) for technical documents; the Roman system (I, A, 1, a) is inappropriate for information searching purposes. For the reader, the all-Arabic system is an aid in both reading and referencing, as it identifies a specific unit of the text and signals the relative position of that unit in the document. With the Roman system, the cue is incomplete: “B” is identified, but is it IB., IV.B., or V.B.?

2.4. Formatted Lists

Effective shipyard reports use lists whenever possible, as the recommendation report (Figure 24) illustrates. Information in list format is more easily grasped than information in prose format. A list, however, requires information that can be presented in outline form. In addition, the information must stand by itself without interpretation.

Lists are either numbered (1, 2, etc.) or bulleted (•, *). Numbering is used when the list is both ordered and inclusive; bulleting is used when the list is not ordered and is merely illustrative.

2.5. Variations in Type Size and Style

With wordprocessing programs, variations in type size and style have

become common. Judiciously used these variations provide excellent format cues for the reader.

Variations in type size are used to indicate relationships. Main headings sometimes are in larger type—two sizes above the standard text are useful. Occasionally, some text is in larger type, a feature common in manuals or instructions. A warning, for example, might be highlighted in this fashion. Examples and subordinate items sometimes are in smaller type—one size below, for example (9-point in a 10-point text).

Variations in type style are quite common. With a typewriter, variation was limited to underlining (in printing a signal to the printer to set the type in italics). Now, variations include bold face, italic, underlining, and even others, depending on the program.

Whenever type size and style are varied, the variations are most effective if type fonts are not varied. Usually, an entire document is in a single font—Times, Helvetica, Courier, etc. When you choose a font for a document, stick with it.

3. Standard Forms and Formats

Technical reports come in a variety of formats. This is more typical of shipyards than of other industries, such as the automotive industry, probably because of a shipyard's close integration of design and construction activities and continual association with government agencies. Shipyard report formats can be classified in two types: standard or boilerplate formats and individualized or tailor-made formats.

3.1. Standard Forms and Formats

Standard forms serve an important communication function: they

transfer routine information efficiently. They are efficient both to write and to read. Thus, they usually are used for repetitive reports of a generic type. The request for engineering services (Figure 25) and the status report (Figure 23, p. 122) are examples.

A standard form signals the type of report, the information it contains, and where that information is. The form itself embodies the purpose of the report and attracts attention to it. The form presents the information compactly. Thus, standard forms, when well designed and used increase the efficiency of written communication systems. Standard forms have established communication paths.

Even when a standard form is not available, you often can put a report in a standard format. When the information is repetitive, such as in a periodic progress report or minutes of a meeting, you should adopt a standard format. You create a format for the report, and adapt it to a specific situation as you use it. The minutes of a meeting (Figure 26) is an example of this approach. That report was created on a blank page—there was no standard minutes form for the yard. However, the writer formatted the report extensively so that it has the appearance of a standard form. As with a standard form, this format enabled the writer to eliminate considerable prose.

With the use of standard forms and formats, however, you have to be certain that you provide the appropriate information. A standard form adopts a “fill-in-the-blank” approach. Therefore, you have to know how to fill in the blanks. A test report format, for example, has a section with the heading, “results.” If you don’t know what “results” are, you won’t put the appropriate information in that section.

3.2. Individualized Formats

Individualized formats also serve an important communication func-

Request for Engineering Services					
	form - MES7.1				
To: C. Cavanaugh Dept. Fdn. Design From: G. Hummell Dept. Design Eng. Date: 6/10/86 Subject: Drawing Change to Facilitate Installation of Ventilation System	Drawing No. LL100-86 Contract No. TY201-78 Shop No. WP/SN No.				
<p>MESSAGE: Drawing No. LL100-86 specifies that the aft bulkhead in propulsion repair aft be watertight. However, the HVAC design for the ventilation system serving the aft engine room requires Uris bulkhead to be non-tight to facilitate installation of ductwork</p> <p>RECOMMENDED SOLUTION: Make subject bulkhead non-watertight Subdivision considerations do not require a watertight bulkhead at this location.</p> <p>SIGNED: <i>G. Hummell</i></p> <hr/> <p>REPLY: Will change Subject bulkhead to non-watertight on drawing LL100-86.</p> <p>SIGNED: C. <i>Cavanaugh</i></p>					
<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"> PRODUCTION / PLANING <input type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED REASON SIGNED _____ D A T E <input type="checkbox"/> Production Drawing Changed SIGNED _____ D A T E </td> <td style="width: 50%;"> ACTION </td> </tr> </table>	PRODUCTION / PLANING <input type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED REASON SIGNED _____ D A T E <input type="checkbox"/> Production Drawing Changed SIGNED _____ D A T E	ACTION	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"> DESIGN ENGEERNG ACTION <input type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED REASON StGNSD _____ D A T E <input type="checkbox"/> Composite Drawing Changed SIGNED _____ D A T E </td> <td style="width: 50%;"> ACTION </td> </tr> </table>	DESIGN ENGEERNG ACTION <input type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED REASON StGNSD _____ D A T E <input type="checkbox"/> Composite Drawing Changed SIGNED _____ D A T E	ACTION
PRODUCTION / PLANING <input type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED REASON SIGNED _____ D A T E <input type="checkbox"/> Production Drawing Changed SIGNED _____ D A T E	ACTION				
DESIGN ENGEERNG ACTION <input type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED REASON StGNSD _____ D A T E <input type="checkbox"/> Composite Drawing Changed SIGNED _____ D A T E	ACTION				

Figure 25. Sample Report On a Standard Form.

Atlantic Shipbuilding MEMORANDUM																								
To: Distribution	Dept.	Date: 14 July 1986																						
From: C. Frederick	Dept. Contracts	File: 324/86-22																						
Subject: Minutes of meeting with Coastal Shipping to discuss unsatisfactory specification items on ASBC Hull No. 324		Page 1 of 2																						
		Contract: TY201-78																						
<p>Place: 12 July 1986, Atkantic Shipbuilding</p> <p>Participants:</p> <table> <tbody> <tr> <td>R. Martin (CSC)</td> <td>C. Frederick (Contracts)</td> </tr> <tr> <td>D. Edwards (CSC)</td> <td>A. Vaslo (Chief Naval Architect)</td> </tr> <tr> <td>L. Moseby (CSC)</td> <td>J. Andrulis (Productimon)</td> </tr> <tr> <td></td> <td>V. Whiie (Quality Assurance)</td> </tr> <tr> <td></td> <td>F. Domino (Construction)</td> </tr> </tbody> </table> <p>Purpose:</p> <p>To discuss the contravct specification items Coastal Shipping Corporation finds unsatisfactory with the construction of Hull No. 324 (letters of 12 June and 23 June). After discussion, appropriate actions were agreed upon and tasks assigned.</p> <table> <thead> <tr> <th>Action to be taken by:</th> <th>Department</th> <th>Item</th> </tr> </thead> <tbody> <tr> <td></td> <td>Design Engineering</td> <td>E03, A11</td> </tr> <tr> <td></td> <td>Cnstruction</td> <td>E02, C16</td> </tr> <tr> <td></td> <td>Purchasing</td> <td>C04</td> </tr> </tbody> </table> <p>Meeting Topics:</p> <ul style="list-style-type: none"> • E02 Noted that #1 control panel in pump room has two damaged control switches. Construction will install new switches.. 			R. Martin (CSC)	C. Frederick (Contracts)	D. Edwards (CSC)	A. Vaslo (Chief Naval Architect)	L. Moseby (CSC)	J. Andrulis (Productimon)		V. Whiie (Quality Assurance)		F. Domino (Construction)	Action to be taken by:	Department	Item		Design Engineering	E03, A11		Cnstruction	E02, C16		Purchasing	C04
R. Martin (CSC)	C. Frederick (Contracts)																							
D. Edwards (CSC)	A. Vaslo (Chief Naval Architect)																							
L. Moseby (CSC)	J. Andrulis (Productimon)																							
	V. Whiie (Quality Assurance)																							
	F. Domino (Construction)																							
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C. Frederick (Contracts)	J. Andrulls (Production)																							
W. Loman (Purchasing)	V. White (Quality Assurance)																							
	F. Domino (Construction)																							

Figure 26. Sample Report In a Standard Format (Page 1 only).

tion. They alert audiences to something unique and particular about the report. Used in a management communication system in conjunction with standardized forms, they call attention to themselves.

You tailor a report when its purpose is to get a decision made or an action taken. The recommendation report (Figure 24, p. 124) is an example of a report tailored by the author. He designed the memorandum format for his purpose, especially with the use of headings.

Reports addressing audiences outside of the yard, such as SupShips or the owner, often are in a letter or memorandum format tailored to their specific contents. This doesn't always have to be the case, as the use of standard formats for many Data Item Descriptions (DIDs) suggests. For routine types of communication to external audiences, you can adopt a standard format as well.

4. Tables and Visuals

A final consideration in report writing is the use of visual aids. Formatting devices help readers read efficiently. You also should use visuals to replace words. When you have an opportunity to put information in a table, do so. When you have an opportunity to use a simplified figure or drawing, do so.

At one extreme, graphics are a primary means of communication. In some production-related reports, bar charts, schedules, and drawings are used without any writing at all. A six-month assembly schedule can be entirely graphic. Drawings are distributed without cover memos. Although changes eventually are documented, the working means of communication is graphic.

Even in written reports, however, you should consider the use of visuals to present information more efficiently than you can in words. The choice of visuals will depend on your readers, but typical drafting usually is not

appropriate. You should create visuals for the report rather than use the detailed drawings and tables that are available. As with the information in the report, you should design a visual selectively and specifically for your purpose and primary readers. As one engineer said, “a photo or a picture rather than a drawing or blueprint is needed for upper management.” Blow-ups of a drawing, such as a blowup of a weld symbol to signal a drawing or construction change, are appropriate for technical and yard audiences.

When you use visuals in a report, you should integrate them by introducing and interpreting them so that they will not be misinterpreted. Although a visual should stand by itself, it also should be interpreted in the report so that it is not misinterpreted or misused.

You use formatting devices and visual aids to increase the communication effectiveness of your reports. Too many writers rely exclusively on words to convey their meaning. Words alone, however, without the use of formatting devices and visual aids, are difficult for a reader to digest. Visuals and formatting devices signal the design of a report. In addition, they replace words and enable you to highlight the essential information.

REFERENCE SECTION

A.

Checklists

1. The Report Writing Process	137
2. <i>Classification</i> of Report Readers	138
3. The Heading Information	139
4. The Purpose Statement	140
5. Problem and Solution Pattern Outline	141
6. Persuasion Pattern Outline	142
7. Analysis Pattern Outline	143
8. Process Pattern Outline	144
9. Cause and Effect Pattern Outline	145
10. Investigation Pattern Outline	146
11. Paragraph Editing	147

THE REPORT WRITING PROCESS

1. Designing the Report

- 1. Define Your Communication Purpose**
- 2. Identify Your Readers**
- 3. Select Relevant Information**
- 4. Organize the Information Appropriately**

2. Writing and Editing the Report

- 1. Write the Rough Draft**
- 2. Revise and Edit the Rough Draft**
- 3. Prepare an Effective Format**
- 4. Edit the Final Draft**

Checklist L The Report Writing Process

CLASSIFICATION OF REPORT READERS

Primary Audience. The person responsible for the action or decision:

Secondary Audiences. Persons who provide input to the primary audience:

Secondary Audiences. Persons who implement the decision and are affected by the actions:

Nominal Audiences. Persons who transmit, forward, or file the report:

Checklist 2. Classification of Report Readers

HEADING INFORMATION

Subject Line:	Is the subject line specific for the report, indicative of the purpose of the report, short, and direct?
Format:	Does the heading format make all of the different types of information immediately accessible?
Audiences	Are the readers explicitly identified by department (and if possible, roles)?
Writer:	Are the issuing department and responsible person clearly identified?
Document Information:	Are the date, file number, and contract/hull/drawing information specified, as appropriate?
Reference Information:	Are the reference documents identified by title, number, and date?
Enclosures/ Attachments:	Are the enclosures and attachments identified by subject and document/reference information?

Checklist 3. The Heading Information

PURPOSE STATEMENT

The first paragraph of the report should state the purpose of the report. Does it?

Organizational Problem or Need. Stated in one or two sentences, if necessary.

Objective of the Analysis or Technical Investigation. State in one sentence, if necessary.

Communication Purpose. A statement of the objective or purpose of the *report*, stated in one sentence.

After reading the first paragraph (or first sentence), will all readers know what the report is about and what organizational responses are expected?

Checklist 4. The Purpose Statement

PROBLEM AND SOLUTION PATTERN

- | | |
|---------------------------------|--|
| 1. <i>Problem</i> | Statement of the problem or issue. |
| 2. <i>Criteria</i> | Criteria or specifications for the solution. |
| 3. <i>Solution</i> | Explanation of the solution, which often has a subpattern, such as cause and effect. |
| 4. <i>Alternatives</i> | Dismissal of alternatives, if necessary. |
| 5. <i>Implementation</i> | Discussion of implementation so that it can be done. If implementation is part of the argument for the solution, it is the final point of step 3. |

Checklist 5. Problem and Solution Pattern Outline

PERSUASION PATTERN

- | | |
|---------------------------------|--|
| 1. <i>Conclusion</i> | Statement of the conclusion, with selected details. |
| 2. <i>Background</i> | Summary of the need or problem; criteria or specifications. |
| 3. <i>support</i> | Justification for conclusion, arranged in descending order of importance. |
| 4. <i>Alternatives</i> | Anticipation and refutation of objections or alternatives, if necessary. |
| 5. <i>Implementation</i> | Brief discussion of organizational implications. |

Checklist 6. Persuasion Pattern Outline

ANALYSIS PATTERN

- | | |
|---------------------------|--|
| 1. Overview | Statement of the concept or object under analysis. |
| 2. <i>Analysis</i> | Point-by-point presentation of the components of the whole, arranged in descending order of importance or in another meaningful sequence. |

Checklist 7. Analysis Pattern Outline

PROCESS PATTERN

- | | |
|-----------------------------|---|
| 1. <i>Objective</i> | Functional overview of the procedure: a statement of the purpose and output. Identification of the basic Stages. |
| 2. <i>Background</i> | Method, warnings or precautions, equipment or tools necessary, theory or concepts necessary to understand the process, and distribution of participants' responsibilities. |
| 3. <i>Procedure</i> | A step-by-step sequence of the actions necessary to accomplish the task, in terms of the function of each basic stage or group of steps. |

Checklist 8. Process Pattern Outline

CAUSE AND EFFECT PATTERN

- | | |
|---------------------------------|---|
| 1. <i>Issue</i> | Statement of the issue, cause or effect, and forecast of the conclusion. |
| 2. <i>Causes/Effects</i> | <i>Analysis</i> of the causes or effects, arranged in descending order of importance or probability. |
| 3. Alternatives | Anticipation or refutation of alternative possibilities. |
| 4. Summary | Restatement of the conclusion, if necessary. |

Checklist 9. Cause and Effect Pattern Outline

INVESTIGATION PATTERN

- | | |
|--|---|
| 1. <i>Objective</i> | Statement of the purpose of the investigation. |
| 2. <i>Background</i> | Explanation of the specifications, criteria, or technical background. |
| 3. <i>Equipment and Methodology</i> | Explanation of the equipment, materials, and method of investigation. |
| 4. <i>Results</i> | Presentation of significant results. |
| 5. <i>Analysis</i> | Analysis of results and derivation of conclusions. |
| 6. <i>Implications</i> | Discussion of conclusions and formulation of recommendations or interpretation of the significance of the investigation. |

Checklist 10. Investigation Pattern Outline

PARAGRAPH EDITING

- 1. Is the core idea or generalization in a “topic sentence”?**
- 2. Is the topic sentence at or near the beginning to provide an overview?**
- 3. Are the particulars arranged according to a logical and appropriate pattern?**
- 4. Are effective subject focus and subject - verb - object relationships maintained?**
- 5. Are transitions and other devices used to move clearly, logically, and smoothly from sentence to sentence?**
- 6. Is the paragraph or paragraph cluster formatted for efficient reading?**

Checklist 11. Paragraph Editing



B.

Report Writing Guidelines and Sample Reports

Problem Solving Reports

Decision Making Reports	151
Implementation Reports	159
Recommendation Reports	165

Administrative Reports

Status Reports	169
Minutes and Trip Reports	173
Procedures and Instructions	177



REPORT WRITING GUIDELINES: DECISION MAKING REPORTS	
1. TYPICAL NAMES	Engineering Change Request/Proposal; Condition Report; Request for Clarification, Interpretation, or Assistance; Problem Identification Report; Quality Deficiency Record; Work Discrepancy Report. Often letters or memoranda without a name.
PURPOSE OF REPORT	To resolve non-routine problems that arise during the design and construction process in regard to a contract. These involve decision making to modify that process. The purpose is either to define a problem or state a solution. If the report defines a problem, it presents a solution and requests a decision or requests action to solve the problem. If the report states a solution, the purpose is to get the solution acted upon. These reports usually have contract and economic implications.
3. AUDIENCES FOR REPORT	The readers for a decision-making report are selected for the purpose of the report. They involve the managers and staff personnel involved in the problem and solution. First, they involve those with decision-making responsibility. Second, they involve those who will be affected by any modification in the design or construction of the hull. Third, they involve those with administrative responsibilities with regard to the contract. These readers should be targeted for each decision-making report. The reports should not be addressed to distribution lists; they should address people in specific roles.
4. INFORMATION TO INCLUDE IN REPORT	<p>A decision-making report focuses on interpretation and judgment. The interpretation and judgment are supported by technical analysis. The report presents conclusions in a form comprehensible to managers and non-specialist technical people.</p> <p>A decision-making report implicitly presents decisions that have been made. In defining a problem or stating a solution, it is communicating those decisions to others. Thus, a decision-making report usually is the result of prior communication, often oral. The principal persons involved have agreed that a problem exists and on the exact nature of the problem. Or, the principal persons involved have agreed upon a solution, and the report formalizes the decision and results in changes to implement the solution.</p> <p>Because the decision-making report focuses upon conclusions, it usually is short -- one or two pages. It is addressed to persons who need to know of changes in design and construction related to a specific hull and of the implications of those changes. The technical details of the changes are matter of documentation and a matter for routine implementation reports. The report should be direct and the content limited to the point at issue.</p> <p>The problem is supported by factual evidence, not asserted. This detail is presented in the report, not left in documents and references. The solution is specified in sufficient detail for impacts on the system, process, or contract to be clear.</p>
PAGE 1 OF 2	

REPORT WRITING GUIDELINES: DECISION MAKING REPORT'S

5. ORGANIZATION OF REPORT

Heading. Memorandum format or letter format,, depending on whether the primary reader is within the yard or in another organization, such as SupShips or an owner. Audiences are identified by name and role so that all who receive the report know the units directly involved in the issue at hand. The distribution list includes persons directly affected by the problem and solution. They are selected specifically for this report.

The subject line states the purpose and specific subject of the report. Reference information includes prior documents and supporting documentation.

Purpose. The first paragraph restates the subject and purpose of the report. It introduces the problem and answers the question: "why should I read this report?"

Summary. The second paragraph Summarizes the important information in the report, either the problem or the solution. Any management reader should be able to quit reading at this point but have all of the important information the writer wishes to communicate.

Support. The following paragraphs explain and support the conclusions in summary. This information often is presented in a problem and solution order:
 Problem (statement of the problem or issue)
 Solution (explanation of the solution or answer)
 or Criteria (statement of the criteria for a solution)
 This information is selective-technical details and explanations are left in the documentation or attachments.

Implications. Any additional impacts or implications of the problem or solution, such as cost or contractual implications, should be mentioned in the report,

Documentation. Technical information and supporting detail, referenced or attached.

6. GUIDELINES FOR FORMATTING AND VISUALS

This report is formatted as an individual document. The format is designed specifically for the document, with substantive heads rather than standard heads. This format signals that the subject of the report is unique, not routine. Visuals are selected or designed specifically for the report, and include only the information needed to illustrate the discussion in the report.

7. ADDITIONAL SUGGESTIONS

A decision-making report usually has external as well as internal audiences, even when it is addressed to someone in the shipyard and includes only shipyard persons on the distribution lists. Therefore, it should be written in a form to be forwarded to external audiences-the Navy or an owner's representative. A contract officer, for example, often will forward an internal report to an owner with just a brief cover memo rather than rewriting the report as his own. This is the efficient thing to do.

A decision-making report is a management report. It seldom should be one page.

**Atlantic Shipbuilding
MEMORANDUM**

File NQ. 64-22B
Date: 6 June 1986

To: A. Vaslo
Chief Naval Architect

From: F. Domino
Construction Engineering

Subject: Request for Documentation to Introduce Intermittent Welding

Enclosure: Report, "Intermittent Welding by Navy Requirements"

In my report (enclosed), I detail intermittent welding requirements as imposed by the Navy. These requirements are for aluminum and steel. The purpose of this memo is to request that you prepare documentation that will permit the incorporation of U.S. Navy standards for intermittent welding into the production of the SWATH A-TSD.

currently, ASBC documentation for intermittent welding is based on ABS specifications. However, intermittent welding specifications for steel and aluminum for the Navy differ from those for ABS. ASBC documents therefore need to be revised to incorporate Navy specifications for use of this technique. These documents should include cost and scheduling information as well.

Intermittent welding specifications for aluminum and steel for Naval Surface Combatant Ships differ from ABS specifications in several respects. The Navy requires that the minimum volume of intermittent fillet weld material be identical to the minimum required volume of continuous fillet weld material. For example, with Navy specifications the volumes of intermittent welds for a non-structural bulkhead stiffener and for an aluminum stiffener are 75% greater than ABS specification, not counting any additional end welds. In addition, the Navy requires significantly double continuous end welding than does ABS. The Navy specification also differentiates between various strength steels.

If you have any questions regarding the need for this documentation, please contact me. Thank you for your cooperation.


Frank Domino

Copies: J. Andrulis, Production Engineering
D. Harper, Hull
C. Sherman, Welding Engineering

Sample Decision Making Report Requests an Action

**Atlantic Shipbuilding
MEMORANDUM**

File No. 64-38C
Date 5 **August 1986**

To C. Frederick
contracts Office

From **V. White** /w/
Quality Assurance

Subject Ballast Tank Drainage, SWATHA-TSD, Contract Defect 28-ZX

Reference (a) Memo C. **Frederick** to V. White, 28 July 1986
(b) Owner letter, Ref. No. 324-D-28-ZX, 15 July 1986
(c) owner defect form Defect 28-ZX

Enclosure Memo L Hernandez-V. White 4 August 1986
"Complete Wing BallastTankDrainsge"

In your memo of 28 July 1986 (reference a), you requested that Quality Assurance evaluate contract defect 28-ZX (references b and c). Outfitting has analyzed the need for complete wing ballast tank drainage (enclosure). The amount of ballast left in the ballast tanks is not significant enough to warrant the incorporation of additional drainage. Thus, no action is warranted on the part of ASBC.

The Owner observes that there is no provision for complete drainage of the wing ballast tanks. Due to normal stem trim in service, a permanent wedge of water will be trapped because of the stepped design of the tanks.

This lack of full wing tank drainage is insignificant. The trim booklet calls for deballasting only at certain ports. The trim will be such that the total amount of ballast remaining will be 2.16 tons. The resulting change in trim and draft is so **inconsequential that cargo carrying capacity will be unaffected.**

Installing a to provide for complete deballasting would incur unnecessary labor and material costs. Therefore, Do action warranted in response be contract defect Dotice 28-2X.

Sample Decision Making Report States a Conclusion

Atlantic Shipbuilding Corporation
Huron River Yard
Ann Arbor, Michigan 48014

29 May 1986
File 16-18Y

Supervisor of Shipbuilding
New Construction, USN
Cleveland, OH 33715

Attention: Mr. E. Shapiro
Project Manager, Code 481

Subject: Request for Resolution of Radar System Exceptions:
Contract Problem Identification Report No. 24

References: U.S. Navy Contract N-UM101-86-CB-1328
SWATH A-TSD, Atlantic Shipbuilding Corporation Hull 324
Minutes: SWATH A-TSD Design Review Meeting, 5-6 May 1986

Enclosures: (a) ASBC Comments / SWATH A-TSD Proposal Evaluation –
Radar System, dated 29 April 1986
(b) Control Electronics, Notes applicable to quotation in
response to Radar System Invitation to Bid

Dear Sir:

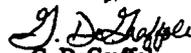
During the SWATH A-TSD Design Review Meeting of 5-6 May 1986, ASBC advised the Navy of a potential problem concerning the COR specified Control Electronics radar system. Control Electronics has taken exception to certain general requirements included in the purchase specifications in accordance with the COR. The purpose of this letter is to ask for a decision on the disputed items by 6 June 1986 so as to avoid a delay in the delivery of Hull 324.

The details of the radar system and the exceptions of Control Electronics are summarized in enclosures A and B. As the minutes of the meeting indicate, a decision from the Navy was to be forthcoming. To date we have not received a reply.

We ask that you either waive the requirements that Control Electronics objects to or provide support to remedy the situation. If the situation is not resolved by 8 June 1986, the delay in equipment delivery will cause a delay in the delivery of Hull 324. This is due to the sixty (60) week delivery time quoted for the radar.

Your prompt attention this problem would be greatly appreciated

Sincerely,


G. DeGraffoli
SWATH Program Manager

Sample Decision Making Letter Report to SupShips (2 pages).

Atlantic Shipbuilding Corporation
Huron River yard •
Ann Arbor, Michigan 48014

29 Ma 1986
File 16-8Y
page 2

DeGraffoli to Shapiro, Request for Resolution of Radar System Exeptions

cc: **C. Fredelick**, Contracts
L. Hernandez Prod Engin., outfitting
J. Andrulis, Prod. Engin.
S. Holmes General Manager

Atlantic Shipbuilding Corporation
Huron River Yard
Ann Arbor, Michigan 48014

Supervisor of shipbuilding
New Construction, USN
Cleveland, OH, 33715

File: TY201-78

Date 18 June 1986

Attention K. shower, Quality Assurance

Subject Insulation Protection and Removal, Incident Response

References (a) SOSCO QDR TY201-78-86-13
(b) SOSCO QDR TY201-78-86-15
(c) ASBC, Procedure Index 13B-455.90

Enclosure (1) "Effects on Insulation of Heat Due to welding"
ASBC Test Report W86-32N, 13 May 1986

Atlantic Shipbuilding Corporation ~~in~~ **ception to the incidents cited in** ~~the~~ **Quality Deficiency Reports TY-201-78-86-13 and TY-201-78-86-15 (references a and b).** The welding procedures were not in violation of ASBC Procedure Index 13B-455.90 (reference c). Accordingly, the contractor requests that these QDRs be retired

The precautions addressed in Procedure Index 13B-455.90 apply to flammable materials. However, specific sp for the insulation installed in the SWATH A-TSD am that it be non-flammable. This insulation is MIL-I-631-E Type II, which is not flammable. Thus, Procedure Index 13B-455.90 does not apply to the incidents cited in SOSCO QDR TY-201-78-86-13 and SOSCO QDR TY-201-78-86-15.

However, the contractor recognizes that massive welding on one side of a bulkhead may deteriorate the insulation on the opposite side of the bulkhead. In such cases, the contractor removes and reinstalls the insulation on the opposite side of the bulkhead. This is done on a case-by-case basis. It is not done when the welding is minor, such as for tack-welding of brackets.

These case-by-case determinations are based on a thorough study of the effects of welding on the opposite side of insulated bulkheads. A copy of this study, ASBC Test Report W86-32N, is enclosed.

Thank you for your cooperation.



G. DeGraffoni
SWATH Program Manager

Sample Decision Making Report Requests a Decision

**Atlantic shipbuilding
MEMORANDUM**

File No. 36-50S
Date: 3 May 1986

To: Mr. R Sweetman
Project Manager
Harbor Tugs
Baltimore, Md. 22002

From: C. Webster, Manager
Design Engineering, Outfitting Section
Ann Arbor, MI 48104

Subject: Request for Change in Vendor for Heat Exchanger
Ocean Tug, Repair and Overhaul

Reference: Equipment Specifications, Contract AD50I-65
Appendix F, p. F-12

Enclosure: White Heat Control Company Bulletin 326D Heat Exchangers

Contract equipment specifications for the ocean tug heat exchanger were written in terms of the Barfield Corporation product line. However, the current Barfield heat exchanger does not meet the precise specifications for this vessel. Specifically, the double-walked design specification is not met. We request a change in authorized vendor to White Control Company.

The White Heat Control Company model H-1420 meets all of the design requirements for this heat exchanger. The technical specifications and cost data for this model are listed in the enclosed Bulletin. The cost differential is negligible.

If Harbor Tugs Inc. approves this change in vendor, please sign below and return this memo to us. We will then proceed accordingly. Thank you for your assistance.

C. Webster

Design Engineering outfitting
Atlantic Shipbuilding Corp.

Approved: _____

Date: _____

cc: A. Vanlo, Chief Naval Architect

w. Loman, Purchasing

Sample Decision Making Report Presents a Solution

REPORT WRITING GUIDELINES: IMPLEMENTATION REPORTS

1. TYPICAL NAMES

Engineering Change Notice; Problem Correction Report; Request for Engineering Services; Impact Notice Ship Alteration Record; Drawing Reservation Notice; Corrective Action Request Production Change Notice. Often on standard fares.

2. PURPOSE OF REPORT

To implement design and construction changes on a specific hull by requesting or authorizing a change. To document a change. These reports result in technical changes—they are action oriented, not decision oriented. The reports implement changes that result from a prior problem-solving process. They also request or authorize routine changes without prior communication or decision making. They are organizationally routine and contract specific.

3. AUDIENCES FOR REPORT

An implementation report is a routine report with established audiences. It often is a standard type of, such as a production change notice. Thus, the organizational context and therefore the audiences for an implementation notice are standard. The lines of communication are relatively fixed for each type of report. Action audiences should be identified; usually, the primary person who will act or implement the change is identified as the primary recipient of the report. Standardized or checkoff distribution lists are used, based on the context of the report.

4. INFORMATION TO INCLUDE IN REPORT

An implementation report focuses on specific technical detail. The detail is sufficient for change to be made or action taken. The reason or problem is stated succinctly in technical terms. Justification for the change often is unnecessary. The technical detail in the report is drawn from standard documentation familiar to the audiences. Therefore, although precise and complete for the issue involved, it is very selective. Background material usually is unnecessary. Interpretation usually is unnecessary. As necessary documentation is attached to report. The information is presented for the engineers and other staff professionals who will actually do the work. Thus, the information is technical and addresses specialists and those familiar with the subject.

REPORT WRITING GUIDELINES: IMPLEMENTATION REPORTS

5. ORGANIZATION OF REPORT

The information in an implementation report is analytic in tone and content. The technical information is presented directly so that action can be taken. It is clearly segmented in terms of type of technical information. It often includes a sequence of actions that will result: request for a drawing change, a drawing change, recording of the drawing change.

The report is organized in terms of a point-by-point presentation of the components of the subject matter. These are arranged in some logical sequence, such as problem-solution or in a descending order of importance. The format reflects this analytic structure.

The report states these in precise technical detail; it does not explain or justify. The style is direct and precise, and even telegraphic. Paragraphing is at a minimum. Writing devices such as introductions, transitions, and discussion are omitted. The presentation focuses on particulars.

The report is organized in terms of a standard format. The format conveys the subject and purpose of the report. The reports, therefore, often lack subject lines and introductions. A standard format also replaces the summary in most implementation reports.

6. GUIDELINES FOR FORMATTING AND VISUALS

Implementation reports are in standard standard formats or "boilerplate" (e.g., printed forms) form. Each type of report has its own format. The format signals the type and purpose of the report. Audiences know what kind of information is in the report and where it is.

The information is presented graphically and visually whenever possible.

7. ADDITIONAL SUGGESTIONS

Because an implementation report is action oriented, its format usually has feedback mechanisms built into the form—sign-off lines, checklists, multiple copy forms, etc.

		Engineering Change Notice		form TI-104	
Originator: Design Engin.		Date: 6/14/86	ECN: RM-222		
Dept. Approval: <i>JM</i>		PR100-347	Hull No: 324		
<p>Engineering Change</p> <p style="text-align: center;">Rerouted hydraulic lines to hatches #1 and #5.</p> <p>Drawing Changes</p> <p>DWG. NO. PR100-238</p> <p style="padding-left: 40px;">Added brackets 4191 TC15, 16, &27 4191PR19 & 20</p> <p style="padding-left: 40px;">Deleted brackets 4191 PR08, 14,16,03,04</p> <p>DWG No. PR100-347</p> <p style="padding-left: 40px;">Added brackets 4191 PJ22, 23, & 28</p> <p style="padding-left: 40px;">Deleted brackets 4191 PT04, 14,&18</p>					
REASON		MATL ENGIN APVL	D Composite Signoff appvd <i>CS</i>		To be incorporated No <input type="checkbox"/> Yes <input checked="" type="checkbox"/>
CODE	SIZE	DESCRIPTION	QTY	MATERIAL	SPEC. REMARKS
DISTRIBUTION		APPVD	ABS	USCG	SUPSHIP
Administration	Design Engineering	Production/Planning	Owner		
General Manager		Production	ABS		
Marketing			USCG		
Estimating	Technical		SupShip		
Contracts		Construction			
Purchasing	Quality Control	Welding			
Program Office		Trade/Shops			
page 1 of 5					

Sample Implementation Report: Engineering Change Notice

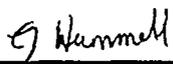
Construction and Production Engineering
Problem Correction Report

Shipbuilding

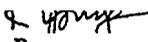
form TO-99

Contract No. N-001006	Part No. A-9000 series	WP/SN NO. 846/432					
Problem Description		Corrective Action Required					
Part numbers A-9000 to A-9200 were in excess of required length by 1.25 inches.		Paris were cut to proper length.					
Sub-plan does not show to hold 1.25 in. fwd, end.		Revise Sub-plan.					
<i>BM 6/12/86</i>							
Remarks		Corrective Action Taken					
Contacted Mold Loft 6/12/86		Correct dimension was added to sub-plan.					
Signed <i>Bruce</i> Date <i>6/12/86</i> Signed <i>ZH</i> Date <i>6/28/86</i>							
Distribution:							
Mold Loft	<input checked="" type="checkbox"/>	Welding	<input type="checkbox"/>	Production Eng.	<input checked="" type="checkbox"/>	Planning	<input type="checkbox"/>
Quality Assurance	<input checked="" type="checkbox"/>	Trades/Shops	<input type="checkbox"/>	Material Control	<input type="checkbox"/>	Design Eng.	<input type="checkbox"/>

Sample Implementation Report: Problem Correction Report

Request for Engineering Services	
	form - ME57.1
To: C. Cavanaugh Dept. Fdn. Design From: G. Hummell Dept. Design Eng. Date 6/10/66 Subject: Drawing Change to Facilitate Installation of Ventilation System	Drawing No. LL100 -86 Contract No. TY201-78 Shop No. WP/SN No.
<p>MESSAGE: Drawing No. LL100-86 specifies that the aft bulkhead in "propulsion repair aft" be watertight. However, the HVAC design for the ventilation system serving the aft engine room requires this bulkhead to be non-tight to facilitate installation of ductwork.</p> <p>RECOMMENDED SOLUTION: Make subject bulkhead non-watertight. Subdivision considerations do not require a watertight bulkhead at this location.</p> <p>SIGNED: </p> <hr/> <p>REPLY: Will change subject bulkhead to non-watertight on drawing LL100-86.</p> <p>SIGNED: </p>	
PP: PRODUCTION/PLANNING ACTION <input type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED REASON _____ SIGNED _____ D A T E _____ <input checked="" type="checkbox"/> Production Drawing Changed SIGNED _____ D A T E _____	DESIGN ENGINEERING ACTION <input type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED REASON _____ SIGNED _____ D A T E _____ <input type="checkbox"/> Composite Drawing changed SIGNED _____ D A T E _____

Sample Implementation Report: Request for Engineering Services

Atlantic Shipbuilding Corporation Huron River Yard Ann Arbor, Michigan 48014		Mail Stop C184
Design Engineering		
February 6, 1987		
Commander (mmt) Third Coast Guard District Governors Island New York, NY 1000-4		
Attn: Lt. P. Jackson		
Subject: Request for U. S. Coast Guard Representatives at Deadweight Survey of S.S. Johnson, ASBC Hull 324		
Ref: Contract No. SB-324-02		
Attachment Instructions for Deadweight Survey S.S. Johnson		
This is a United States Coast Guard to designate its representatives at the deadweight survey of Hull 324 to be conducted by Atlantic Shipbuilding Corporation the week of February 11, 1987.		
Purpose of Survey. The deadweight survey will determine the lightship weight and the location of the longitudinal center of gravity. As previously agreed upon the vertical center of gravity will be assumed to be that of sister vessel, Hull 323. The vessel will be nearly upright and complete as possible at the time of the survey (see attachment for detailed survey instructions and activities).		
Survey schedule.		
0800 Monday, 11 February 1987	Start inspection and signing off of tanks.	
0900 Wednesday, 13 February 1987	Start damage survey,	
0900 Friday, 15 February 1987	Reading of drafts and checking of damage sheets	
Survey Location. Left Bank Basin, Huron River Yard, ASBC.		
Your comments the procedure would appreciated.		
Sincerely,		
 R. J. Young Section Chief Design Engineering		
General Manager, Mail Stop A123 Program Manager, Mail Stop A234 Administrator, Mail Stop A 202 Chief Naval Architect, Mail Stop C150 Yard Superintendent, Mail Stop G21 Rigging Department Superintendent, Mail Stop F12 Representative, Hurst Shipping Company		

Sample Implementation Letter Report

REPORT WRITING GUIDELINES: RECOMMENDATIONS

1. TYPICAL NAMES

Recommendation; Proposal; Request

2. PURPOSE OF REPORT

To obtain management approval for a change in a standard design and construction practice or a standard management and administrative procedure.

3. AUDIENCES FOR REPORT

A recommendation report is a decision-making report. Its primary audience is the person responsible for making the decision.

Secondary audiences staff upon whose advice the decision maker will rely; managers in affected departments whose advice the decision maker will solicit; managers and other staff whose departments and responsibilities will be affected if the recommendation is adopted.

4. INFORMATION TO INCLUDE IN REPORT

A recommendation report is similar to a decision-making report in that it addresses a problem and proposes a solution. However, there are significant differences that require a different focus. A recommendation usually applies across contracts rather than is contract specific. Consequently, the recommendation has to establish the criteria to support the recommendation. Since it is requesting a change in a policy or procedure, rather than a change in a given design, it requires a decision to be made. The decision-making report, on the other hand, usually assumes that a decision has been made or will be made.

A recommendation report focuses on interpretation and judgment. Technical detail is subordinated to management and administrative implications, and often is attached. The report has a persuasive approach.

The report includes:

A convincing statement of the problem or need for change.

A clear statement of the recommendation and the justification for the recommendation.

A statement of the organizational implications of adoption of the recommendation: implementation; cost; schedule; departments impacted; contract and bid; etc.

The report presents these selectively, not in detail.

REPORT WRITING GUIDELINES: RECOMMENDATIONS

ORGANIZATION OF REPORT

A recommendation report is organized to communicate directly with a decision maker. The report presents analysis, interpretation, and judgment in one or, at most two pages. Technical and supporting detail is presented in attachments or referenced. If referenced, it should be summarized in attachments.

The important sections of a recommendation report in this order, are

Heading and subject line: The heading addresses the person responsible for acting upon the recommendation. The subject line states the purpose and subject of the report.

Summary (the first section of the report often in two paragraphs)

1. The organizational problem or need and the specific decision or action requested.
2. The recommendation and the basic conclusions or justification for the recommendation.

Justification or Support—the reasoning to explain the conclusions:

1. Summary of the problem, criteria for the solution, and selected details of the specific recommendation. Essentially, an argument that the problem needs action and that the criteria are appropriate.
2. Support for the recommendation conclusions with supporting justification, arranged in descending order of importance.
3. Anticipation and refutation of objections or alternatives, if any, or qualifications.
4. Summary or brief explanations of organizational implications if accepted.

6. GUIDELINES FOR FORMATTING AND VISUALS

The format of a recommendation report is designed for that specific report. That is, a tailored rather than standard format is used. Although the report relies on prose rather than graphic presentation, it is formatted so that the audience can determine by the format the basic parts of the report and the structure of the justification for the recommendation. This means that substantive headings and even numbers are used throughout the report.

7. ADDITIONAL SUGGESTIONS

A recommendation, more than any other type of shipyard— must be written to managers. It should be presented in terms of their values and the basic values of the shipyard, not the particular values of the writer's department or role.

Recommendations aren't approved to make your job easier, they are approved to make their job easier. At least in tone, recommendations are approved if they result in improvements in the productivity of the yard as a whole, not in the improvement of the productivity of a department at the expense of other departments or programs.

Atlantic Shipbuilding
MEMORANDUM

File No. 12-5T
Date 3 July 1986

To: **S. Guthrie**
Assistant General Manager

From: J. Andrulis, Manager-
Production Engineering

Subject: **Proposal to Introduce Line-Heating Technology into
ASBC Production Procedures**

At the present time, the technique of cold-forming shell plating limits our productivity and flexibility. The fact that we rely on this technique limits our **competitiveness in some bid situations. I therefore propose that ASBC introduce** line-heating technology in our facilities. This will enable us to stay competitive with other U.S. Shipyards.

Line-heating technology will (1) increase our productivity, (2) facilitate more complex shell plate curvature and lower costs, and (3) improve production flow. Improved fabrication quality will result in the yard more competitive. Implementation of line-heating technology will require approximately one year, including planning.

Limitations of cold forming technique. ~~Our facilities for cold-forming shell plating do not suit the needs of current designs. These facilities can only perform adequate~~ shaping up to 3/4 inch thick plates and are not capable of not giving plates longitudinal curvature. The specifications of our cold-forming facilities and optimal specifications for contract TY236-83 are listed in Attachment A.

Line-heating technology. Line heating is the process of ~~forming~~ structural shapes and plates by controlled heating and ~~forming~~ cooling. The process is also scientifically applied for fitting structural intersections and removing distortion due to thermally stress.

Advantages of line heating for forming curved shell plating. By employing line heating, we can eliminate the restrictions we now face in the forming of shell plating. The advantages of line heating are:

- 1) Increase in productivity, as seen in other U.S. shipyards (Attachment B).
- 2) **Ability to accurately form shell plates with compound curvature (Attachment C itemizes parameters and dimensional control for plates on Hitachi Hull Y-14-2), which results in a cost savings.**

Atlantic Shipbuilding
MEMORANDUM

- 3) Ability to fit curved parts to curved shell accurately with minimal force, which requires fewer man-hours than cold forcing.
- 4) Accommodation of larger plate sizes, thereby butts seams.
- 3 Optimization of existing facilities through improved scheduling and elimination of bottlenecks.
- 6) Facilitation of subsequent assembly by eliminating distortion prior to forwarding an interim product to the next level of production.
- 7) Ability to accurately and productively fair structural intersections.
- 8) Enhanced worker safety.

Our statistical accuracy control system would be modified to assure the normal process capability, including standard range and tolerance limits.

In conclusion, line heating shapes material more accurately with less effort and provides more production flexibility.

Implementation of line heating would be best accomplished by contracting with a Japanese firm to provide technical information and training. Our own shipyard would be responsible for the adaptation of existing equipment and the construction (and purchase) of new equipment needed for this method. Finally, ABS approval will be needed before this technique is used in actual production. The implementation of line-heating technology will require approximately one year.

Upon approval of this proposal I will prepare a detailed procedure and cost estimate for implementation of line-heating technology. Final cost estimates can be made after technical training with the Japanese firm. Qualitative benefits then can be calculated for selected proposals and contracts, based on the percentages of shell plates which could be formed in whole or part by line heating.

I have scheduled a meeting in the Administrative Conference Room for 0900 Wednesday, 16 July to discuss this proposal and implementation plans.

Attachments: A-Yard Specification
A-Yard Specifications and Optimal Specifications, Contract
B - Effect on Productivity of Line-Heating Technology
C-compound shell curvature for Hitachi Hull Y-14

cc: **S. Guthrie, Asst. General Manager**
G. Landon, Prod. Engineering
C. Sherman, Welding Engineering
A. Vaslo, Chief Naval Architect

V. White, Quality Assurance
F. Domino, Construction
W. Loman, Purchasing

REPORT WRITING GUIDELINES: STATUS REPORTS

1. TYPICAL NAMES

Production Status Quality Control Record; Estimating Schedule; Compartment Discrepancies Report; Dimensional Control Record; Project Summary
 Related reports: Progress Report; Annual Report; Quarterly Report; XXX Plan

2. PURPOSE OF REPORT

To inform management, engineering, and construction of the status of projects across the yard or of the status of an individual project. The reports usually are periodic. Status reports provide information. Even action items are presented as information-actions that will occur in the next period.
 Secondly, to justify, support, or document activities included in the status report

3. AUDIENCES FOR REPORT

Audiences for status reports are diverse but standardize Audiences usually range from the general manager to yard supervisors. The audiences are standardized for each type of status report, whether yard-wide or for a specific contract
 Audiences often are departments and roles, not individuals.

4. INFORMATION TO INCLUDE IN REPORT

Status reports are selective. Their purpose is to summarize the progress or status of a project not to present technical detail. They summarize decisions, activities, and changes. The information is presented so that the readers can determine the implications for them.

Status reports present facts of actual activities and compare them to the standards for those activities.

The status report presents quantitative data and results, usually without explanation or interpretation. Decisions and actions are presented as facts.

Status consists of the following types of material:

Quantitative description of activities within a period or to date.

Decisions and actions within a period or to date.

Decisions and actions that will occur.

Plan or schedule for the next period.

A framework of standards, expectation, schedule, milestones, etc.

REPORT WRITING GUIDELINES STATUS REPORTS

5. ORGANIZATION OF REPORT

Status reports are organized in terms of topic or subject matter: this is an analytic order.

The order of the items depends on the subject matter of the report. The type of status should suggest the order. In decreasing order of importance, typical patterns of arrangement include:

General to specific: summary information, then increasingly specific information (e.g., work action status to critical work actions)

Most important information to least important information.

Project Number, Department Activities; etc.

Chronology.

Comments and miscellaneous information are presented last.

Status reports usually implicitly suggest that the status is acceptable. Thus, any problematic implications of the status information should be anticipated. These will have been addressed or will be addressed with a decision-making or implementation report. The status report presents as fact that problems have been, are being, or will be addressed. For example:

Reworking piping, WA 894, required some redesign. This was accomplished by the Design Engineering Outfitting Section.

Because status reports summarize information, they are one page reports or one page summaries whenever possible.

6. GUIDELINES FOR FORMATTING AND VISUALS

Status reports are highly formatted and primarily graphic or tabular rather than verbal in design. The format and information are standard, as the report is a repetitive report for its type of information. The format makes the information immediately accessible.

7. ADDITIONAL SUGGESTIONS

Status reports increasingly have come to rely on computerized information retrieval.

If possible, the computer printout format should be avoided as it usually is designed to record information rather than to communicate information. The best solution is to prepare a standard one-page cover memorandum to summarize the status information contained in the printout. The printout information can be interpreted and summarized for the audiences of the report. The printout can be referenced or attached- depending on the audience (e.g., referenced for the general manager and attached for the manager of quality control).

Atlantic Shipbuilding Project Summary	Planning L. Duke, Supervisor Scheduling			
Project: SWATH A-TSD	Date: 17 June 1986			
Contract TY201-78				
<hr/>				
Work Action Status As of 17 June 1986				
	actual Scheduled percentage			
Work Actions (Starded)	101 140 72.1			
Work Actions (completed)	185 220 84.1			
<hr/>				
Delivery Date Status As of 17 June 1986				
	actual scheduled			
Current progress	60% 65%			
Delivery date	October 9 September 28			
<hr/>				
Critical Work Actions As of 17 June 1986				
Work Action No.	Description	Sch. Comp.	% comp	Req. Manpower
380	Outfit block 1790	7-20-86	25%	32
291	Install heat exch.	6-19-86	78%	10
894	Rework piping	6-23-86	43%	15
<hr/>				
Comments:				
Reworking piping, WA 894, required some redesign. This was accomplished by the Design Engineering Outfitting Section.				
Distribution:				
S. Holmes (General Manager)		Production Engineering and Planning		
S. Guthene (Asst General Manager)		Design Engineering		
Contracts		Quality Assurance		
Program Navy-		Production Construction		

Sample Status Report

REPORT WRITING GUIDELINES : MINUTES	
1. TYPICAL NAMES	Meeting Minutes; Conference Record; Telephone Record; Trip Report; Sales Contact Report; Technical Communications Report (CDRL-DID USI-A-23532) Related Items: Meeting Announcement; Highlights/Summary of Contract/Document.
PURPOSE OF REPORT	To report the required actions, decisions, and important information (the results) of a specific meeting or similar event. To document for the record. Decisions: the primary purpose is to report decisions arrived at during the meeting. Actions: the primary purpose is to report actions that will be taken. Information: a secondary purpose is to keep persons informed. secondary purpose is to document for the record.
3. AUDIENCES FOR REPORT	Audiences should be identified on a need-to-know basis. Protocol audiences should be kept to a minimum. Broadcast distribution lists should be omitted whenever possible. AU managers who must make any decision or take any action required. All managers whose departments will be affected by the decisions and actions. Others who will be affected by decisions and actions. Persons who need any of the information, especially regarding contracts/programs. Senior managers who need to be kept abreast of important contract developments.
4. INFORMATION TO INCLUDE	<p>Heading information</p> <ul style="list-style-type: none"> Date, source, file number. Subject, place, and date of meeting. Contract identification. Participants (and missing participants irrelevant) by name and role. Distribution list. <p>Background information:</p> <ul style="list-style-type: none"> Purpose of meeting and reason for meeting (organizational problem or need). Organizational implications of the meeting--importance to yard contracts, departments, and management. Problems and issues discussed; topics or agenda of meeting. <p>Summary of Important Information:</p> <ul style="list-style-type: none"> State the important conclusions, decisions, agreements, solutions, and actions required. Present bottom line results of discussions only; do not present details. Provide brief background information only when necessary for managers to understand or accept conclusions, actions, etc. <p>selected Documentation:</p> <ul style="list-style-type: none"> Attach selected detailed documentation necessary to understand or implement decisions and actions. Key documentation to specific items. Reference sources and additional background documentation as appropriate

REPORT WRITING GUIDELINES: MINUTES

5. ORGANIZATION OF REPORT

Heading. Most of the heading information comes first. Some formats have distribution lists and reference information last. If a list of participants is part of the heading information the distribution list might come last to avoid confusion.

Purpose. This section should be brief. It functions to introduce the important items covered in the minutes. Omit background material whenever possible and focus on the organizational context and implications.

Summary or Highlights. If important decisions or action items are distributed among the topic by topic summary of the meeting, these might be highlighted in a brief summary. As the minutes themselves are a summary, this section might just call attention to items below.

If the minutes are several pages, then the summary should be a substantive summary of important decisions, actions to be taken, contract and cost implications, and future actions and events selected from the topic-by-topic discussion.

Topic Arrangement A topic-by-topic summary of the meeting—arranged in a descending order of importance—is appropriate if the meeting is an occasional or special meeting, a one-topic meeting, or a problem oriented meeting.

Administrative Arrangement A topic-by-topic summary arranged according to a formal agenda or standard meeting order. This order is appropriate when the meeting is routine or periodic and primarily informational. The order is a reference order expected by the audiences.

Additional Information The minutes conclude with any miscellaneous information.

Attached Documentation. Handouts, attachments, etc., referenced in the minutes.

6. GUIDELINES FOR FORMATING AND VISUALS

Minutes should be heavily formatted, with bullets, lists, heads and subheads, boldface, underline, etc., to separate and highlight items of information. Use white space effectively. The style should be telegraphic. Paragraph clusters should be used. Standard formats and standardized forms should be used for routine reports. One-of-a-kind meeting minutes also should be highly formatted.

ADDITIONAL SUGGESTIONS

Minutes should be reconstructed from notes, not presented in narrative form. If it's worth having a meeting, it's worth having minutes. However, minutes are not transcripts.

Minutes are distinctive because the writer often is merely transmitting information and decisions rather than is the person responsible for them. Minutes furthermore have no feedback mechanism. Thus, careful audience analysis is needed.

Telephone minutes also should be topic oriented, impossible. Several calls over several days on one issue can be included in one minutes.

Announcements of meetings deserve a separate communication. They should present the heading and background information discussed in item 4.

Atlantic Shipbuilding MEMORANDUM		
To: Distribution	Dept.	Date: 14 July 1986
From: C. Frederick	Dept. contracts	File: 324/86-22
		Page 1 of 2
Subject: Minutes of meeting with Coastal Shipping to discuss unsatisfactory specification items on ASBC Hull No. 324		Contract: TY201-78
Place: 12 July 1986, Atlantic Shipbuilding		
Participants:		
R. Martin (CSC)	C. Frederick (Contracts)	
D. Edwards (CSC)	A. Vaslo (Chief Naval Architect)	
L. Moseby (CSC)	J. Andrulis (Production)	
	V. White (Quality Assurance)	
	F. Domino (Construction)	
Purpose:		
To discuss the contract specification items Coastal Shipping Corporation finds unsatisfactory with the construction of Hull No. 324 (letters of 12 June and 23 June). After discussion, appropriate actions were agreed upon and tasks assigned.		
Action to be taken by:	Department	Item
	Design Engineering	E03, A11
	Construction	E02, C16
	Purchasing	C04
Meeting Topics:		
1 E02	Noted that #1 control panel in pump room has two damaged control switches. Construction will install new switches.	
Distribution		A. Vaslo (Chief Naval Architect)
S. Guthrie (Asst. General Manager)		
C. Frederick (Contracts)		V.White (Quality Assurance)
W. Loman (Purchasing)		F. Domino (Construction)

Sample Minutes of a Meeting (2 pages)

Atlantic Shipbuilding
MEMORANDUM

To: Distribution Dept.	Data: 14 July 1986
From: C. Frederick Dept. Contracts	File: 324/86-22
	Page 2 of 2
Subject: Minutes of meeting with Coastal Shipping to discuss unsatisfactory specification items on ASBC Hull No. 324	Contract TY201-78

- 1 E03 Noted that in the aft pump room all valves are not accessible. T-handles were suggested.
Design Engineering to change.
- 1 A11 Noted that forward hydraulic supply hoses could chafe and pinch during the operation of #1 and #5 hatches.
Rerouting will correct problem.
Design Engineering, Outfitting Section will resolve.
- 1 C04 Noted that the #2 emergency generator does not function properly.
Problem appears to be in the governor.
Purchasing to have vendor correct.
- 1 C16 Noted that Engine Control Room is dirty.
Construction will clean after all engine room work is completed.
- G01 Material Control received air conditioning units that had delayed some outfitting work.

References: Letter, Moseby (CSC) to Frederic 12 June 1986
Letter, Moseby (CSC) to Frederick, 23 June 1986
Letter, Frederick to Moseby (CSC), 30 June 1986

REPORT WRITING GUIDELINES: PROCEDURES

5. ORGANIZATION OF REPORT

Procedures and instructions are organized in several parts: an overview; then a step-by-step set of instructions for performing the procedure.

The overview is an introduction that states the purpose of the procedure and the expected output of the procedure. This might be phrased as a statement of the need or problem for which the procedure is the solution. This overview often is in a cover memorandum, with the procedure itself attached to be used separately.

If the overview is presented separately from the procedure, the procedure itself has an overview.

A procedure has the following outline:

Functional overview of the procedure: a statement of the purpose and output of the procedure.

Background information warnings and precautions; equipment or tools necessary; theory or concepts necessary to understand in order to do the task; distribution of responsibilities and actions of those directly involved in supervising and performing the task.

A step-by-step sequence of actions necessary to accomplish the task. Impossible, these are grouped in stages so that the progress can be measured against milestones toward completion of the task.

If the task is grouped in stages, each stage is presented as a mini-procedure. That is, each stage is organized with a functional overview, background information, then a step-by-step sequence of actions necessary to complete that stage.

Detailed description of the output or result. This often is formatted separately.

6. GUIDELINES FOR FORMATING AND VISUALS

All procedures are formatted in some manual-style format. Similar types of procedures are formatted in a standard format. The format increases efficiency of use. A one-of-a-kind procedure is put in a format adapted to that procedure.

Visual aids are used whenever possible to illustrate a task result.

7. ADDITIONAL SUGGESTIONS

Standard formats for procedures should be established yardwide. Different formats issued from different departments can confuse users.

Procedures have safety and liability implications as well as contract implications. Thus, many procedures should be written in terms of current standards of judgment in liability cases (handling of dangerous materials, etc.).

Procedures that involve trades and crafts require analysis in terms of their implications for job descriptions.

Atlantic Shipbuilding
MEMORANDUM

To: Construction Engin. Material Control	Trades and Shops Quality Assurance	Date: 8 June 1986
From: L. Hernandez <i>LH</i> Dept. Production and Construction		File: 1O-28E
Subject: Procedure to Protect Fan Coil Units		Page 1 of 1
		Contract: Generic

Recently, corrosion in fan coil units in the production staging area has caused concern. Hence forth, all units stored in the open should be protected from rain and moisture. The attached Work Standard has been adopted for protection of fan coil units throughout the yard.

Work Standard #A5-23/10 is issued alert all shops and trades to the procedures for protecting Fan Coil Units. It explains when and how to protect these units. Material Control is responsible for assuring that all units released to Construction are adequately protected.

Supervisory personnel should review this WS with the affected trades and shop personnel at the next Work Procedure meeting.

Attachment Work Standard, A5-23/10

Distribution

S. Gutherie (Asst. General Manager)

Joiners
Sheetmetal Workers
Riggers
Laborers
Painters
Welders

Electricians

Machinists
Pipe fitters
Tool Room
Transportation
Crane Operators

Sample Procedures With Cover Memo (2 pages)

Atlantic Shipbuilding	Subject: Fan Coil unit Protection No. A5-23/10 Date: 23 june 1986 Page: 1 of 1	Form ST-78
Work Standard		
1.0. Purpose		
This work standard presents a procedure for protecting fan coil units from corrosion.		
2.0. General		
2.1. The fan coil units are designed for indoor use. They should not be exposed to rain and moisture without proper protection.		
2.2. Material Control is responsible for assuring that all units released to Construction are adequately protected against moisture damage.		
3.0. Action		
3.1 All fan coil units to be transported and stored in the open must be covered to protect against rain and moisture.		
3.2. Units must be covered prior to removal from the warehouse. Plastic (4 mil min.) or similar wrapping material should be used.		
3.3. Temporary storage sites at assigned production staging areas must be above standing water levels.		
3.4. Units must be examined during regular preventive maintenance to assure continued protection. Any damaged covering must be replaced.		
3.5. Units must remain covered against moisture until they no longer are exposed weather conditions. UNITS MUST REMAIN COVERED WHEN REMOVED FROM THE PRODUCTION STAGING AREA AND TAKEN TO THE CONSTRUCTION AREA.		
3.6. Quality Assurance is responsible for inspection of fan coil unit protection in the production storage area.		
Issued by: <u>L. Hernandez, Production and Construction</u>		
Approved by: <u>V. White, Quality Assurance</u>		

I n d e x

Administrative Reports 12,17-22,63-69,73,169-180

Analysis, Technical (see Discussion)

Analysis Pattern 72,79-83

 Checklist 143

Attachments 28,36

Audiences (see Readers)

Cause and Effect Pattern 86-87

 Checklist 145

Communication Purpose 4,6,40,46-52

 Problem Solving Recess 49

 Table 51

Components, Basic Report 27-38

 Figure 28

Conclusions 40,52-56

Data 28

Decision Making Reports 13-15,59,72,151-158

 Guidelines 151-152

DID (Data Item Description) 19, 130

Discussion 28,32-35

Documentation 28,36

Drafts

 Rough 5,6

 Final 9

Drawings 28

Editing

 Report 5

 Draft 5

 Sentences 101-117

Format 8,43,90,99-100,119-130

 Cues 121-130

Formats, Standard 126-127

 Individualized 127-130

Forms, Standard 126-127

General To Specific 36-38,94

Handbooks 117

Heading 40-46

 Checklist 139

 Subject Line 40-46

Headings 123

Implementation Reports 15-16,59-60,72,73,159-164

 Guidelines 159-160

Instructions (see Procedures)

- Investigation Pattern 87
 - Checklist 146
- Line Length 120
- Line Spacing 120
- Lists 125
- Margin Justification 121
- Minutes 18-19,65-66,173-176
 - Guidelines 173-174
- Numbering 125
- Organizational Problem 48-50
 - Table 48
- Organizing Information 4,7,71,95-88
- Paragraphs 89-100
 - Cluster 90
 - Editing Checklist 147
 - Topic Sentence 91,94-95
 - Transitions 98-99
- Persuasion Pattern 72,75-79
 - Checklist 142
- Problem and Solution Pattern 72,73-75
 - Checklist 141
- Problem Solving Reports 12,12-17,58-62,72,151-168
- Procedures 19-22,66-69,73,177-180
 - Guidelines 177-178

Process Pattern 72,83-85
Checklist 144

Purpose Statement 40,46-52
Checklist 140

Recommendation Reports 17-18,60-62,72,168

Recommendations 40,52-56
Guidelines 165-166

Readers (Audiences) 4,24-27,119
Classification Checklist 138
Complex 26 (Table 3),35
Nominal 25-27,29
Primary 24,29
Secondary 28,29
Table of 24

Report Types 12

Report-Writing Process 2-9
Plow Chart (Figure) 3
Checklist 137

Revising
Draft 6
Paragraphs 89-100
summary 7

Sample Reports
Ballast Tank Drainage 14, 154 reference 13,24,27,38,40,58,59,
73
Engineering Change Notice 61,161; reference 60,81
Insulation Protection and Removal 54,157; reference 53,79
Minutes of Meeting 20,129, 175; reference 19,38,56,65,81,127

Problem Correction Report 76, 162; reference 75
Procedure to Protect Fan Coil Units 67, 179; reference 66,69,85
Proposal to Introduce Line-Heating Technology 30, 124, 167; reference 29,35,38,40,52,60,78, 100, 123, 124, 130
Reflag of Interlakes Shipping Corporation Ships 33; reference 32,46, 50
Request for Change in Vendor for Heat Exchanger 55, 158; reference 53,79
Request for Documentation to Introduce Intermittent Welding 37, 153; reference 36,81
Request for Engineering Services 16, 128, 163; reference 15,40,43, 56,75,127
Request for Resolution of Radar System Exceptions 41, 155; reference 40,43,52
Request for U.S. Coast Guard Representatives 82, 164; reference 81
Status Report 64, 122,171; reference 63,81,121

Selecting Information 4,7,57-69

Sentences

Agreement 111-112
Ambiguous Constructions 109
Clauses 102-104
Commas 114-117
Dangling Modifiers 109-110
Editing 101-117
Concreteness 111-117
Directness 102-108
Precision 108-111
Indirect Constructions 104-106
Paragraphs (in) 96-98
Parallel Construction 112-114
Passive Constructions 106-107
Phrases 102-104
Pronoun Reference 110-111
Subjects 96-98,107-108, 111-112

- Verbs 96-98,107-108, 111-112
- Word Order 108

- Status Reports 18,63-65,169-171
 - Guidelines 169-170

- Subheadings 123

- Subject Line 44-46
 - Tables 45

- Summary 7,28,29-32,39-56
 - Parts (Table) 40

- Tables 130-31

- Technical Communications Report (CDRL) 19

- Technical Investigation 50-51
 - Table 50

- Trip Reports (see Minutes)

- Type (Characters) 120

- Type Size 120,125-126

- Type Style 125-126

- Visuals 130-31

- White Space 123