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A REPORT GUIDE TO RADIOGRAPHIC TESTING LITERATURE - VOLUME II

Monograph Series by

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Materials Testing Technology
Nondestructive Testing Techniques

MATERIALS TESTING LABORATORY
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PREFACE

The literature survey contained herein has been prepared by the U. S. Army Materials and Mechanics Research Center (AMMRC) and is the second volume of a series on radiographic testing. Through necessity, a series of volumes has been planned because of the large amount of literature available in the field of radiography. The volumes will be published as compiled and will appear to be chronological since the oldest publications generally are contained in Volume I, etc. All items included in this volume have been taken from the holdings of the Department of Defense Nondestructive Testing Information Analysis Center (NTIAC) which is housed, staffed, and maintained at AMMRC.

The publications and articles documented herein are in some way related to radiographic testing, hence the use of certain seemingly unrelated descriptors. For the sake of completeness, each item is described by a profusion of descriptors to insure complete and accurate coverage of the subject matter.

The intent of this publication is to make available, under one cover, an exhaustive literature survey of the subject matter. By means of these report guides, items of interest may be rapidly and easily retrieved by industrial and scientific users.

Input to the NTIAC is accomplished by obtaining information from all leading and recognized sources such as the Defense Documentation Center (DDC); NASA; Engineering Index; foreign translations; numerous books, technical journals, etc. Many of the items listed have been taken from reports currently on file at AMMRC, while others may have been taken directly from abstract cards on the subject matter supplied by DDC, World Information Files, etc.

Special thanks go to the Documentation Service of the American Society for Metals, Metals Park, Ohio, and the Engineering Index, Inc., 345-47th Street, New York, New York for their kind and generous permission to reproduce their abstracts. The following copyright holders are also thanked for their courtesy in granting reproduction rights:

American Society of Mechanical Engineering
American Society for Metals
Brutcher, Henry
Business Week
Engineering Index
Forest Products Journal
Iron Age

Journal of Applied Physics
Magnafacts
Materials Evaluation
Materials Research and Standards
Metal Treating
Modern Castings
Nuclear Science and Engineering
Oil and Gas Journal
Steel
Test Engineering and Management
Welding Engineer
Welding Journal

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INTRODUCTION

Where available, each item in this publication consists of the following information: (1) item, report, or article title, (2) author or authors, (3) source or facility, (4) report number or identification, (5) date, and (6) abstract.

Word descriptors pertinent to each item are listed in alphabetical order and are cross referenced by the AMMRC identification number. Also provided is an author index or, if no author is available, then the issuing organization is listed.

OBJECTIVE

The main objective of this compilation is to provide a simple and fast access to information on the subject of radiographic testing and also to provide sufficient information in the form of abstracts and word descriptors to make the listing useful.

SCOPE

This guide is Volume II of a series of planned report guides consisting of the complete coverage of items in the Department of Defense Nondestructive Testing Information Analysis Center covering the subject of radiographic testing. Subsequent volumes will be published as the work load permits.

The following is a list of report guides previously published by the Department of Defense Nondestructive Testing Information Analysis Center. The guides may be obtained from the Defense Documentation Center, Cameron Station, Alexandria, Virginia.

AMRA MS 64-11	A Report Guide to Gamma Radiographic Literature, August 1964, AD 612 042
AMRA MS 64-10	A Report Guide to Auto- and Microradiographic Literature, August 1964, AD 612 047
AMRA MS 64-12	A Report Guide to Liquid Penetrant Literature, August 1964, AD 612 044
AMRA MS 64-13	A Report Guide to Literature in the Fields of Fluoroscopy and Remote Viewing, August 1964, AD 612 045
AMRA MS 64-14	A Report Guide to Thermal Testing Literature, August 1964, AD 612 043

AMRA MS 65-03	A Report Guide to Electromagnetic Literature, April 1965, AD 615 346
AMRA MS 65-04	A Report Guide to Magnetic Particle Testing Literature, June 1965, AD 617 758
AMRA MS 65-09	A Report Guide to Ultrasonic Attenuation Literature, December 1965, AD 627 565
AMRA MS 66-02	A Report Guide to Ultrasonic Testing Literature, Volume I, March 1966, AD 630 652
AMRA MS 66-05	A Report Guide to Ultrasonic Testing Literature, Volume II, June 1966, AD 638 749
AMRA MS 66-11	A Report Guide to Ultrasonic Testing Literature, Volume III, December 1966
AMRA MS 67-03	A Report Guide to Ultrasonic Testing Literature, Volume IV, April 1967, AD 650 279
AMRA MS 67-06	A Report Guide to Ultrasonic Testing Literature, Volume V, June 1967
AMMRC MS 67-03	A Report Guide to Radiographic Testing Literature, Volume I, December 1967

USAGE

All word descriptors included in this guide are listed in alphabetical order and are cross referenced to the AMMRC report identification number. Also listed is an author index, or, if no author name is available, then the issuing organization is listed. Users have only to refer to those descriptors that they are concerned with at the time and read only those abstracts which the descriptor cross references.

The abstracts normally refer the reader to the source where the complete report may be obtained.

ABSTRACTS

AMMRC
IDENTIFICATION
NUMBER

1018 HIGH SPEED COUNTERS AND SHORT PULSE TECHNIQUES
J. B. H. Kuper
Brookhaven National Laboratory Conference Report, AEC-26, BNL-C-1, 1947

This report encompasses presentations of over twenty different speakers at the Brookhaven Conference in 1947. Subjects covered include scintillation counters, multipliers, photomultiplier tubes, coincidence circuits, pulse amplifiers, broad band amplifiers, gas discharge counters and many other subjects.

1035 THE RESPONSE OF FILM TO X-RADIATION OF ENERGY UP TO 10 MEV
E. Storm
Los Alamos Scientific Laboratory, AEC, LA #1220, 1951

The response of Eastman type K and DuPont type 552 film to high energy X-rays was investigated. Both types of film were found to be energy independent from 0.4 to 2.0 MEV. For a given roentgen (r) value, a greater response in terms of density is obtained on the film as the effective energy is increased beyond 2.0 MEV. A method of determining the effective energy by means of filters on the film is described.

1037 HIGH ENERGY RADIOGRAPHY IN THE AIRCRAFT AND MISSILE INDUSTRIES
G. Taylor
Proceedings First National Symposium on NDT of Aircraft and Missile Components, 1960

Application of high energy X-rays at 1 MEV and above for the inspection of aircraft components is discussed. It is possible to make a single radiograph of jet engine blades. Special alloy components can be inspected as well as small complicated castings. Further, a review of high energy X-ray sources, including the linear accelerator and betatrons, is given. It is stated that the use of high energy radiation will facilitate and improve many inspection procedures. In addition, recommendations are made for the inspection of solid propellants. A table comparing various X-ray sources is included.

1043 NONDESTRUCTIVE INSPECTION OF BRAZED HONEYCOMB STRUCTURES
B. E. Justice
Proceedings First National Symposium on Nondestructive Testing of Aircraft and Missile Components, 1960

The paper reviews methods of post-process quality control or nondestructive inspection as applied to brazed sandwiches on the B-58 weapons system. Three basic test methods are applied: radiography, fluoroscopy, and thermal tests (Hot Shot Tester). The defects detected are: metal-to-metal defects, vertical tie defects, case-to-metal defects, and case defects.

1057 HOT RADIOGRAPHY CUTS WELD INSPECTION TIME
A. Gobus
Steel, 27 October 1952

Advantages of radiography for the nondestructive testing of welds are enumerated. Particular emphasis is given to the saving of time realized by the radiography of hot welds.

1058 X-RAY EXAMINATION OF LIGHT ALLOYS
G. Gauthier and M. Renouard
Revue de Metallurgie, October 1952 (in French)

Examples are given of conditions under which the interpretation of radiographic plates is open to question. Cases include those in which the spots of diffusion or of diffraction produce the appearance of abnormal contrast in the zones of crystallization that are oriented or almost oriented; those in which these same anomalies of intensity mask the real defects (fissures); and those in which they exaggerate the small local inhomogeneities having no influence on the mechanical characteristics. When examining apparent defects, it is necessary to exercise much care in order to determine whether the appearance is due to segregations or to fissures. In addition, other requirements, such as semi-microradiography and the use of experienced personnel are needed to insure accuracy.

1060 SEMI-AUTOMATIC X-RAY EQUIPMENT
D. Goodman
American Foundryman, August 1952

A description is given of the use of semi-automatic X-ray equipment for faster nondestructive testing. The equipment was developed by General Electric.

1091 GIANT BETATRONS USED TO INSPECT TANK ARMOR CASTINGS
D. Goodman
Foundry, August 1952

Three 24 MEV betatrons are now being used in eastern and midwestern steel foundries to help speed production of vital armor steel castings. Powerful enough to penetrate seven to nine inches of armor steel in little more than a minute, the new X-ray producers greatly speed and improve inspection techniques requiring, formerly, hours and even days in some cases.

1093 MINIATURE RADIOGRAPHY
S. L. Fry
Metal Industry, June 1952

A third method--miniature radiography--is now available to supplement ordinary radiography and screening. This method involves the photography by means of a camera of a fluorescent screen the same size as the specimen. This gives the following important advantages: 1. Considerable reduction in film cost. 2. Marked increase of sensitivity over screening. 3. A permanent record is available. Although the method could be used over a wide variety of work, it could never be suitable for the more complex light alloys or for magnesium.

1096 THE PRESENT STATUS OF MATERIALS TESTING BY X-RAYS AND GAMMA-RAYS
R. Benthold et al
Stahl und Eisen, 24 April 1952

During the post-war years the upper limit of metal thicknesses that can be industrially examined for flaws by X-rays has been increased by 15%, owing to improvements in generation construction furnishing voltages of high degree of constancy, and also owing to progress in the manufacturing of small-grain photographic films. For medium thicknesses of tested pieces, results obtained with gamma-ray emitters are at present as satisfactory as those obtainable with X-rays, while for large pieces, they are even superior to the latter. The optimal detection of flaws in steels takes place at 10-50mm thicknesses with iridium^{192}, and at thicknesses exceeding 45mm when cobalt^{60} is employed.

1101 SIMPLE STEP-SECTOR X-RAY SENSITOMETER
J. Kastner et al
Photographic Science and Engineering, Vol. 6, No. 5, September-October 1962, pp. 287-289

Novel and simple X-ray and gamma-ray sensitometer for rapidly obtaining film characteristic curve of density vs X-ray or gamma-ray exposure; device operates on principle of intermittent-exposure time scale; characteristics of medical X-ray film for both light and X-ray sensitometry, and gamma-ray sensitometric curve using Picker Cyclops Radiographic Unit containing 1700 curies of cobalt^{60} are shown.

1102 X-RAY SPECTROSCOPY OF SMALL QUANTITIES AND AREAS
K. Toegel
Siemens Zeit, Vol. 36, No. 7, July 1962, pp. 497-501

X-ray fluorescence analysis of very small quantities and areas; X-ray spectrometer arrangement for analyzing samples down to 10^{-6} g., and areas, down to 0.0008 sq. in.; examples to illustrate efficiency of method with dispersive and nondispersive paths of rays.

1103 PRINCIPLES OF SPECIMEN PREPARATION FOR X-RAY SPECTROSCOPY
K. Toegel
Siemens Zeit, Vol. 36, No. 8, August 1962, pp. 597-603

Specimen preparation methods for X-ray fluorescence analyses; critical parameters for specimen preparation; simple relation is derived for calculating thickness of irradiated layer and quantity of substance to be analyzed; influence of geometrical position of specimen and depth of its roughness on result of analysis.

1105 SERVO-DENSITOMETER FOR EXAMINING X-RAY DIFFRACTION PATTERNS OF COTTON FIBERS
R. S. Krowicke and P. R. Ewald
Textile Research Journal, Vol. 32, No. 10, October 1962, pp. 815-818

Apparatus consists of phototube balanced bridge circuit with either direct or vacuum tube cathode follower output through servoamplifier to servomotor; servomotor drives disk, automatically seeking film angle to give conventional 40% or 50% density as required; instrument used in conjunction with 6-port X-ray machine would allow analysis of up to 60 samples/day, based on exposure time of 10 to 15 min.; time for analysis of sample is less than required by either Geiger method or old galvanometer-densitometer method; circuit diagram.

1107 SOFT X-RAY SPECTROMETER WITH PULSED SOURCE, AND SYNCHRONOUS PHOSPHOR-PHOTOMULTIPLIER DETECTOR
A. H. McIlraith
Journal of Scientific Instruments, Vol. 39, No. 10, October 1962, pp. 504-508

In spectrometer described, high signal-to-noise ratio is obtained by modulating output of X-ray tube with periodic voltage applied to auxiliary electrode and using synchronous detector; application to molybdenum research.

1108 APPLICATIONS OF X-RAY FLUORESCENCE ANALYSIS IN OIL INDUSTRY
R. Jenkins
Institute of Petroleum Journal, Vol. 48, No. 464, August 1962, pp. 246-256

Use of conventional plane crystal spectrograph in control analysis for low atomic number elements such as phosphorus, sulfur, and chlorine; determination of trace metals in silica-alumina cracking catalyst, lead in gasoline, sulfur in mortar, and elemental analysis of internal combustion engine deposits.

1116 RADIUM, TANTALUM^{182}, AND COBALT^{60} IN INDUSTRIAL RADIOGRAPHY
J. W. Dutli et al
Los Alamos Scientific Laboratory, AEC #2719, 1949

The use of tantalum^{182}, and cobalt^{60}, as sources of radiation in the field of industrial radiography has been investigated and compared with radium. The technique charts of the following elements have been developed for thicknesses up to three inches: aluminum, zinc, iron, tin, copper, and lead. The resolution, sensitivity, and half value layers have been compared. It can be concluded that tantalum^{182} behaves almost in the same manner as radium. Cobalt^{60} offers better radiographic qualities in the case of heavier metals partly due to the greater intensity per unit volume. Tantalum^{182} and cobalt^{60} give better radiographic resolutions.

1117 THREE TO TWENTY MILLION VOLT RADIOGRAPHY
G. M. Almy and G. D. Adams
University of Illinois, Report OSRD 5067, Progress Reports 1-9, June 1945

A study of the radiographic properties of X-rays in the energy range between 3 and 20 million electron volts is described. Such X-rays are readily produced with a betatron and the main initial purpose of the work was to ascertain and improve the value of the betatron for practical radiography. It has been established from a study of the nature of high energy radiation and of the radiographic characteristics of the betatron that the 20 million volt betatron is useful for a wide range of radiographic problems and its X-rays are unique in radiographic quality and speed for thick metal sections. A detailed study of the high-energy X-ray characteristics of many kinds of film is included.

1118 AN INVESTIGATION OF THE SENSITIVITY LIMITS OF FLUOROSCOPY FOR LIGHT ALLOY CASTING INSPECTION
D. T. O'Connor and D. Polansky
U. S. Naval Ordnance Laboratory, White Oak, Md.
NAVORD Report No. 2168, 15 November 1951

Expressions have been developed which describe the sensitivity or quality of fluoroscopic images in terms of measurable characteristics of X-ray tubes and fluoroscopic screens. Experimental data are presented in support of these expressions. The requirements imposed by adequate fluoroscopic viewing are used to specify the design features of a proposed fluoroscopic X-ray tube. A fourfold improvement in fluoroscopic sensitivity in the inspection of aluminum and magnesium alloys is demonstrated. Full utilization of the principles at a sensitivity of two percent, meeting the present requirements of Federal Specifications for the radiographic inspection of materials.

1129 DISTANT-FOCUS X-RAY TUBES
A. H. G. Kuntke
Phillips Technical Review, Vol. 20, 1958-1959

There exists a comprehensive literature of theoretical and experimental investigations concerning the focusing of the electron beam in cathode ray tubes, but little has yet been published on the analogous problem in X-ray tubes. This article is a contribution to this subject. It describes a development, the results of which have been applied for some years now by C. H. F. Muller A. G. and by Phillips. Although this development refers to a special case, the considerations discussed here are perhaps of more general interest.

1131 MOBILE X-RAY VAN SPEEDS CHECK ON MISSILE PARTS

Phillips Electronic Instruments
Western Metalworking, September 1961

This brief article describes a Giant Mobile Van which houses complete X-ray laboratory for inspection of missile castings at Aerojet General and Brush Beryllium in Northern California. The 40-foot van backs up to a plant, has three compartment work areas consisting of dark room; office and work area and is complete with fork lift truck to assist in materials handling.

1146 A LARGE DIAMETER X-RAY SENSITIVE CAMERA TUBE
R. Rutherford
CBS Laboratories
Contract DA-19-020-ORD-5515

The design and fabrication of several developmental large diameter (9") X-ray sensitive camera tubes of the photoconductive selenium surface type are described with preliminary operational results. Al and Be window tubes were successfully made using an epoxy cold seal technique with continuously operating gettering pumps.

1153 X-RADIOGRAPHY OF ELECTRICAL COMPONENTS
R. Taylor
Institute of Electrical Engineers Proceedings, Vol. 109, Part A (Supp.), No. 3, 1962, pp. 203-205

Method and its usefulness in inspection of resistors, short-circuiting fuses, terminal seals and electron tubes, and for detection of faults in these components and in capacitors.

1154 STROBOSCOPIC X-RAY SYSTEM
L. W. D. Pittendrigh
Institute of Electrical Engineers Proceedings, Vol. 109, Part A (Supp.), No. 3, 1962, pp. 189-191

System for obtaining vibration effects in electric components and mechanisms, when parts are concealed by protective enclosures.

1171 NEW DEVELOPMENTS IN X-RAY EXAMINATION
A. Gobus
Proceedings First National Symposium on Nondestructive Testing of Aircraft and Missle Components, 1960

The article discusses the latest developments in radiography and other applications of X-rays in nondestructive testing such as X-ray spectroscopy. Image intensifier techniques, in-motion radiography for inspection of welds are covered. Further, high speed cineradiography, and a portable X-ray spectrograph "Portaspec" are described. The latter equipment can be used as an analytical tool for portable sorting work.

1216 LIMITATIONS IN THE EVALUATION OF GAMMA RADIOGRAPHS USED FOR EXAMINING CIRCUMFERENTIAL PIPE WELDS IN ACCORDANCE WITH DIN 54-111
W. H. Papke
Stewarts & Lloyds
Schweissen und Schneiden, 1958, pp. 439-441

The relations between the variables, changes in thickness, changes in focal spot and distortion in the case of double wall radiation of circular spot and distortion in the case of double wall radiation of circular tube welds are discussed and plotted correspondingly in a number of graphs. The remarks on unsharpness explain why existing defects will no longer be visible at an unfavorable angle of incidence in spite of adequate density. The best radiographic reproduction of defects is only possible at a dimetral irradiation. The useable film length, related to the number of exposures required, must be stated.

1217 XERORADIOGRAPHY APPLIED TO INSPECTION OF ELECTRIC EQUIPMENT
A. W. Balls and W. F. Cox
Institute of Electrical Engineers Proceedings, Vol. 109, Part A (Supp.), No. 3, 1962, pp. 184-188

Practical experience with radiography which utilizes photoconductivity of amorphous selenium when exposed to X-rays or gamma-rays; examples of application include wide range of electric components and materials used in electric industry.

1218 RADIOGRAPHY OF POLYTHENE IN SUBMARINE CABLE SYSTEMS
D. C. Shotton
Institute of Electrical Engineers Proceedings, Vol. 109, Part A (Supp.), No. 3, 1962, pp. 199-202

X-ray examination of joints in polythene submarine cable core and of cable-entry glands of submerged repeaters; when parts are being checked, exposures from various angles are required because in any one view some of polythene is hidden by metal; it is desirable to make systematic tests from known angles and to record them side by side on signal film to help locate features of interest; example of equipment designed for field testing of cable joints.

1220 X-RAY METHODS FOR DETERMINATION OF PLATE THICKNESS
E. P. Bertin and R. J. Longobucco
Metal Finishing, Vol. 60, No. 8, August 1962, pp. 42-44

Three X-ray diffraction methods, three X-ray fluorescence spectometric methods, and combination of methods and miscellaneous applications are reviewed.

1223 TECHNIQUES FOR LOW-VOLTAGE RADIOGRAPHY
R. W. McClung
Nondestructive Testing, July-August 1962, pp. 248-252

Improvements on existing methods and techniques considered; low voltage radiographic method is shown to be very useful tool for radiographic inspection of components, and materials such as beryllium and thin sections of aluminum and stainless steel; applicable thickness ranges for 0-50 KVP energy and reasonable exposure times (less than 10 min.) seem to be up to approximately 0.037 in. of stainless steel, 0.750 in. of Al and much more than 2.0 in. of Be; considerable advantage can be realized for both sensitivity and exposure times by use of intermediate helium atmospheres and darkroom, bare-film exposure techniques.

1224 NONDESTRUCTIVE INSPECTION OF TURBINE-GENERATOR PARTS DURING MANUFACTURE AND SERVICE
D. L. Sauer and R. G. Matters
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Nondestructive Testing, July-August 1962

Testing during manufacture of parts subjected to high pressure and high temperature, to centrifugal stresses, and to fatigue stresses; nondestructive tests during service; ultrasonic and radiographic inspection are mostly considered.

1228 MATERIALS TESTING WITH X-RAY IMAGE INTENSIFIER
E. Schiebold and E. Becker
Neue Huette, September 1962, pp. 566-570

Materials testing with X-ray image intensifier; description of screen intensification system and of results obtained in testing steel and aluminum; discussion of other factors affecting clarity of pictures.

1229 INVESTIGATION OF WEAR IN WROUGHT IRON AND MILD STEELS
B. J. Nield and J. Smith
Great Britain Safety in Mines Research Establishment, December 1961, 44 pp.

Comparison of wear rates of wrought iron, mild steel, and 1.5% manganese steel; factors responsible for pronounced differences in wear behavior of these materials observed in some service applications; influence of wear rate of load, relative humidity, geometric shape of specimen, and lubrication; X-ray examination of debris from unlubricated tests.

1230 THE SELECTION EVALUATION AND SPECIFICATION OF METALLIC MATERIALS

National Academy of Sciences, 1943

This is a general report on the conservation and substitution of metals in critical short supply during wartime. It is a treatise which points out which available metal could be substituted for a less available one and also as an aid to the engineer selecting a metal or alloy for a specific use. Methods of testing are briefly covered.

1232 RADIOISOTOPES IN INDUSTRY

Ansco Corp.

The most common radioisotopes currently in use in industry are derived from the elements cobalt, cesium, and iridium and are referred to as cobalt^{60}, cesium^{137}, and iridium^{192}. This article discusses their practical application, radioactive half-life, gamma-ray energy and intensity. Several tables are included showing their characteristics.

1233 ELECTRONIC PRINCIPLES AS APPLIED IN GERMANY TO THE TESTING OF MATERIALS
W. G. Shilling
British Intelligence Objectives Subcommittee Report #724, 1946

A wide cross section of German practice on the use of electronics as applied to the testing of materials during World War II is covered in this report. Precise technical data is lacking. The influence of intense sound on molten metals is covered as well as acoustic and electromagnetic testing. An extensive bibliography is included.

1234 NDT: INDUSTRY'S EXPANDING QUALITY CONTROL TOOL
C. J. Cannizzo
Picker X-Ray Corp., Reprint, June 1962

This article presents a general discussion of various nondestructive testing methods and, in particular, that of isotope radiography. Also included are tables of tenth and half value layers and a table on the roentgen output of cobalt^{60}, radium^{226}, and cesium^{137}, and iridium^{192} at various distances. The inverse square law is cited and several problems are worked out.

1238 ULTRASONIC DETECTOR REVEALS FLAWS
W. J. Stirling
Canadian Metals, September 1952, pp. 58, 60, 62-63

Where as X-rays can penetrate only several inches of material, the ultrasonic flaw detector can be used for examination of materials thirty feet or more in thickness. A brief review of the principles of ultrasonic detection is given, together with some common applications in Canadian industry.

1242 THE X-RADIOGRAPHY OF RADIOACTIVE SPECIMENS USING A ROTATING LEAD DISK WITH COLLIMATING SLITS
K. M. Swanson and A. G. Kerswell
British Journal of Scientific Instruments, December 1962, pp. 642-644

A rotating lead disk with radial collimating slits is placed between the active specimen and the X-ray film. The factor which determines whether the radiograph will be fogged by gamma rays then becomes the activity per unit length of the specimen rather than the total activity. The successful reduction of background fogging by the device is demonstrated. The extension of radiography to the study of very highly active specimens is indicated.

1244 PLACE FOR NONDESTRUCTIVE TESTS IN FIELD OF PLANT AND EQUIPMENT OVERHAUL
H. G. Bogart
American Society of Mechanical Engineers, Paper 61-WA-209, November-December 1961, 10 pp.

Technical and economic aspects of testing parts, components, and structures by nondestructive methods during overhaul; various types of industrial plants and equipment considered; magnetic particle, liquid penetrant, radiographic, ultrasonic, and electromagnetic tests are briefly described and some of their applications and limitations considered.

1246 X-RAY TELEVISION SYSTEM WITH IMAGE STORAGE AND AUTOMATIC EXPOSURE-RELEASE
A. J. Seyler
British Institute of Radio Engineers Journal, September 1962, pp. 229-240

Design of medical X-ray television system containing electronic recording storage tube; sequence of storage tube functions and X-ray exposure is automatically controlled by central timing device and all time intervals are synchronized with vertical scanning period of television system; by actuating single exposure release button when new image is required, erasure of previous image and storage of new one are completed within 1/2 sec.; substantial reduction in radiation hazards can be achieved.

1249 X-RAY IMAGE INTENSIFIER AS INSPECTION TOOL AND ITS APPLICATION TO STROBOSCOPIC EXAMINATION
C. E. Paine
British Institute of Radio Engineers Journal, July 1962, pp. 73-76

X-ray image intensifier can be employed in nondestructive testing to examine welds; using rotating shutter, it can carry out vibration tests on sealed assemblies; intensifier provides image 1000 times as bright as normal fluorescent screen with less than half grain size.

1253 RECOMMENDED PRACTICE CONCERNING RADIOGRAPHIC IMAGE QUALITY INDICATORS

British Welding Journal, January 1962, pp. 11-13

Supplement to Document IIS/LLW-6-58 "Recommended Practice for Radiographic Inspection of Fusion Welded Joints in Steel Plates up to 2 in. Thick," indexed in Engineering Index 1959, p. 1510; recommended IQI and their use discussed.

1254 RECOMMENDED PRACTICE FOR X-RAY INSPECTION OF FUSION WELDED JOINTS

British Welding Journal, December 1961

Aluminum and its alloys and magnesium and its alloys up to 2 in. thick are considered; inspection techniques are divided into general technique for X-ray inspection of welds on light alloys, and more sensitive technique intended for use where class A technique is unlikely to reveal defects sought.

1256 USE OF LARGER COBALT SOURCES FOR INDUSTRIAL RADIOGRAPHY
R. D. Forbes
British Journal of Nondestructive Testing, March 1962, pp. 12-16

Nature of industrial cobalt equipment, degree of protection which container should provide, design of container and questions of control are considered; geometric unsharpness quality of radiographs; it is concluded that cobalt should not be used on specimens 1 in. thick, and that minimum thickness should probably be 3 in.; upper limit is determined not only by energy of radiation but also by size of source and if exposure is to be of reasonable length not more than 5 in. of steel can be examined.

1260 8 MEV MICROWAVE ELECTRON LINEAR ACCELERATOR INSTALLATION IN WISCONSIN

Engineer, 9 March 1962, pp. 467-469

Installation for use in nondestructive testing of solid wall pressure vessels, etc., at A. O. Smith Corp. can make radiographs through 15 in. of steel in less than 10 min.; 5mm focal spot size is rated at 1500 roentgens/min., and 1mm focal spot size produces 6000 roentgens/min.; power supply provides h-v d-c power to modulator, which converts direct current to high-peak pulses which drive power source comprising 2 high powered amplitrons.

1262 RADIATION SAFETY REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHY USING RADIOISOTOPES
A. K. Das Gupta
Nondestructive Testing, July-August 1962, pp. 238-241

Responsibilities of Radiation Production Div., Dept. of Nat. Health and Welfare, Ottawa, Ont.; minimum conditions for making radiography safe are discussed covering adequate supervision by person who is responsible, training of radiographers, use of properly designed equipment and adequate maintenance and correct procedures.

1263 RADIOGRAPHIC MASKING AND VIEWING TECHNIQUE
G. M. Corney
Nondestructive Testing, November-December 1961, pp. 416-417

Radiographic masks to reduce undercut of scattered radiation can be made with low melting alloy such as is used in bending of thin-walled tubing; positive contact print, on high contrast film, of original masked radiograph is used as viewing accessory; by reducing glare to viewer's eyes, it permits use of high densities in area of interest.

1274 ELECTRON MICROSCOPIC STUDY OF DISLOCATIONS AND FISSION DAMAGE IN PLATINUM FOILS
E. Ruedl et al
Journal of Nuclear Materials, May-June 1962, pp. 46-68

Investigation of annealed and quenched thin beaten foils of Pt subjected to fission-fragment and alpha particle irradiation; annealed foils show features which are typical for fcc metal with medium high stacking fault energy; damage rate of quenched specimens seems to be larger than that of annealed ones.

1278 SCIENTIFIC APPLICATION OF PARTICLE ACCELERATORS FOR NONDESTRUCTIVE TESTING
E. A. Burrill
Materials Research and Standards, January 1962, pp. 9-16

Radiation available from particle accelerators is not exclusively penetrating X-rays; high energy electrons and positive ions are directly produced by interaction of accelerated charged particles with special target materials; behavior and characteristics of nuclear particles and radiation are reviewed; emphasis is given to industrial applications and directions of research.

1281 MODULATION TRANSFER FUNCTION OF RADIOGRAPHIC SYSTEMS USING FLUORESCENT SCREENS
K. Rossman
Optical Society of America Journal, July 1962, pp. 774-777

New method of measuring modulation transfer function of system comprising radiographic film and fluorescent intensifying screens; relation between spatial fluctuations of absorbed X-ray quanta and "quantum mottle" in output.

1282 NONDESTRUCTIVE TESTING PAYS OFF
C. E. Lautzenheiser
Oil and Gas Journal, March 1962, pp. 117-118

Examples of use of ultrasonic testing for flaw detection, thickness measurements and evaluation of metallurgical structure; pulse echo flaw inspection; use of liquid-penetrant in leak detection; application of optical testing, radiography, eddy-current inspection and magnetic particle inspection.

1286 NONDESTRUCTIVE TESTING OF WELDS AND THEIR STRENGTH
H. Kihara et al
Society of Naval Architects of Japan, 1960, 96 pp.

Influence of defects in welds on weld strength; relation between defects in mild steel and aluminum alloy welds, and mechanical strength of welds; nondestructive testing of welds by radiographic, ultrasonic and magnetic particle inspection.

1288 DETERMINATION OF TOTAL X-RAY BEAM ENERGY WITH CALIBRATED IONIZATION CHAMBER
J. S. Pruitt and S. R. Domen
U.S. Bureau of Standards Monograph 48, 5 June 1962, 16 pp.

Use of air filled aluminum alloy ionization chamber to determine energy transported by bremsstrahlung beam with maximum photon energy in range 6 to 170 MEV; experimental calibrations of chamber over this energy range are given; results of calibration experiments made with 250 KV constant-potential X-ray tube and with cesium^{137} and cobalt^{60} gamma rays.

1289 NONDESTRUCTIVE INSPECTION OF CABLE TERMINATIONS AND SPLICES BY X-RAY ANALYSIS
T. L. Bourbonnais, II
Transactions American Institute of Electrical Engineers, December 1961, pp. 821-827

Technique developed by DuPont Co., for using X-rays to produce radiographs of cable terminations and splices and to analyze radiographs for purpose of finding defects, particularly incipient weakness in material of installation.

1291 X-RAY TUBE WITH GRID FOR CONTROL OF EXPOSURES IN CINERADIOGRAPHY
T. H. Rogers
Transactions American Institute of Electrical Engineers, January 1962, pp. 713-716

Tube designed to produce X-ray exposures of optimum characteristics with X-ray image intensifier systems now available, is being incorporated into X-ray installations which are suitably designed to take advantage of these characteristics; reports on clinical experience may be expected soon.

1311 NON-ELECTRONIC DOSE RATE INDICATING SYSTEMS
H. Linschitz
Syracuse University, AD 41 810, 15 March - 15 June 1954, 40 pp.

Fundamental studies were carried out on radiation-sensitive systems to develop a practical non-electronic dose-rate meter. An extensive literature search from 1895 to present date, 1954, was made on reversible effects of X-rays and other ionizing radiation. Experimental work was devoted to studies of various chemical effects of radiation. A system for measuring dose rate should ideally be one which undergoes no permanent change upon irradiation and which responds to radiation in some way such that the change is a function of flux density. The response of the ferrous-ferric redox system to X-rays was shown to be reversible and linear, with a threshold less than 50 R. The use of organic glasses containing simple aliphatic amines was developed as a tool in the study of electron-emission processes.

1320 VARIOUS PENETRAMETER TYPES AND THEIR LIMITATIONS
N. C. Miller and G. H. Tenney
University of California, 7 October 1952

An experiment is described in which steel blocks of various thicknesses have been radiographed with penetrameters of several types, and artificial cavities placed at different levels within the blocks. A 1000 KVP X-ray unit, a cobalt^{60} isotope, and a 22 MEV betatron have been used as sources of radiation. Correlation has been found among the resolved images of the various penetrameter types and the shadows of the cavities with regard to their geometrical locations; conclusions are indicated concerning the validity of various penetrameter usages.

1326 NONDESTRUCTIVE TESTING OF WELDS IN SHIPBUILDING
A. de Sterke
Lastechniek, May 1962, pp. 102-105

Nondestructive testing of welds in shipbuilding, description of scheme operating in Netherlands whereby central organization RTD (X-ray Eng. Service) conducts radiographic examination of welded structures with aid of mobile X-ray units; limitations of this method with suggestions for obtaining sounder quality control; how ultrasonic testing can be employed successfully in shipyard; system for testing of welds in T-joints described.

1332 ULTRASONIC INSPECTION OF GIRTH WELDS IN PIPE LINES DESTINED FOR TRANSPORTATION OF LIQUEFIED HYDROCARBONS
M. Evrard and J. Dubresson
Soudage et Techniques Connexes, 11 November - 12 December 1961, pp. 436-444

Ultrasonic inspection of girth welds in pipe lines destined for transportation of liquefied hydrocarbons; studies made by French Welding Inst. of 24 in. pipes, 8.74 mm thick, to determine testing conditions, sensitivity of method to internal defects, influence of irregularity of weld bead, and possible identification of defects by means of oscillograms; results compared with those obtained by X-ray inspection.

1337 NONDESTRUCTIVE TESTING WITH 31 MEV BETATRON
A. Nemet and W. F. Cox
British Journal of Nondestructive Testing, 1 March 1962, pp. 17-23

Principle and description of equipment; prints of radiographs of roots of Pelton wheel blades and of 4 1/2 inch thick cast steel boss obtained with betatron are presented. Applications of Brown Boveri 31 MEV betatron, J. Woitschach, 24-9, is presented as contribution to above report.

1338 MEASURING PARTS IN MOTION
W. M. Stocker, Jr.
American Machinist/Metal-Working Mfg., 25 December 1961, pp. 64-66

New non-contact technique developed by Abilities, Albertson, Long Island, New York, is so fast that it will measure as many as 200,000 dimensional variations/sec. in moving parts (of rotor blades spinning at thousands of rpm, for example); method combines non-contacting eddy current transducer with choice of readout and/or recording modules; parts can be precisely balanced; using surface effects only, device is sensitive to millionths of inch.

1340 HOW TO USE X-RAY CRYSTALLOGRAPHY IN SOLVING PROBLEMS CONCERNING STRENGTH OF HARD CHROMIUM PLATED STEEL
M. Koch and H. R. Kaiser
Metalloberflaeche, 4 April 1962, pp. 124-130

How to use X-ray crystallography in solving problems concerning strength of hard chromium plated steel; report of experimental study undertaken to develop substitute for time consuming fatigue tests now used to determine effect of bath variables on stresses and properties of plate; results indicate that X-ray determination of texture gives, to some extent, same information as fatigue tests. 27 refs.

1341 PHOTOGRAPHIC TECHNIQUES DEVELOPED TO IMPROVE QUALITY OF IMAGE OBTAINED IN EXAMINATION OF WELDED STEEL JOINTS BY BETATRON
K. Fink and J. Woitschach
Schweissen und Schneiden, 4 April 1962, pp. 137-149

Photographic techniques developed to improve quality of image obtained in examination of welded steel joints by betatron; steps taken to extend range of application of betatron; comparison of efficiency of 15 MEV with that of 31 MEV machine. 22 refs.

1355 RADIOGRAPHIC SENSITIVITY
C. G. Pollitt
British Journal for Nondestructive Testing, Vol. 4, No. 3, September 1962, pp. 71-80

Attempt made to obtain theoretical basis for sensitivity of any penetrameter and correlation between sensitivity figures given by different instruments; various types of image quality indicators; theoretical assessment; crack detection; penetrameter and crack and flaw sensitivities; calculated and observed values of sensitivities in radiographic examination of steel are given in table.

1356 MOVING RADIOGRAPHY
C. E. Paine
British Journal for Nondestructive Testing, December 1961, pp. 88-97

Principle of method involving movement of either X-ray tube or specimen; unsharpness in radiograph is made up from 3 components; inherent unsharpness of film, geometric, and movement unsharpness; design of collimater and rate of motion is demonstrated by example, practical applications referring to nondestructive testing of missiles; drive mechanism, films and processing.

1357 LOW KV X-RAY EQUIPMENT FOR USE IN INDUSTRY
N. C. Cordingly
British Journal for Nondestructive Testing, December 1961, pp. 98-110

Applications in metallurgical field demand use of such equipment for non-destructive testing of fabricated components and low density materials; equipment operates at voltages less than 50 KV and wavelength may be in region of 1 to 10 A; study of long wavelength X-ray bank in electromagnetic spectrum; use of low filtration X-ray windows; techniques considered are contact and point projection microradiography; photographic enlargement and choice of emulsions.

1358 FUTURE DEVELOPMENT IN NONDESTRUCTIVE TESTING
R. S. Sharpe
British Journal for Nondestructive Testing, December 1961, pp. 111-117

General aspects of nondestructive testing that require serious study and form basic framework for future developments of techniques are outlined; in light of general requirements, radiography and ultrasonics are considered and some of more likely trends in foreseeable future examined.

1366 RESIDUAL STRESSES IN ALLOY STEELS AFTER PLASTIC DEFORMATION
K. Kolb and E. Macherauch
Materialpruefung-Materials Testing-Materiaux, 20 October 1962, pp. 369-373

Residual stresses in alloy steels after plastic deformation; X-ray study of residual stresses in surface layers and core of low alloy Cr-Mo and Mn-Si-V steel specimens after tensile deformation; in ferrite crystals near surface, increasing deformation caused increasing compressive stresses; how these stresses result from superposition of level of residual stress being constant across section of specimen and of residual stress component decreasing with increasing distance from outer surface of specimen.

1367 GAMMA-RAY DEVICES FOR ON-STREAM REFINERY INSPECTIONS
W. Wyganowski
Materials Protection, 9 September 1962, pp. 18-23

One of 2 instruments employed used iridium^{192}, while radiation source of other was cobalt^{60}; advantages of on-stream inspection include ability to spot corroded equipment requiring repair or replacement; one instrument projects shadow onto photographic emulsion and other measures backscatter; examples of their use on piping, furnace tubes, heat exchangers, and valves; only one diametric scan of pipe can be made with one exposure of projected image type, so 2 or more exposures are required for complete survey.

1370 X-RAY ANALYSIS AND CONTROL OF CEMENT PLANT RAW MIX
W. S. Hoffman and J. W. Pastorius
Pit & Quarry, September 1962, pp. 113-116

Report of 8 months experience with General Electric on-line X-ray unit installed at Whitehall Cement Mfg. Co.; additional report discusses some concepts on automatic plant operation from management point of view.

1371 PARAMETERS OF IN-MOTION RADIOGRAPHY
B. A. Skelton
Third Annual Symposium on Nondestructive Testing of Aircraft and Missile Components, 1962
Southwest Research Institute, San Antonio, Texas

In-Motion radiography, as used at Chance-Vought, has found most prominent use probably in X-raying stainless steel honeycomb. It is also useful for X-raying weldments on a shop floor, since scatter radiation of slit radiography is easier to control. The author discusses unsharpness of conventional radiographs and the effects of in-motion techniques. Also discussed is the geometry of in-motion slit radiographs, including the related equations, and the importance of part-to-film distance. The relationship of focal spot size, distance, exposure, intensity, and slit width are discussed.

1373 GENERAL APPLICATIONS OF MICROFOCUS X-RAY TECHNIQUES TO FIELD OF NONDESTRUCTIVE TESTING
R. D. Williams
Third Annual Symposium on Nondestructive Testing of Aircraft and Missile Components, 1962
Southwest Research Institute, San Antonio, Texas

This paper describes some recent applications using a microfocus X-ray unit both directly and indirectly in the field of nondestructive testing. While a microfocus X-ray unit is usually thought of in connection with X-ray diffraction studies, its low power is very useful in radiography of relatively thin sections or material of low density, and where extremely high resolution is necessary. This unit, as used at Southwest Research Institute, is primarily a tool supporting research programs. A description of some of the types of work using this unit is given.

1374 NEW TECHNIQUES IN RADIOGRAPHY
N. S. Beyer
Argonne National Laboratory, Argonne, Ill.
Third Annual Symposium on Nondestructive Testing of Aircraft and Missile Components, 1962
Southwest Research Institute, San Antonio, Texas

This article summarizes recent work in radiography using techniques not generally employed by the average radiographic inspection laboratory. The subjects discussed include techniques for radiography of thin aluminum (less than .050 inches), radiography with the scattered beam, and the production of colored radiographs. Each topic is presented individually, accompanied by a short discussion of technique with comments and conclusions.

1386 CONTRIBUTION TO IMPROVEMENT OF RADIOGRAPHIC TECHNIQUES BY BETATRON
R. Rath, G. Forest and E. Pierre
Revue de Metallurgie, October 1961, pp. 857-869

Contribution to improvement of radiographic techniques by betatron; description of design and operation of 15 MEV Siemens betatron used jointly by group of companies known as Central Laboratory of Electric Industries; several steel manufacturers are included.

1390 RADIOGRAPHIC TESTING, ANALYSIS OF THE ORDNANCE CORPS RADIOGRAPHIC QUALIFICATION TEST
Satrak Der Boghosian
Instruction Booklet, Army Materials and Mechanics Research Center, Watertown, Mass., August 1962

This monograph presents an analysis of radiographic qualification data generated over a period of years, supported with opinions of inspection personnel expressed during their attendance of the Nondestructive Testing Training Program conducted by Watertown Arsenal. Its purpose is to review qualification procedures and to set forth the general concepts of qualification as applied to The Department of the Army quality assurance program.

1391 THE CASE FOR X-RAY INSPECTION (NONDESTRUCTIVE TESTING REINFORCED PLASTICS)
D. Slocum and G. Robbins
Plastics Technology, December 1962, pp. 29-31

Beyond conventional process quality control, radiography provides an economical rapid method of evaluating and correcting process and production factors, such as tooling, mold and die design, and fabrication and finishing methods of plastic. This article describes the techniques required for the production of acceptable radiographs.

1404 MODULATION TRANSFER FUNCTION OF RADIOGRAPHIC SYSTEMS USING FLUORESCENT SCREENS
K. Rossman
Journal of the Optical Society of America, July 1962

When radiographic film is exposed with fluorescent intensifying screens the spatial X-ray quantum fluctuations are recorded on the film in the form of density fluctuations (quantum mottle). The X-ray quantum fluctuations can be regarded as the input and the quantum mottle as the output of the image forming system. The Weiner spectrum of the quantum mottle has been used to determine the relative modulation transfer function of two radiographic systems.

1415 X-RAY PERFECT
D. Goodman
American Machinist, 14 April 1952, pp. 155-157

The advantages of industrial radiography are enumerated, and typical applications are described and illustrated. Numerous X-ray laboratories throughout the country are prepared to do such work.

1449 APPLICATION OF X-RAYS EXCITED BY BETA- SOURCES TO STUDYING HYDRODYNAMICS OF TWO-PHASE MEDIA
Z. L. Miropolsky and R. I. Shneyerova
International Journal of Heat and Mass Transfer, 5 August 1962, pp. 723-728

Principles for determining parameter of two-phase flow in small cross section channel by means of soft X-rays excited by bombardment of wall by particles; experimental apparatus; determination of errors.

1478 THE MEASUREMENT OF STRAY RADIATION
R. S. Landauer
Industrial Radiography, 1943, pp. 15-17

The radiation emanating from an X-ray tube may be divided into two classes; useful and stray. The useful is that which, passing through the object to be examined impinges on a photographic plate or flourescent screen and produces a desired effect. All other radiation is of no value to the observer and is termed "stray." This stray radiation may be present in greater or lesser amounts and may accordingly be harmful or not. Since it may be seriously deleterious to personnel both of the X-ray department and to those working in areas contiguous to that department, a quantitative evaluation of it is a necessity. The measurement of this stray radiation forms the subject of this article.

1479 APPARATUS FOR NONDESTRUCTIVE INSPECTION OF WELDED JOINTS
A. A. Trushchenko
Automatiches Roya Svarka, #11, 1961, pp. 86-94
Foreign Technology Division, WP-AFB, 25 April 1962, FTD-TT-62-565
ASTIA 281162

This article describes an ultrasonic defectoscope used to detect various defects. With an electron depth meter one can determine the depth of the location of the defects or the full thickness of the part.

1496 PAPER PRINTS AS A SUPPLEMENT TO RADIOGRAPHIC FILMS, SPEED REWELDING, IMPROVE PRODUCTION
Frank Combeck
American Machine and Foundry Co., Buffalo, N. Y.
Nondestructive Testing, January-February, 1963

A sheet of X-ray film is sandwiched between two 0.05-inch-thick lead screens. Screens laminated with cardboard are used, and the lead sides are placed in contact with the film. A sheet of Kodabromide F-3 photographic paper is placed on top of this sandwich, with the paper side against the cardboard side of the screen. A third lead screen is placed over this, with the lead against the paper emulsion. This pack is then placed in an exposure holder so that the paper emulsion is toward the X-ray source. The developed print is used by the grinder to locate any defective areas. The negative is used for permanent record.

1499 LET'S PEEK INTO THE FUTURE OF INDUSTRIAL RADIOGRAPHY
Justin G. Schneeman
X-Ray Products Corp., Pico Rivera, Calif.
Nondestructive Testing, January-February 1963

This article discusses the trend in X-ray equipment towards higher output both in milliamps and kilovoltages. New types of light weight units will be available. Film processing equipment to become more and more automatic. Higher skills to be required of the X-ray technician and operator.

1586 RELIABILITY FACTORS IN STEEL USAGE
H. T. Hallowel
Test Engineering, February 1961, 8 pp.

Review of design requirements of fatigue strength, tensile strength and elongation for tool steel, alloy steel, and carbon steel. Survey of testing methods including magnetic, ultrasonic, Magnaflux, X-ray diffraction, spectrograph and chemical analysis, micro examination, inclusion count, grain size, checks and hardness, fatigue, tensile and stress corrosion testing.

1589 NEW WELDERS MAKE 14% LESS REJECTS
R. W. Eskelson
Welding Design and Fabrication, September 1961, 53 pp.

Inside-out argon arc welding of rocket motor cases from 4130 low-alloy steel sheet by the short-arc process using automatic equipment. Prevention of distortion in seam, flange, and girth welds. Weld quality is examined by X-ray and hydrostatic testing.

1590 WANTED: WELDS WITH 100,000 PSI YIELD STRENGTH

Welding Design and Fabrication, May 1961, pp. 48-49

Techniques and materials in the welding of high-strength, heat treated constructional alloy steel. Use of low-hydrogen electrodes for manual butt welding, as well as automatic welding using a mild steel flux. Inspection by magnetic particle and radiography methods.

1591 PITTSBURGH PUBLIC AUDITORIUM--RETRACTABLE ROOF
E. Cohen and R. H. Goldsmith
Welding Journal, May 1961, pp. 510-516

Design of cantilever space frame, movable leaves and raingirder of dome-line auditorium roof with special attention to utilization of welded components and connections. Visual, radiographic and ultrasonic inspection of semiautomatic submerged arc, and manual arc welded components.

1592 UPSIDE-DOWN TIG WELDING MAINTAINS UNIFORM PIPE CONTOUR
F. T. Tancula
Welding Engineer, November 1961, pp. 52-54

Overhead tig welding of 300 series stainless steel, Zircaloy and Ti alloy tubing by the Contour Trentweld process, in which continuous weld seams are made on the bottom, gravity pulling the molten metal down to make the inner weld contour the same as that of the pipe wall and preventing inclusion and contamination of the weld by tungsten. Process parameters are given for welding, annealing, cold working, descaling and X-ray, eddy current, hydrostatic and ultrasonic testing of 304 stainless steel.

1595 ALUMINUM WELDING PRACTICE
L. Capel
British Welding Journal, May 1961, pp. 245-257

Factors that affect the quality of welds in Al made by the Mig and Tig welding processes. Edge preparations are illustrated formulae for the calculation of distortion. Nondestructive methods for the examination of welds. Detailed recommendations for radiographic methods.

1596 WELDING IN SHIPBUILDING

British Welding Journal, October 1961, pp. 477-481

Papers presented at a London symposium covering cutting, submerged arc, CO_2, automatic, arc and Mig welding of Al-Mg alloys and steel. Radiography and ultrasonics are covered under nondestructive testing.

1598 ALUMINUM ALLOY 356-BE PERMANENT MOLD CASTING
A. J. Iler
Modern Castings, August 1961, pp. 98-105

Effect of forces applied by the permanent mold centrifuge on mechanical properties and structure is measured using a specially developed mold to eliminate other solidification factors, radiography, photomicrography and tensile tests.

1599 MAKING SUPER-ALLOY BLADES BY VACUUM CASTING
D. Fishlock
Metalworking Production, 2 August 1961, pp. 49-53

Investment casting of turbine wheel blades composed of Vacumelt G64, a complex Ni-base alloy with 11% Cr, 4% W, 2.8% Mo, 2% Cb, 6% Al and 0.03% B, which is melted in carbon-arc vacuum furnaces. Furnace design and construction, arc-melting cycle and quality control by fluorescent, dip and X-ray techniques.

1600 NONDESTRUCTIVE TESTING
Warren J. McGonnagle
McGraw-Hill Book Co., Inc., 330 West 42nd Street, N.Y. 36, N.Y., 1961, 455 pp.

Comprehensive survey of theoretical and empirical background, development and applications of nondestructive testing methods, including visual, pressure and leak, penetrant, thermal, X-ray and gamma-radiography, ultrasonics, dynamic, magnetic, electrical, eddy current, chemical, residual stress, irradiation and thickness measurement techniques. Metal discontinuities are analyzed and related to specific testing procedures. 397 refs.

1601 NONDESTRUCTIVE TESTING OF BRAZED BUTT JOINTS OF COPPER PLATES
Han Krachter
Materialprüfung, Vol. 3, August 1961, pp. 297-299

Investigation of quality of bonding of butt-brazed Cu plates by X-ray and ultrasonic testing, comparative tensile strength and transmitted sound energy.

1629 SOURCES OF ERROR IN X-RAY MEASUREMENTS OF RESIDUAL STRESS
B. D. Cullity
University of Notre Dame
Journal of Applied Physics, June 1963

Two sources of error are discussed in this article. The first, due to previous plastic flow in one direction, is the cause of X-ray line shift regardless of the presence of a real macrostress, and this is due to a particular distribution of microstress. The second source is that of stacking faults. The first error is apparently unavoidable, but the second can be corrected by proper X-ray techniques.

1640 CINEFLUOROGRAPHY OF SOLID FUEL ROCKET MOTORS
E. L. Criscuolo and D. Polansky
U. S. Naval Ordnance Lab.
American Society for Testing and Materials Fourth Pacific Area Meeting, Paper #72, October 1962

A cinefluorographic system which has been developed for the study of internal burning of rocket motors during static tests is described. This system utilizes a nine-inch image intensifier tube with a light intensification of 3000 coupled to a 35mm movie camera. A 250 KVP, 5 Ma X-ray machine is used to penetrate a 5-inch diameter test motor that contains voids and cracks. Performance data of the system at X-ray energies of 250, 1000, 2000 KVP and 10 MEV are presented.

1658 SURVEY OF RADIATION TECHNIQUES
Gerald H. Tenney
Symposium on Nondestructive Testing in the Field of Nuclear Energy
American Society for Testing and Materials Special Technical Publication No. 223, pp. 44-61

This paper deals with the utilization of radiation in the field of nondestructive testing. One of these applications-industrial radiography-in use for inspection at plant level during the 1920's, and reached a recognized position by management during the second World War. Since World War II, the use of radiation has become essential in the field of nuclear energy. It is logical, therefore, to discuss in fundamental terms the characteristics of radiation and how they are put to work in the field of nondestructive testing.

1664 MEASUREMENT OF SHOCK PRESSURES IN SOLIDS
D. G. Doran
American Society of Mechanical Engineers, Paper 62, WA-353 for Meeting November 25-30, 1962, 20 pp.

Review of two categories of methods used: first is based on relationship of shock and particle velocities to pressure; second includes various transducers which make use of pressure sensitive (shock sensitive) property of second material; optical, electrical, and X-ray techniques used to measure shock and free-surface velocities and deduction of shock pressure therefrom; pressure-electric transducers are described which employ piezoelectric and piezoresistive effects and shock polarization of polar solids; problems encountered in comparison of shock and static data. 57 refs.

1676 INDUSTRIAL APPLICATIONS OF X-RAYS

Electrical Engineering, Vol. 9, No. 23, 1940, pp. 894-898

1. General technique of X-ray crystallography and shadowgraph work.
2. Some examples of these methods of investigation, and 3. Construction of the necessary apparatus.

1678 THE USE OF X-RAY INTERFERENCE PATTERNS AS A NON-DESTRUCTIVE MEANS OF TESTING METALLIC MATERIALS
M. Widemann
Ergebn, Techn, Rontgenkunde, Vol. 6, pp. 105-121;
Chem. Lentr. Vol. 109 (II), 1938, p. 3739;
Cf. Metallurgical Abstracts, Vol. 5, 1938, p. 330

The manner of use and the technique of the testing of fine structure with X-rays are described with 8 examples from practice. The material is presented with the view of stimulating the use of such methods in plant laboratories.

1679 INSPECTION OF AIRCRAFT COMPONENTS
R. C. Woods and T. M. Nolan
Iron Age, Vol. 147, No. 24, 1941, pp. 46-49

The application of X-rays to the inspection of aluminum used in the construction of aircraft and the detection of small defects are described.

1680 INDUSTRIAL X-RAY APPARATUS

Journal of Scientific Instruments, Vol. 17, No. 5, 1940, pp. 132-133

A brief note describing the "Baltograph" apparatus for the X-ray examination of industrial materials. This consists essentially of an X-ray tube on an adjustable mounting, an H. T. generator, and a control cabinet.

1681 SHARPNESS AND RESOLVING POWER IN X-RAYS SHADOWGRAPHS
R. Glocker and O. Schaaber
L. Techn. Physik, Vol. 20, No. 10, 1939, pp. 286-290

The use of fine-focus X-ray tubes, fine-grain photographic emulsions and optical magnification of the X-ray pictures are discussed and tested experimentally. An ingenious device for testing the resolution obtainable is described. The structure of a thin metal film revealed without etching is shown, and the practical limitations of longer times of exposure is noted.

1682 X-RAY AND MAGNETIC TESTING OF BEARING SHELLS
O. Vaupel
Metallwertschaft, Vol. 18, No. 35, 1939, pp. 764-767

A sand mould for the bottom-casting of leaded bronze bearings on to steel shells is described with reference to a diagram, and the X-ray and magnetic method of examining the bearings for various flaws are illustrated in 12 photographs.

1683 X-RAY APPARATUS FOR THE MACROSCOPIC EXAMINATION OF MATERIALS
J. E. de Graaf
Phillips Technical Review, Vol. 4, No. 3, 1940, pp. 69-74

A discussion of the problems of an electrical nature which arise in the construction of X-ray apparatus for the macroscopic examination of materials.

1689 THE DIRECTIONAL DISTRIBUTION OF INTENSITY OF X-RAYS FROM MASSIVE ANTI-CATHODES
H. Hinz
Am. Physik, Vol. 39, 1941, pp. 573-590

The apparatus, which permitted the recording of the intensity distribution at angles 0° to $\pm 120^{o}$ with the incident cathode rays (150-300KV) is described in detail. The intensities were deduced from photometric measurements of the film blackening using a calibration from two photographs with exposure times in the ratio 1:2. For beryllium the angle of maximum intensity in the direction of the cathode rays to that at right angles ($1_0/1_{90}$) was measured at different voltages and with different filtering for beryllium and with one set of conditions for aluminum, copper, and silver. $1_0/1_{90}$ increases with voltage and decreases with atomic number. With a lead anticathode a slight variation of intensity with angle was observed.

1690 CORRELATION OF SOME MECHANICAL TESTS OF ALUMINUM ALLOYS WITH X-RAY TESTS
T. A. Triplett and W. L. Howland
Proceedings of American Society for Testing and Materials, Vol. 39, 1939, pp. 749-763; Discussion pp. 764-768

Various mechanical tests were carried out (Cf. Mackling and Jack, Metallurgical Abstracts, Vol. 6, 1939, p. 301) on wrought billets of aluminum alloys, 14St and 24St; the results are compared with radiographs of the specimens. Radiographic "Quality" gives a good indication of structure and of the results of mechanical tests, but bears little relation to the results of Static tests. A further series of tests was carried out on castings of aluminum-copper alloy 195T4; and approximate relation between static test and X-ray quality, and good correlation between dynamic tests and X-ray quality were found. In the discussion some applications of radiographic testing are indicated and further details on the tests are given.

1691 PRECISION (GAMMA-RAY) RADIOGRAPHY II
G. E. Doan and W. H. Sharp
Proceedings of American Society for Testing and Materials, Vol. 40, 1940, pp. 1301-1304

Radiographic studies have been carried out on steel, in which crack depth was varied as well as crack width and specimen thickness. The results show that there are definite limits beyond which internal flaws will not be revealed by these radiographic methods. They substantiate further the observation made previously loco citato, in the place cited, that depth sensitivity limits are not absolute and must be expressed in terms of crack width.

1692 FINE FOCUS RADIOGRAPHY-GAMMA-RAYS
G. E. Doan and M. B. Vordahl
Proceedings of American Society for Testing and Materials, Vol. 39, 1939, pp. 741-748

A bulb of radon 1/16" in diameter, approximately to a point source of X-rays, was used to determine the minimum detectable width of an internal crack in a metal object. Artificial cracks in steel blocks were used for the experiments, each crack being a 1/4" deep. It was shown that with blocks 1, 2, and 3 and 4" thick, it was possible to detect cracks 0.001, 0.002, 0.003, and 0.005 in. wide, respectively.

1693 X-RAYS IN INDUSTRY: INDUSTRIAL RADIOLOGY
H. W. Greenwood
British Journal of Photography, Vol. 85, 1938, pp. 823-825
Monthly Abstract Bulletin K. R. L., Vol. 25, No. 9, 1939, p. 472

A general survey of the use of X-rays in industry from a photographic standpoint is given. The use of intensifying screens with attendant loss of definition, is discussed. Two types of film have been developed, one giving maximum sensitivity when used with intensifying screens, and one for use without screens giving high resolution. The effects of scattered radiation are described, both on the film and on the operator, together with precautions taken to minimize these effects, including the use of the Potter-Bucky diaphragm.

1694 INDUSTRIAL RADIOGRAPHY
R. G. Tobey
Iron Age, Vol. 145, No. 9, 1940, pp. 27-30

The latest advances in equipment for industrial radiography, the technique of continuous and planar inspection and types of protection needed are treated. The use of low-voltage radiation, flexible calcium tungstate intensifying screens, new types of developing solution, etc., are described.

1697 THREE DIMENSIONAL PHOTOS RECORD METAL DEFECTS
R. C. Gibbons
Machinist, Vol. 83, No. 42, 1939, pp. 452-453

A procedure is described for taking pairs of X-ray photographs from slightly different angles (about 70° apart) which are subsequently viewed side by side in a stereoscope. The depth of the internal defects can thus be estimated.

1698 THE WORKING PRINCIPLES OF RADIOGRAPHY
H. Hirst
Modern Engineering, Vol. 13, No. 10, 1939, pp. 549-551

The principles of X-ray photography and the factors responsible for the production of accurate radiographs are discussed.

1701 RADIOGRAPHIC EXAMINATION OF ELECTRONIC VALVES
H. B. van Wijlen
Philips Technical Review, Vol. 12, Reference 2508, January 1951, p. 207
Proceedings of Institute of Radio Engineers, Vol. 39, No. 11, November 1951, p. 1484

The examination of the electrode structure of tubes by means of X-rays is described. A resolution of 6 microns is obtained with an image of approximately the same size as the object.

1707 DETECTION AND EVALUATION OF INTERFACE SEPARATIONS IN ROCKET MOTORS
J. I. Bujes
U. S. Naval Ordnance Test Station, NOTS TP 2931, August 1962, 15 pp.

Unbonded areas at the interfaces in rocket motors can be detected by radiographs taken tangentially to the critical surfaces. Separations can be reliably determined even when the radial dimension is as small as 0.001 inch. The procedure offers a method for in-process and end-product inspection.

1710 RADIOGRAPHY AND VISUAL PERCEPTION - 1962 LESTER HONOR LECTURE
E. L. Criscuolo
Nondestructive Testing, Vol. 20, No. 6, November-December 1962, pp. 373-379 and 401

Published information on visual performance and physiological measurement is applied to detection of radiographic indications; threshold visibility of object; analysis of radiographic images; detection of cylindrical voids; detectability of linear type voids; detection of wires and of spheres; comparison of detectability of difference voids; detection of distributed type voids.

1716 DESIGN OF TARGETS FOR RADIOACTIVE X-RAY SOURCES
D. Mueller and G. Brunner
Isotopentechnik, Vol. 2, No. 9, September 1962, pp. 257-261

Dependence of K-radiation, produced by beta particles on thickness of target investigated experimentally; calculation of fluorescence excitation of characteristic radiation, and of K-radiation produced by beta particles leads to formulas allowing determination of optimum thickness of transmission targets.

1722 NONDESTRUCTIVE TESTING TECHNIQUES
R. H. Lambert
Min Congress, Vol. 48, No. 11, November 1962, pp. 86-92

Applications, costs, reliability and speed of radiation testing, electrical and magnetic testing, penetrant tests, sonic and ultrasonic methods and thermal methods; examples of equipment and methods used in maintenance inspection.

1727 DETECTABILITY OF SMALL CRACKS AND CRATER DEFECTS IN WELDS BY NON-DESTRUCTIVE EXAMINATION
G. J. Janssen
Materialpruefung-Materials Testing-Materiaux, Vol. 4, No. 12, 20 December 1962, pp. 456-462

In investigation reported it was found that radiographic inspection does not detect small cracks in any given pass if one or more passes have been made on top of defective one; radiography detects craters only to limited extent, which varies with shape and size of defect, recording technique, and thickness of material; ultrasonic testing detects both types of defect. In English.

1728 PHILOSOPHY OF NON-DESTRUCTIVE TESTING
L. Mullins
Quality Engineering, Vol. 26, No. 6, November-December 1962, pp. 165-173

Review of aspects which should be considered before deciding whether to use nondestructive inspection and, if so, what method; testing methods described included magnetic testing, dye-penetrant, radiographic, ultrasonic and eddy current; why components, castings and welds should be inspected; defects to be sought and their importance in service; what should be inspected; choice of method and its limitations; selection and training of inspectors.

1733 NON-DESTRUCTIVE TESTING STEEL CASTINGS

Metallurgia, Vol. 65, No. 391, May 1962, pp. 235-238;
Iron and Steel, Vol. 35, No. 5, May 1962, pp. 194-195;
British Steelmaker, Vol. 28, No. 6, June 1962, pp. 225-226;
Mass Production, Vol. 38, No. 5, May 1962, pp. 87-89;
British Machine Tool Engineering, Vol. 44, Summer 1962, pp. 42-44

Methods and equipment used in K & L Steel founders' new laboratory; radiographic examination; magnetic flaw detection dye penetrant testing; ultrasonic inspection; acid pickling as inspection aid.

1749 DYNAMIC RADIOLOGICAL TESTING METHODS
K. F. Sinclair and H. A. Zagorites
American Rocket Society Journal, Vol. 32, No. 12, December 1962, pp. 1892-1898

Design and performance of dynamic flaw detection systems using X- and Y-radiation and scintillation detection, i.e., transmission and backscatter technique; in latter, information is carried by degraded photons resulting from Compton interaction in test medium; in transmission method, information is contained in unscattered beam of photons that traversed test medium; variations in number of photons detected per unit time, not attributable to known dimensional changes in test medium, are indicative of anomalies; how to achieve optimum performance; applicability in missile industry.

1751 A RADIOGRAPHIC STUDY OF SHOCK LOADED IRON
A. S. Balchan
Journal of Applied Physics, Vol. 34, No. 2, February 1963, pp. 241-245

A study of shock-loaded Armco iron has been made using a flash radiographic technique. Oblique shock waves were produced in iron samples by the collision of an explosively loaded driver. Details in the radiograph were compared qualitatively with the shock configuration to be expected from the Hugoniot curve of iron. The double shock structure of iron and the rarefaction shock were observed.

1753 A SYSTEM OF ROUTINE RADIOLOGY
J. A. Allen and D. Haley
Light Metals, Vol. 3, No. 34, 1940, pp. 280-281

The routine inspection of light alloy castings by X-rays is discussed. Castings for aircraft use fall into these categories, depending upon the consequences of failure, and each category requires somewhat different inspectional procedure.

1754 RADIOGRAPHIC DEVELOPMENT IN THE CASTING INDUSTRIES
C. W. Briggs
Metals and Alloys, Vol. 11, No. 1, 1940, pp. 1-5;
Metal Industry, Vol. 56, No. 8, 1940, pp. 187-189;
Metal Treatment, Vol. 6, No. 21, 1940, pp. 36-38

The value of radiography for inspecting aluminum and steel castings, for demonstrating design defects, and for aiding manufacture and repair work is discussed. Purchase specification should designate the sections that will be subject to radiographic examination, and agreement should be reached on the standards to be used in interpreting photographs.

1759 IMPROVING THICKNESS CONTROL IN HOT STRIP MILLS
R. G. Beadle and W. E. Miller
Control Engineering, Vol. 8, July 1961, pp. 94-99

Control of variations in steel strip thickness caused by thermal rundown, cold spots and loss of tension at the end of the strip by using load and X-ray gages for inspection. The system design is based on digital computer analysis of steady state performance and analog computer analysis of transient performance.

1768 LIMITATIONS OF RADIOGRAPHY IN DETECTING CRACK-LIKE DEFECTS IN THICK SECTIONS

British Journal for Non-Destructive Testing, Vol. 4, No. 4, December 1962, pp. 103-119

Summary of results obtained on two specimens tested, designated "Preliminary" and "British Engine Radiographic Technique Assessment"--BERTA; Standard of assessment of test radiographs; general arrangement and typical radiographs of "Preliminary" specimen; assessment of radiographs of BERTA specimen; prediction of crack detectability; taken as whole, and for similar techniques, results obtained by various radiographers were of commendable high standard and in good agreement with each other.

1770 RADIOGRAPHY OF WELDS OF BOILERS AND PRESSURE VESSELS

Report IIS/IIW-85-61 of Commission 11 of International Institute of Welding

Considers principles and discusses amount of radiography necessary; suggestions are presented regarding radiography of welds, based on best information available at present.

1791 X-RAYS USED IN THE PROJECTION OF RUBBER ARTICLES
L. G. Borisova
Legkaya Promyshlennost, Vol. 11, November 1951, pp. 15-16

Briefly discusses possibilities of the use of X-rays in the projection of rubber articles.

1795 EVALUATION OF WELD QUALITY AS COST FACTOR
J. E. Hinkel
Welding Journal, Vol. 42, No. 1, January 1963, pp. 23-28

After stating that weld quality has no universal meaning and that no generally accepted methods of determining weld quality exist, discussion is presented of measures of weld quality, weld inspection and code standards, X-ray inspection, undercutting, weld craters, fillet weld size, and updating of codes; conclusions concerning codes and standards needed to establish practical level of weld quality; importance of relating weld quality to service requirements is emphasized.

1797 RADIOGRAPHY IN SHIPBUILDING
E. F. Tibbetts
Informal article contained in files of Nondestructive Testing Information Analysis Center

This paper describes the equipment and processes used in the examination of castings, pipe welds and welds in hull construction.

1824 CONTROLLING QUALITY OF RADIOGRAPHIC TESTING
American Society for Testing and Materials, Methods of Testing Metals, Part 3, 1959, pp. 87-92

Standards, techniques and specifications to govern quality of radiographic inspection; use of penetrameters, direction of radiation, recording medium, source-film distance.

1827 EXAMINING WELDED PIPEWORK
Australasian Engineer, Vol. 52, August 1960, 62 pp.

Leak tightness of welded piping in a breeder reactor is determined by radiographic examination and gas testing.

1828 RADIOGRAPHY AS AN INSPECTION TOOL
Aluminum Courier, September 1960, pp. 22-23

Inspection of Al castings and welds by X-rays or gamma-rays to detect gas cavities, sand or slag inclusions, shrinkage defects, lack of root penetration and lack of fusion.

1829 RADIOGRAPHIC INTERPRETATION
J. Hill
Australian Welding Journal, March 1960, pp. 19-22

Use of radiation to locate defects such as porosity, cracking, lack of fusion, piping and inclusions in welded areas.

1836 ISOTOPES VS X-RAY
J. A. Reynolds
Blast Furnace and Steel Plant, Vol. 48, March 1960, pp. 282-284

Light, portable units, furnished in greater variety at less cost, recommend cobalt^{60} and iridium^{192} isotope radiography units for many applications. Units have greater intensity, give quicker results and permit variation in design. Comparison of the two approaches.

1837 MECHANICAL PROPERTIES OF SELECTED ALLOYS AT ELEVATED TEMPERATURES
A. Pearl, M. Nowak and G. DeBan
Bell Aircraft Corp., Engineering & Research Labs., Buffalo, New York, January 1960, 134 pp.

A study was made of nondestructively testing silicon carbide by density uniformity, dynamic modulus by sonic technique, X-ray diffraction under transverse load, electrical resistivity, and internal friction. Dynamic modulus of silicon carbide was experimentally determined at 80, 2200°F. Modulus of rupture tests were conducted at 80, 2200, and 2400°F. A theoretical analysis is presented on the effect of specimen size, surface finish, and methods of loading on the strength properties of silicon carbide. Available literature and manufacturer's property data for various types and forms of commercially available silicon carbide are tabulated. Various areas of possible application of silicon carbide in aircraft and missile and design parameters for leading edge application are given.

1840 RECOMMENDED PRACTICE FOR RADIOGRAPHIC INSPECTION OF FUSION-WELDED JOINTS

British Welding Journal, Vol. 7, June 1960, pp. 410-414

A general technique for X-ray and gamma ray examination of butt welds in mild or low alloy steels and a more sensitive technique for use with X-rays are described.

1843 RADIOGRAPHIC TESTING EXAMINES THE DEPTHS
Peter W. Sherwood
Canadian Machinery and Metalworking, Vol. 71, October 1960, pp. 172-174

Comparison of X-ray and gamma-ray radiography with emphasis on the use of cobalt^{60} and iridium^{192} as sources for gamma-rays. The gamma-ray technique is illustrated by tests on steel welds.

1848 COMPLETES NEW FACILITIES FOR RADIOGRAPHIC INSPECTION

Foundry, Vol. 88, September 1960, pp. 114-115

Completion of a gamma-radiographic inspection room to house a 5.25-curie source of cobalt^{60} for use in the radiography of cast steel at the Farrell-Check Steel Co., Sandusky, Ohio.

1849 F. H. LLOYD'S RADIOGRAPHY UNIT

Foundry Trade Journal, Vol. 107, 3 December 1959, pp. 541-543

Largest gamma-ray unit and auxiliary equipment used at the Wednesbury Steel Foundry of F. H. Lloyd and Co., Ltd., for radiographic inspection of large steel castings. Cobalt, cesium, or iridium sources are used.

1853 X-RAY TESTING AND THE DEVELOPMENT OF CASTINGS (GERMAN)
Hans Reininger
Freiberger Forschungshefte, Vol. B38, 1960, pp. 256-286

Historical development of X-ray testing. Examples for improvement of molding techniques and elimination of defects caused by improper gating and unsuitable design of the risers.

1854 PRODUCT QUALITY IMPROVEMENT IN THE WELDING INDUSTRY OF THE GERMAN DEMOCRATIC REPUBLIC BY X-RAY TESTING (GERMAN)
Walter Anders
Freiberger Forschungshefte, Vol. B38, 1960, pp. 287-308

Experience at the Central Welding Institute (ZIS) from 1954-1958. Classification of defects for various welding methods. Influence of automatic welding on quality; effect of weather.

1859 EVALUATION AND INTERPRETATION OF X-RAY AND GAMMA-RAY EXPOSURES TAKEN FROM CASTINGS
Ernest Schiebold and Egon Becker
Ciesserei-Technik, Vol. 6, March 1960, pp. 74-76

Examination of the image quality, identification of faults, and the interpretation of the defects. To improve a more objective interpretation of the observed faults a standardization is suggested of the most common defects such as shrinkage holes, gas bubbles, slag inclusions, and cracks.

1860 X-RAY INSPECTION OF CASTINGS
Rudi Matthes
Giesserei-Technik, Vol. 5, September 1959, pp. 264-268

Specifications for X-ray testing of Al, Fe and Cu castings. Effects of X-ray energy on testing data.

1861 ENLARGING THE APPLICABILITY OF A 15 MEV BETATRON IN NONDESTRUCTIVE MATERIAL TESTING
R. Schittenhelm
Industrie-Anzeiger, Vol. 82, March 1960, pp. 331-334

Experiments are carried out to extend the applicability to smaller as well as larger wall thicknesses of the tested material. Tests on the detectability of cracks on the radiation of steel using an image amplifier and television. Construction of a portable betatron.

1863 CINEMATOGRAPHIC X-RAY TESTING OF THE METAL FLOW IN SHELL MOLDS (SPANISH)
K. Shobayashi and K. Okamoto
Instituto del Hierro y del Acero, Vol. 13, May 1960, pp. 455-459

Top and bottom casting of iron in shell molds of a special design is tested by X-ray cinematography. Metal flow, development of pipe, gas bubbles and inclusions formed by particles separating from the mold, can be observed.

1875 PROGRESS REPORT ON WELD PENETRATION STUDY OF ZIRCALOY-2 HAFNIUM WELDS AS DETERMINED BY RADIOGRAPHIC INSPECTION
M. A. Gerardi
Knolls Atomic Power Lab., Schenectady, N. Y., 23 December 1959, 11 pp.

Zircaloy-2-Hf welds made at different current settings to correlate complete weld penetration with the original weld interface shift are reported. All welds were radiographed. Zyglo, macroscopic, and microscopic examinations were run on sections of the welds to justify radiographic findings. Results indicate that an intermittent line appears on weld radiographs at a definite distance from original interface location; however, this is not a rejectable condition. Zyglo tests show that a diffusion bond exists between the parent Hf metal and the surrounding weld metal.

1876 FEEDING OF CASTING AS INFLUENCED BY THE COMPOSITION AND OVERHEATING OF THE MELT
K. N. Militsyn
Liteinoe Proizvodstvo, March 1960, pp. 19-24

Production of high density castings by means of continuous feeding during solidification. Al-Si alloys are melted in the induction furnace in refractory crucibles. Pouring at 1-50% overheating. Lost heads are poured separately with addition of carbon^{45} and zinc^{68} (0.001-0.005%) radioactive substances. Photometric and radiographic analyses. Chemical composition, mechanical properties, gas content, porosity, density, shrinkage and structure are measured. Overheating of the molten metal not less than 20-30% before casting produces best results.

1877 CONTROL OF QUALITY IN NUCLEAR POWER PLANT AND MISSILE PRODUCTION

Machinery, Vol. 97, July 1960, pp. 202-209

Nuclear power plant and missile component specifications are met by a system of quality control utilizing optical jig transits and radiographic X-ray inspection machines. Temperature must remain constant during the process to insure absolute accuracy. 100% inspection at high speed is possible.

1879 NEUTRON RADIOGRAPHY
J. Thewlis
Progress in Nondestructive Testing, Vol. 1, Macmillan Co., New York, N. Y., 1959, pp. 113-126

Principles underlying the absorption of neutrons. Techniques available for neutron radiography as a supplement to X-ray inspection.

1880 RECENT DEVELOPMENTS IN INDUSTRIAL RADIOGRAPHY. FLUOROSCOPY AND SCREEN-INTENSIFICATION PROCESSES
R. Halmshaw
Progress in Non-destructive Testing, Vol. 1, Macmillan Co., New York, N. Y., 1959, pp. 3-31

Fluoroscopy is becoming more popular in industrial radiography because it eliminates the cost of X-ray film. Image intensifiers are commercially available which will give a high brightness image on a screen. Experimental work on the sensitivity limits attainable in fluoroscopy utilizing an image intensifier and the factors limiting performance.

1887 NONDESTRUCTIVE TESTING OF HEAVY DUTY STEEL CASTINGS (GERMAN)
Hans Zeuner
Materialprüfung, Vol. 2, July 1960, pp. 230-233

Boiler fittings and turbine housings are radiographically tested for cracks, pipe, gas bubbles and metal penetrations caused by high sulphur content, rapid or interrupted cooling, improper gating and molding, gassing and contamination by material of core supports or the molding mixture.

1895 RADIOGRAPHIC QUALITY TESTING OF WELDMENTS (DUTCH)
C. J. Janssen
Metallen, Vol. 15, June 1960, pp. 182-187

Testing of welded seams on steel plates and circumferential and longitudinal weldments on cylindrical parts. Effect on image quality of foil material, film grain, distance from radiation source and material thickness.

1896 RADIOGRAPHIC TESTING OF WELDMENTS PART 2 (DUTCH)
C. J. Janssen
Metallen, Vol. 15, May 1960, pp. 168-172

Testing of the image contrast of radiographs obtained with radioactive isotopes. Fine wires of the same material as the weldment tested are used as image quality indicates. Image quality as a function of material thickness, distance from the radiation source, distance from sample to film and minimum size of flaws.

1897 THE RADIOGRAPHIC TEST OF WELDMENTS (DUTCH)
C. J. Janssen
Metallen, Vol. 15, May 1960, pp. 144-149

Factors influencing the quality of radiographs such as the kind of rays used, the film material and the thickness of the material tested. Maximum tube voltage applicable in the X-ray test as a function of the thickness of the material tested.

1901 X-RAY TESTING IN PIPELINE WELDING
M. Sircon
Petroleum, Vol. 23, March 1960, pp. 95-96

Comparison of irradiation and X-ray photographic techniques for flaw detection in pipeline weldments.

1902 X-RAY INSPECTION OF HOT STEEL BILLETS DURING ROLLING
W. J. Oosterkamp and M. C. Teves
Philips Technical Review, Vol. 21, 1959-1960, pp. 282-285

Detecting blowholes and inclusions during the rolling of hot billets. Billets are moved through a beam of 31 MEV X-rays generated in a betatron and the image observed with the aid of a special X-ray image intensifier and an industrial TV system.

1908 HOW TO ORDER AND INSPECT LIGHT-ALLOY GRAVITY CASTINGS
Fernand Dabel
Revue de l'Aluminum, Vol. 36, July-August 1959, pp. 827- 832

Control of casting defects such as shrinkage, blowholes, cracks and microporosity. Internal defects are revealed only by X-ray examination.

1920 ULTRASONIC WELD INSPECTION AT WORK
J. E. Bobbin
Ultrasonic News, Vol. 4, Spring 1960, pp. 7-10

Advantages of weld inspection by ultrasonics as compared to X-ray.

1922 HOW TO USE RADIOGRAPHY IN PIPELINE CONSTRUCTION
J. R. Strebelle
Welding Engineer, Vol. 45, October 1960, pp. 44-46

Placement of radiation source. Advantages and limitations of various techniques.

1924 AN 18 MEV MOBILE BETATRON
W. Laws, F. Malsch, R. Schittenhelm and P. H. Wagner
Welding and Metal Fabrication, Vol. 28, September 1960, pp. 357-361

An 18 MEV, mobile betatron is used in the examination of cracks and other defects in thick steel sections. A study is made of the monochromatic absorption curves for steel in order to determine the best energy range for radiographic purposes and betatron operation.

1925 IMPROVING THE METHOD OF WELD RADIOGRAPH (TRANSLATION-BWPA)
L. A. Shehekin and A. P. Starostin
Welding Production, December 1959, pp. 91-94

Layer-by-layer radiography of thick-walled welded joints in plate and tubing to determine exact locations of defects.

1926 INSTRUCTIONS FOR THE RADIOGRAPHIC INSPECTION OF FLASH-WELDED STEEL PLATES UP TO 50-MM THICK
Welding Production, December 1959, pp. 109-114

Techniques and equipment for the radiographic inspection of butt welds in flash-welded mild and low-alloy steel plates.

1934 CONSTRUCTION OF CEMENT KILNS IN EGYPT (CZECH)
Josef Cach
Zvaranie, Vol. 9, June 1960, pp. 185-187

Weldments performed during the construction of two rotary kilns. The base material was 11364.1 Steel, electrodes used were Philips no. 46, 28, 48, 68, 50, 36, and 56 and Philips-contact no. 18 and 20. Radiographic tests of the weldments were performed using special film material for hot climates.

1935 WHEN DOES INSPECTION BECOME A PROFIT?
Harry Thomasson
Canadian Metalworking, Vol. 24, November 1961, pp. 38-40

Evaluation of inspection techniques for various defects before, during, and after multipass, fillet and butt welding processes. Nondestructive methods include visual, air pressure (100 psi), radiographic and ultrasonic.

1936 WHICH NONDESTRUCTIVE TEST DO YOU USE?
Harry Thomasson
Canadian Metalworking, Vol. 24, March 1961, pp. 40-43

Use of X- and gamma-rays for radiographic testing and fluorescent penetrant dyes for inspection of welded structures.

1937 NONDESTRUCTIVE TESTING OF PRESSURE VESSELS
John Battema
Canadian Welder, Vol. 52, February 1961, pp. 10-16

Nondestructive inspection procedures for welded pressure vessels include the functional applications of air and water testing, magnetic particle, X-ray and isotope radiation, dye and fluorescent penetrant and ultrasonic methods.

1938 NONDESTRUCTIVE TESTING AND QUALITY CONTROL OF STEEL CASTINGS
B. K. Gupta
Current Engineering Practice, Vol. 3, February 1961, pp. 17-26

Outline of nondestructive testing procedures, including visual, etching, dye, fluorescent, magnetic particle and flaw, ringing, ultrasonic and radiographic techniques. Testing applications and their use as inspection standards are listed with reference to specific discontinuities.

1942 NONDESTRUCTIVE TESTING OF WELDED TUBING

Metal Treatment and Drop Forging, Vol. 28, June 1961, pp. 249-250, 252

Survey of hydrostatic, radiographic, magnetic particle, ultrasonic and electromagnetic induction nondestructive tests for welded steel tubing.

1943 WELDING POLARIS MISSILES BY HOT EDGE-UPSETTING
R. D. Libert
Metalworking Production, Vol. 105, 23 August 1961, pp. 51-53

Hot upsetting, rolling, scarfing, welding, stress relieving and inspecting by magnetic particle and X-ray methods of steel sheet expanded to form a 54-in. cylinder for the body of the Polaris missile chamber.

1944 SPECIAL METHODS OF NONDESTRUCTIVE MATERIAL TESTING (GERMAN)
H. J. Rodewald and C. Studer
Metall, Vol. 15, May 1961, pp. 410-414

Review of current status of ultrasonic, ultrasonic immersion, penetration, foil replica for detection of micro-holes and X-ray and microhardness test methods. Techniques studied include determination of modulus of elasticity and torsion and use of foil replica for detection of microcracks.

1948 TESTING IRRADIATED FUEL AT HANFORD
J. M. Fouts
Nucleonics, Vol. 19, August 1961, pp. 64-65

Radiographic, weighing and ultrasonic procedures and equipment for testing natural-U, Al-clad irradiation fuel for corrosion, dimensional stability and bond integrity between U core and Al cladding after irradiation.

1955 THE USE OF FILM IN X-RAY FILTER TECHNIQUE
N. W. Grimes
Journal of Scientific Instruments, Vol. 40, No. 3, March 1963, 128 pp.

One of the principal contributions to background fog on X-ray crystallographic film arises because the short-wave "hump" of white radiation which remains after B-filtering is enhanced by the effect of the absorption edges in the silver halides in the film. It is suggested that in certain circumstances this contribution to fog can be significantly reduced by using a film as a filter.

1960 RESPONSE OF PHOTOGRAPHIC MATERIALS TO IONIZING RADIATIONS
R. H. Hertz
Applied Materials Research, Vol. 2, No. 1, January 1963, pp. 12-19

Review of some factors which lead to present understanding of basic photographic process; mechanism involved in response of photographic material to ionizing radiation; basic concepts of latent image formation and experimental facts which led to these ideas are presented together with phenomena involved in exposures to X- and gamma-radiation and charged particles, such as quantum efficiency, energy dissipation of particles, graininess, wavelength dependence, reciprocity rule, etc.; these concepts applied to radiation sensitometry are discussed.

1961 WHY IS X-RAY THICKNESS GAUGE IMPORTANT
J. W. Wallace
Blast Furnace and Steel Plant, Vol. 51, No. 1, January 1963, pp. 32-33

Design of X-ray thickness gage and its application in automatic mill control systems; how to obtain optimized operation of X-ray gage.

1990 NONDESTRUCTIVE TESTING OF WIRE ROPE
L. Richolm
Hungarian Research Institute for Min. Publication, No. 5, 1961, pp. 105-114

Nondestructive testing of wire rope; deficiencies of traditional testing methods; use of ultrasonic X-ray, and isotope techniques; improvement of Marton type (Komlo) device.

1996 X-RAY TUBE CURRENT STABILIZER
R. S. Calder and J. B. Forsyth
Journal of Scientific Instruments, Vol. 40, No. 4, April 1963, pp. 189-191

Stabilizer is described for use with self-rectifying X-ray tubes where 3-phase supply is available; fast response is obtained with control ratio exceeding 100, by using hard tubes in pulse-operated circuit; stabilizer is adapted to correct automatically for counting losses due to paralysis in X-ray detector when integrating diffraction profile; corrected integrated intensities thus obtained were within 0.5% of calculated values.

1997 RADIOGRAPHIC MACROSTRUCTURAL TESTING OF REINFORCED CONCRETE STRUCTURES
A. Hoenig
Kerntechnik, Vol. 4, No. 11, November 1962, pp. 499-503

Radiographic macrostructural testing of reinforced concrete structures; general aspects of using tracers, gamma-rays and X-rays for investigation of concrete macrostructure; stereometric photographs; object contrast and photographic contrast; intensification foils; exposure duration, etc.

1999 IN REVIEW OF PRINCIPLES AND PROBLEMS OF X-RAY DETERMINATION OF ELASTIC STRESSES REASONS ARE GIVEN WHY CLASSIC METHODS, WHICH ARE DISCUSSED, SHOULD BE REPLACED BY $SINE^2$ PSI TECHNIQUE PROPOSED BY E. MACHERAUCH AND P. MUELLER

E. Macherauch

Materialpruefung-Materials Testing-Materiaux, Vol. 5, No. 1, 20 January 1963, pp. 14-26

In review of principles and problems of X-ray determination of elastic stresses, reasons are given why classic methods, which are discussed, should be replaced by $sine^2$ psi technique proposed by E. Macherauch and P. Mueller in 1961; among problems described are effects of elastic, yield point, and work hardening anisotropies, of macro and microstructural inhomogeneities, and of stacking faults, lattice defects and internal stresses, on strain distribution.

DESCRIPTOR INDEX

All descriptors listed in alphabetical order pertain to the information contained in the report or item that is identified by the AMMRC number following the descriptor. This journal is concerned with radiographic testing literature and every item in the journal contains some aspect of radiographic testing. A complete breakdown of each subject item by descriptors was deemed necessary in order to make the journal useful.

Reviewers need only to look up the item numbers which apply to the particular descriptors of interest and turn to the abstract applicable to those referenced numbers.

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