STANDARDS IN NUCLEAR SCIENCE AND TECHNOLOGY

A Bibliography

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INTRODUCTION

References included in this bibliography were selected from *Nuclear Science Abstracts*, Volumes 16 through 26, for the period 1962 through 1972, inclusive. The abstracts are arranged in chronological order in four categories: Reactors and Engineering, Instruments and Calibration, Radiation and Radiation Protection, and Miscellaneous. The Reactors and Engineering category also includes references to standards related to safeguards, radioactive waste, vacuum technology, and welding. The Instruments and Calibration category also includes references to standards related to neutron sources, standard neutron fluxes, standard cells, and instrumentation methods. The third category includes references to standards related to control procedures for SNAP (Systems for Nuclear Auxiliary Power), Plowshare, biological shielding, and radioactive materials shipping. The Miscellaneous category includes references to standard materials (geologic and chemical standards) and measuring units other than radiation.

A subject index is included.

ABSTRACT

Abstracts of 1803 U. S. and non-U. S. publications concerning a broad range of standards used in nuclear science and technology are included. The publication dates span the period 1962 through 1972, inclusive. Abstracts are arranged chronologically within four categories entitled Reactors and Engineering, Instruments and Calibration, Radiation and Radiation Protection, and Miscellaneous. A subject index is also included.

ENGINEERING AND REACTORS

1 CLASSIFICATION STANDARDS FOR NUCLEAR-POWERED SHIPS B Hildrew and J McCallum (Lloyd's Register of Shipping London) p 135-49 of "Nuclear Ship Propulsion" Vienna International Atomic Energy Agency 1961 (In English)

Safety requirements additional to those normally associated with shore nuclear installations or conventionally powered ships which a classified nuclear ship must satisfy are indicated. Such requirements are designed to cover all foreseeable reactor types suitable for marine use in the coming decade. The quality of material to be used in the hull is specified and the basic requirements relating to the longitudinal strength of the ship structure are outlined. Protection against collision and grounding is discussed and the extent of protection required is indicated. The basic principles relating to the support of the containment vessel within the ship are postulated and the location of the reactor is considered with particular reference to ship handling and design. The design conditions for all categories of pressure vessels are briefly stated and the parameters of the major accident for which the containment vessel is to be designed are detailed. Ship motion and external shock loading are discussed in relation to the design of the reactor components and associated supports. Acceptable maximum accelerations are proposed. Guidance is given to permit acceptable design of pressure relief systems for primary and secondary circuits. The design requirements consequent upon installation in a marine environment are stated in a brief survey of reactor engineering: reactor control and decay heat removal. Supplementary installation requirements covering shielding, defuelling, effluent disposal and electrical supplies are also discussed but only where the marine environment influences the particular subject. The requirements for survey and maintenance of the major items of hull and reactor machinery are outlined together with details of the periodic tests required and the probable time scale for inspection. A discussion is included on particular items which it is suggested are subject to further rationalization but require experimental proof to permit relaxation of the requirements outlined. Such items are major accident parameters, containment choice of reactor materials and secondary shielding. It is suggested that the safety and consequently the economic potential of any system is dependent upon a greater understanding of these problems. (auth)

2 NUCLEAR QUALITY STANDARDS AND SPECIFICATIONS Warren J McGonnagle (Argonne National Lab., Ill.) Nondestructive Testing, 20 173-6, 181 (May-June 1962)

Quality standards and specifications in nuclear industry are discussed. (M C G)

3 DEVELOPMENT OF REACTOR SAFETY STANDARDS M C Leverett (General Electric Company Richland Wash.) IAEA Preprint SM 24/42 28p

To be published in the Proceedings of the IAEA Symposium on Reactor Safety and Hazards Evaluation Techniques held in Vienna 14-18 May 1962

Formal reactor safety standards are in essence written statements of what constitutes good and safe practice in reactor work issued with the assent of experts in the field. They are voluntarily arrived at, and their observance is not mandatory unless made so by governmental authority. In the United States of America the American Standards Association centralizes the development of reactor safety standards. Reactor safety standards vary greatly in specificity from one to another aspect of reactor safety depending upon the degree to which recognized good practice has evolved. Standards are being developed in almost all areas of reactor safety. The more specific standards are developing in the mechanical engineering field where the practices of vessel and piping fabrication and design are well recognized and in the handling of fissile materials. Less specific but still useful standards are evolving in the areas of control system design and operation, reactor system stability investigation, atmospheric dispersion of fission products, operator qualification and organization. Some subjects, such as reactor siting, appear difficult to standardize in even a general way. The voluntary creation of safety standards by the nuclear industry which standards the industry itself can alter by due process will probably obviate the need for some governmental regulations on nuclear reactors, and is of assistance to the government in establishing those regulations which are necessary. (auth)

4 ATOMIC FREQUENCY STANDARDS USING OPTICAL PUMPING OF RUBIDIUM 87 AND CAESIUM-133 IN GAS CELLS V B Gerard (National Physical Lab Teddington Middx Eng.) Brit J Appl Phys 13 409-14 (Aug 1962)

The more important variables involved in the engineering of practical gas cell frequency standards are measured. Particular emphasis is laid on the importance of the frequency shifts produced by buffer gas pressure and temperature and incident light intensity. It is shown that stabilities of one or two parts in 10^{11} should be possible and this figure is approached with a laboratory standard. (auth)

5 (ORNL TM 281) GENERAL STANDARDS GUIDE FOR EXPERIMENTS IN ORNL RESEARCH REACTORS C D Cagle (Oak Ridge National Lab Tenn.) Aug 2) 1962 Contract W 415 Eng 2(48)

The Oak Ridge National Laboratory has three general purpose research reactors which accommodate testing of target irradiations and beam type experiments. Since the experiments must share common or similar facilities and utilities be designed and fabricated by the same groups and meet the same safety criteria certain standards for these have been developed. These standards deal only with those properties from which safety and economy of time and money can be maximized and do not

relate to the intent of the experiment or quality of the data obtained. The necessity for and the limitations of the standards are discussed, and a compilation of general standards is included. (auth)

6 (EXPERIMENTS TO COMPARE RADIATION DAMAGE DOSE RATES IN DIFFERENT REACTOR SPECIES) A. D. Rossin (Atomic National Lab., Ill.) Trans. Am. Nucl. Soc., 5: 472 (Nov. 1962)

7 (HW-74796) MEASUREMENTS ON PHOENIX FUEL STANDARDS. T. B. Thornbury (General Electric Co., Hanford Atomic Products Operation, Richland, Wash.) Sept. 10, 1962. Contract [AT(45-1)-1350] 9p

The boron and plutonium contents of the poison standards for the Phoenix Fuel experiment were measured in the Physical Constants Testing Reactor (PCTR). This demonstrated the use of the PCTR to measure the quantity of fissile material in a sample by varying the relative worths of the fast and thermal neutrons. The worth of thermal neutrons at the sample position, was reduced more than the worth of fast neutrons by surrounding the sample with a 1 in. water jacket to which 0.001 g/cc boron was added. (auth)

8 (HW-SA-2507) DEVELOPMENT OF REACTOR SAFETY STANDARDS. M. C. Leverett (General Electric Co., Hanford Atomic Products Operation, Richland, Wash.) Mar. 27, 1962. Contract AT(45-1)-1350 29p

A description of standards for the safe design and operation of nuclear reactors being developed in the U. S. is presented. A discussion is included concerning the development status of these standards and the probable future trends. (J. R. D.)

9 (WAPD-BT-27(p. 53-7)) A SURFACE FINISH STANDARD FOR RADIOGRAPHING WELDS. J. F. Gipson (Westinghouse Electric Corp., Bettis Atomic Power Lab., Pittsburgh)

Surface finish requirements for welds in pipe and pressure vessels are not consistently and explicitly defined. An investigation is therefore undertaken to determine the extent of surface conditioning of welds necessary for satisfactory radiography. As a result of a series of tests, it is concluded that a surface finish of 1000 μ in./rms is adequate provided that all welding code and material specifications are satisfied. (auth)

10 (NP-12629) PROPOSED SAFETY STANDARD FOR DESIGN, FABRICATION AND MAINTENANCE OF STEEL CONTAINMENT STRUCTURES FOR STATIONARY NUCLEAR POWER REACTORS. (Sargent and Lundy, Chicago) Nov. 14, 1962 13p

A discussion of proposed standards for the design, fabrication, and maintenance of steel containment structures for stationary nuclear power reactors, which would protect the general public from radioactive material dispersal under conditions of accidental violation of primary plant integrity, is presented. (H. G. G.)

11 (IDO-16428 (Rev. 1)) IN-TANK IRRADIATION FACILITIES IN THE MTR AND ETR (STANDARD PRACTICES GUIDE). A. S. Richardson, ed. (Phillips Petroleum Co., Atomic Energy Div., Idaho Falls, Idaho) Mar. 15, 1963. Contract AT(10-1)-205 70p

A guide was prepared as an aid to the experimenter in his planning and designing of capsule-type irradiations in the MTR and ETR. A complete description of the facilities available for capsule-type irradiations is presented. Standard capsules and capsule holders or baskets are also described. A generalized discussion of typical designs of various types of capsules is included. In addition, the requirements for irradiation of capsule-type experiments are presented. (auth)

12 (EUR-30 e) POWER SUPPLY FOR ESONE STANDARD PLUG-IN SYSTEM. I. De Lotto, G. Giannelli, and L. Stanchi (European Atomic Energy Community Nuclear Research Center, Ispra, Italy) 1962 28p

A transistor power supply for two cases according to ESONE standard is described. It consists of a 24-v semi-regulated voltage from which all the regulated voltages required by the standard are derived. The 24-v semi-regulated voltage is obtained by controlling two switching transistors with magnetic amplifiers. The regulators use a new circuit and are protected against overloads and short circuits. The analysis of the circuits and the protection system is given. (auth)

13 (PRWRA-GNEC-7) BOILING NUCLEAR SUPERHEATER (BONUS) POWER STATION RADIATION PROTECTION STANDARDS. (Puerto Rico Water Resources Authority, San Juan and General Nuclear Engineering Corp., Dunedin, Fla.) Dec. 1, 1961. Contract AT(40-1) 2674 60p

Radiation protection standards developed for use at the Boiling Nuclear Superheater Power Plant are presented. Radiation and contamination limits for personnel and equipment are listed. Operating regulations, routine operations, emergency procedures and facilities and detection instruments and equipment are described. A summary of permissible radiation exposure limits is also presented. (C. E. S.)

14 (TID-19154) FABRICATION OF STAINLESS STEEL FOR AGGRESSIVELY CORROSIVE RADIOACTIVE SERVICE. W. H. Koontz (General Electric Co., Hanford Atomic Products Operation, Richland, Wash.) Jan. 31, 1963. Contract [AT(45-1)-1350] 6p (HWS-5936)

Specifications are presented for the fabrication of stainless steel vessels, piping, and other equipment for the chemical processing of radioactive, corrosive materials. The specifications cover standards of fabrication, materials, handling and working, assembly, welding, testing, and cleaning and painting. (D. L. C.)

15 (TID-15244 (Rev.)) ARCHITECTURAL AND CIVIL STANDARDS. (General Electric Co., Hanford Atomic Products Operation, Richland, Wash.) 1963. Contract AT(45-1)-1350 496p (HWS-10000)

Hanford Atomic Production Operation specification guides and standards for architectural and civil engineering are presented. Information includes construction of roads, railroads, roofs, signs, buildings, building equipment, sewers, fences, safety systems, and drainage systems. Details of this manual are given in TID-4100 (Suppl.) (N. W. R.)

16 (TID-15245 (Rev.)) SAFETY-MECHANICAL STANDARDS. (General Electric Co., Hanford Atomic Products Operation, Richland, Wash.) Contract AT(45-1)-1350 324p. (HWS-10001)

Hanford Atomic Production Operation specification guides and standards for plumbing, chemical engineering, mechanical engineering, sanitary engineering, exhaust systems, steam engineering, stainless steel, dry boxes, thermal insulation, filtration and materials testing are presented. Details of this manual are given in TID-4100 (Suppl.) (N. W. R.)

17 (TID-15246 (Vol. I) (Rev.)) DESIGN GUIDES. (General Electric Co., Hanford Atomic Products Operation, Richland, Wash.) 1963. Contract AT(45-1)-1350 471p (HWS-10003-1)

Hanford Atomic Production Operation specification guides for chemical, civil, electrical, mechanical, structural, steam, and metallurgical engineering are presented. Information is included on piping, valves, packing and gasket materials, stainless steel, tanks, compressed air,

painting, and loads. Details of this manual are given in TID-4100(Suppl.). (N.W.R.)

- 18** (TID-15246(Vol.II)(Rev.)) GUIDES. (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). 1963. Contract AT(45-1)-1350. 268p. (HWS-10003-2)

Hanford Atomic Production Operation specification guides for equipment and procedures, instrumentation, structural engineering, welding, design criteria, electrical engineering, and construction repairs are presented. Details of this manual are given in TID-4100(Suppl.). (N.W.R.)

- 19** (TID-19753) STANDARD DESIGN CRITERIA (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). 1963. Contract AT(45-1)-1350. 216p. (HWS-10006)

Hanford Atomic Production Operation specification guides for design criteria, structural engineering, civil engineering, heating, ventilation, air conditioning, fire alarm systems, noise control, lighting, railroad construction, corrosion protection, and electrical engineering are presented. Details of this manual are given in TID-4100(Suppl.). (N.W.R.)

- 20** (TID-19755) COMPOSITE INDEX OF HANFORD ENGINEERING STANDARDS. (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). 1963. Contract AT(45-1)-1350. 52p. (HWS-10007(Index))

Hanford Atomic Production Operation composite index refers to subjects contained in the nine handbooks and manuals published under the Hanford Engineering Standard Program. This index is described in TID-4100(Suppl.). (N.W.R.)

- 21** (TID-15247(Rev.)) WELDING STANDARDS. (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). 1963. Contract AT(45-1)-1350. 116p. (HWS-10004)

Hanford Atomic Production Operation specification guides and standards for welding and brazing are presented. Details of this manual are given in TID-4100(Suppl.). (N.W.R.)

- 22** A PHILOSOPHY OF NUCLEAR-REACTOR SAFETY. Robert E. Trumble and Floyd D. Robbins (General Electric Co., Richland, Wash.). Trend Eng. Univ. Wash., 15 No. 4, 11-16(Oct. 1963).

Nuclear reactor safety criteria developed at Hanford is presented. The Hanford N-Reactor is used as an example of the application of these criteria. (C.E.S.)

- 23** QUALITY CONTROL AND SERVICE PERFORMANCE. Helmut Thielsch. 45p. (CONF-102-32)

From American Society of Mechanical Engineers 1963 Winter Meeting, Philadelphia, Nov. 1963

Quality control requirements applicable to materials specifications, fabrication specifications including welding, heat treatment, and cleaning, and final inspection specifications are discussed. (P.C.H.)

- 24** (UCRL-11226) PROPOSED STANDARDS FOR GRAPHIC SYMBOLS IN VACUUM TECHNOLOGY. Finn S. Reinath (California Univ., Berkeley. Lawrence Radiation Lab.). Jan. 27, 1964. Contract W-7405-eng-48. 10p. (CONF-395-1)

From American Vacuum Society, Chicago, Feb. 1964. Some standards proposed to the Standards Committee of the American Vacuum Society are presented. (D.C.W.)

- 25** (HW-79290) SPECIFICATIONS FOR SWAGE-COMPACTED, MIXED OXIDE (UO_2 - PuO_2) FUEL ELEMENTS FOR THE PRTR(MARK I-M). (General Electric

Co. Hanford Atomic Products Operation, Richland, Wash.). Oct. 1, 1963. Contract AT(45-1)-1350. 42p

Plutonium-containing, 19-rod cluster fuel elements have been fabricated for the Plutonium Recycle Test Reactor (PRTR) by swage compacting loose, mixed oxide powders in Zircaloy cladding. Some elements contain physical mixtures of UO_2 and PuO_2 while others contain high energy rate, pneumatic-mechanical impaction densified fuel particles (Nupac), in which PuO_2 is dispersed throughout UO_2 . The swage compacted fuel rods feature swageable end caps which minimize the possibility of contamination spread during processing. Specifications governing the fabrication of these fuel elements were developed in detail during development of the fabrication process. (auth)

- 26** (HW-79291) SPECIFICATIONS FOR VIBRATIONALLY COMPACTED, MIXED OXIDE (UO_2 - PuO_2), FUEL ELEMENTS FOR THE PRTR (MARK I-L). (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). Oct. 1, 1963. Contract AT(45-1)-1350. 41p.

Plutonium-containing, mixed oxide, 19-rod cluster fuel elements have been fabricated for the Plutonium Recycle Test Reactor. The particulate, oxide fuel was densified in Zircaloy cladding tubes by vibrational compaction. Some elements contain physical mixtures of UO_2 and PuO_2 while others contain high density impacted particles ('Nupac' process) in which the PuO_2 is dispersed throughout the UO_2 . Detailed specifications governing the fabrication of such elements were developed during development of the fabrication process. (auth)

- 27** (MAB-196-M) RECOMMENDED QUALITY STANDARDS FOR TUNGSTEN SHEET PRODUCED IN THE REFRACTORY METALS SHEET ROLLING PROGRAM (National Research Council Materials Advisory Board) Jan. 22, 1964. 23p

Quality standards recommended for identification sampling, testing, visual inspection, dimensional tolerances, sonic inspection, chemistry, tensile properties, bend tests, and metallography and hardness of tungsten sheet are given. A form sheet report is included. (P.C.H.)

- 28** STANDARD PILES. M. De Beaucourt, M. Boyer, M. Denis, M. Hyver, and M. Prodoscini. Bull. Inform. Sci. Tech. (Paris), No. 81, 39-42(Mar. 1964). (In French)

A survey on the standard pile is presented with a description of the main problem: power construction neutrons sources, moderators, and shieldings. Flux measurements may be made by calibration by activation of ^{47}Au with absolute determination by means of coincidence ($\beta\gamma$) flux calculation by means of Fermi age was considered. Brief descriptions of standard piles belonging to the C.E.A. are given. (auth)

- 29** (NLCO-909) GRAIN SIZE STANDARDS FOR BETA-HEAT-TREATED URANIUM FUEL CORES. M. H. Cornett (National Lead Co. of Ohio, Cincinnati). May 14, 1964. Contract AT(30-1)-1156. 6p. (CONF-607-3)

From AEC Metallography Group 18th Meeting, C. Inoga Park, Calif., June 1964.

Visual standards are presented for rating grain size at 3X of the following beta heat-treated uranium fuel cores: (1) oil-quenched extruded tubular fuel cores; (2) oil-quenched, rolled I & E fuel cores; and (3) water-quenched, rolled I & E fuel cores. (auth)

- 30** (NLCO-910) STANDARDS FOR METALLOGRAPHIC EVALUATIONS OF URANIUM METAL. M. H. Cornett (National Lead Co. of Ohio, Cincinnati). May 14, 1964. Contract AT(30-1)-1156. 8p. (CONF-619-1)

From 18th Meeting of the AEC Metallography Group, Los Angeles, June 1964.

Visual standards are presented for rating the degree of

recrystallization of formed uranium metal, the inclusion content of as-cast uranium metal, and the inclusion and stringer content of formed uranium metal. (auth)

- 31** CONTROL OF HAZARDS IN NUCLEAR REACTORS. T. C. Sinclair. London, Temple Press, 1963. 84p. 15s.

This volume, one of a series of nuclear engineering monographs, deals with the safety aspects of nuclear reactor operation, including the biological hazard (acute, sub-acute and genetic effects of radiation, maximum admissible levels in air, water and body, surface contamination), the effects of radiation on reactor materials (creep and corrosion resistance, types of radiation damage, annealing and hardening, increased tensile strength of steel), fuel and cladding (thermal cycling, fuel element failure, fuel element measurement, etc.), the pressure circuit (design and operational limitations of pressure vessel and design stress values), and reactor safety and siting (solid wastes, liquid and gaseous effluents, monitoring programs and maximum admissible levels under accident conditions), safety being defined as a reduction of hazards until an acceptable calculated risk has been achieved. (Occupational Safety Health Abstr. 2, No. 8, 1964)

- 32** (HWS-6574(Rev. 1)) SPECIFICATION FOR CONFINEMENT SEALS. 105-N and 109-N Buildings. Project CAI 816. H. I. Jensen and G. E. Wade (General Electric Co., Hanford Atomic Products Operation, Richland, Wash.). Feb. 17, 1961. Rev. 1, Apr. 19, 1961. Contract AT(45-1)-1350. 24p. Dep. (mn), \$1.00(cy), 1(mn) CFSTI.

Includes Appendices A through D.

The specification covers the purchasing, forming, mixing, placing, curing and testing the confinement seals on all joints, openings, or penetrations into Zone I of 105-N and 109-N and Zone II of 105-N buildings. The seals will serve to contain the fission products in the event of a nuclear incident. Materials and workmanship are discussed. (D. L. C.)

- 33** (TID-21644) GANTRY AND TROLLEY FOR FUEL HANDLING CASK. J. deArrieta (Atomics International, Canoga Park, Calif.). July 17, 1959. Revised Oct. 9, 1959. Contract [AT(11-1)-Gen-8]. 18p. Dep. (mn); \$1.00(cy), 1(mn) CFSTI.

Specifications are given for the gantry and trolley for transferring reactor components to and from the Hallam reactor core. Operational requirements, structural design, equipment details, etc., are specified. (D. L. C.)

- 34** (TID-7698(Pt. I)(p. 31-2)) NUCLEAR SAFETY—STANDARDS AND EVALUATION. J. A. Lieberman (Division of Reactor Development (AEC), Washington, D. C.).

An outline is presented of guides and hazards evaluation for nuclear devices in space. A chart for aerospace nuclear power safety reviews and approval for use is included. (D. L. C.)

- 35** (CONF-650409-1) AN INTRODUCTION TO THE ASME UNFIRED PRESSURE VESSEL CODE. C. V. Moore (Knolls Atomic Power Lab., Schenectady, N. Y.). Mar. 15, 1965. Contract W-31-109-eng-52. 44p. Dep. (mn); \$2.00(cy), 1(mn) CFSTI.

From Pressure Vessel Symposium, ASME, Idaho Falls, Idaho.

A general introduction to the ASME Unfired Pressure Vessel Code, primarily from the viewpoint of the designer, is presented. The history of the Code is outlined briefly. The areas of application of the Code are described, and the jurisdictional status of the Code is outlined. The administrative arrangements by which the Code is kept up to date and modified are discussed. The organization of the different sections of the Code are explained and the requirements of the various subsections of the Code are outlined—stressing those portions that are frequently misinterpreted or subject to dispute. Finally, current directions for future development of the Code are sketched. (auth)

- 36** (CONF-650201(p. 45-53)) THE ESTABLISHMENT OF STANDARDS FOR SAFETY EVALUATION OF

REACTORS. Mann, Marvin M. (Atomic Energy Commission, Washington, D. C.).

A discussion is given of the principles and beliefs upon which the standards and guides for evaluation of reactors are based. It is emphasized that the primary responsibility for the safe operation of a licensed reactor rests upon the licensee. Changes in some areas are considered. The subject of technical specifications is discussed in some detail, and some work of a Task Force on this subject is described. (D. L. C.)

- 37** PROPOSED STANDARD FOR LEAKAGE RATE TESTING OF CONTAINMENT STRUCTURES FOR NUCLEAR REACTORS. Nucl. Eng. Bull., 2, 1-13 (Dec. 1964).

A standard was proposed to specify uniform methods for determining the ability of a reactor container to retain, within the limits of permissible leakage rates, any gases, vapors, or liquids, or other fluid materials, which would be of a hazardous nature if not contained and which might be present in the containment structure as a result of an energy release, rupture, or leak in the nuclear reactor components or accessories. The preferred practices and test requirements for quantitative determination of gas leakage rates of containment structures for the housing of operating nuclear reactors are specified. Topics covered include: sequence of tests, general preparations for test pressurizing, time scheduling of the leakage rate test, applicable test methods, test equipment and facilities, the absolute method, the reference vessel method, personnel access to pressurized containment structures, period of test, recording of data, computation of leakage rate, and reinspection and recheck of containment structure. (M. C. G.)

- 38** (HW-84512RD) SPECIFICATION FOR NUCLEAR GRADE MIXED OXIDES (UO_2-PuO_2), HANFORD SALT CYCLE COMPACTIBLE POWDER. Anderson, H. J. (General Electric Co., Richland, Wash., Hanford Atomic Products Operation). Nov. 16, 1964. Contract AT(45-1)-1350. 7p. Dep. (mn); \$1.00(cy), 1(mn) CFSTI.

The specification defines the physical and chemical characteristics required of high-density PuO_2-UO_2 particles. These particles were formed by the salt cycle process and are to be used in packed-particle fuel elements manufactured by a vibrational compaction or a similar process. Lot sizes, sampling, testing, test reports, and packing and marking are covered. (D. L. C.)

- 39** PROPOSED STANDARD PROPOSED STANDARD FOR CLEANING NUCLEAR REACTOR SYSTEM COMPONENTS. Savolainen, Ann W., ed. Nucl. Eng. Bull., 3, 1-7 (May 1965).

The standard defines classes of cleanliness and provides methods for specifying degrees of cleanliness for components to be installed in nuclear systems. Examples from industrial experience are cited as guides. (J. I. P.)

- 40** REACTOR SAFETY AT AEC-OWNED FACILITIES. McCool, Whittie J. (Atomic Energy Commission, Germantown, Md.). Trans. Am. Nucl. Soc., 8, Suppl., 19 (1965).

- 41** RULES FOR CONSTRUCTION OF NUCLEAR VESSELS. ASME Boiler and Pressure Vessel Code, Section III, 1965 Edition. Report of Subcommittee of Boiler and Pressure Vessel Committee. New York, The American Society of Mechanical Engineers, 1965. 154p. Included, Summer 1965 Addenda, ASME Boiler and Pressure Vessel Code, Nuclear Vessels, 1965 Edition, date of Issuance June 30, 1965. 14p.

- 42** SPECIFICATIONS FOR WELDING AUSTENITIC STAINLESS STEEL (Engineering Materials). (Phillips Petroleum Co., Atomic Energy Div., Idaho Falls, Idaho). (CAPE-1080). 4 specs.

Welding specifications, control standards, and radiographic technique requirements used in manual welding of austenitic stainless steel in nuclear reactor experiment systems are presented. The welding specifications cover tungsten-inert gas process welding and combined tungsten-inert gas and shielded metal-arc welding of steel tubes, pipes, and fittings. The maximum weld metal thickness is 0.75 in. Qualification procedures are included.

which will permit operators to obtain approval to weld austenitic stainless steel tubes, pipes and fittings. The control standards include requirements used in inspecting piping welds and supplementary requirements to existing welding codes. Radiographic technique requirements are included for the inspection of piping welds. (For details see TID-4100) (M C G)

43 PROPOSED STANDARD NUCLEAR REACTOR CLASSIFICATION. Nucl. Eng. Bull., 3 8-9(Aug. 1965).

The standard proposed classifies nuclear reactors into four primary categories and lists the classes within each category. The identifying characteristic property, or product is listed for each class. The primary categories are: purpose, thermomechanical design, nuclear design and development sequence. (M C G)

44 (NLCO-954) MICROGRAPHY OF URANIUM PROCEDURES AND STANDARDS. Cornett M. H. (National Lead Co. of Ohio, Cincinnati). Mar. 2 1966. Contract AT(30-1)-1136. 78p. Dep. mn. CISTI \$3.00 cy, \$0.75 mn.

Techniques for the preparation of uranium specimens so that their micro and microstructures may be studied are presented. Included are procedures for sample preparation, etching, and photography. Also included are metallographic standards for the evaluation of the prepared samples with respect to grain size, recrystallization, and inclusion content. (W L C)

45 (ORNL-P-1263) THE NEW SECTION III NUCLEAR PRESSURE VESSEL CODE. Miller, Edward C. (Oak Ridge National Lab., Tenn.). [1964]. Contract W-7405-eng-26 17p. Dep. mn. CISTI \$1.00 cy, \$0.50 mn.

The history of the Boiler Code is reviewed and the contents of Section III are discussed and compared with Sections I and VIII. (W L C)

46 (ORNL-P-2107) CODES AND THE NON-DESTRUCTIVE TESTING OF WELDS. Miller, Edward C. (Oak Ridge National Lab., Tenn.) 1966. Contract W-7405-eng-26 16p. (CONF-660211-2) Dep. mn. CISTI \$1.00 cy, \$0.50 mn.

From 1st Midwest Symposium on Nondestructive Testing of Welds, Chicago.

The history of the development of pressure vessel and piping codes is summarized and the problems involved in introducing new techniques, including nondestructive testing requirements, into these codes are described. These problems include the necessity for establishing procedures whose results are readily interpretable with a minimum of dispute and capable of giving consistently reproducible results when employed by a variety of operators and shops with a variety of equipment and varying levels of ability. The generally good record of service performance of code constructed equipment requires that the introduction of new techniques be justified on the basis of improved quality of construction consistent with the cost involved. The actual methods of nondestructive testing presently incorporated in Codes and their acceptance standards are reported in some detail. (auth)

47 NOTES ON REACTOR SAFETY IN THE USSR. Nucl. Safety 7 153-61(Winter 1966)

The observations of a US delegation to the USSR on the general safety criteria applied at Soviet installations are summarized. (C O Y)

48 HEAT TREATMENT FOR IMPROVING THE NOTCH TOUGHNESS OF HEAVY THICKNESS Mn-Mo STEEL PLATE FOR NUCLEAR REACTOR VESSELS. Susukida Hiroshi, Ando, Tomozumi. (Kobe Technical Inst., Japan). Mitsubishi Heavy Ind. Tech. Rev., 3 156-65(May 1966).

Effects of quenching, tempering and stress relieving on the notch toughness of heavy thickness Mn-Mo steel plate (modified type) for nuclear reactor vessels were studied. The most effective method for improving the notch toughness was to increase the cooling rate from austenitized temperature. Stress relieving caused deterioration of the notch toughness. The critical cooling rate at which Charpy V impact value exceeded 5.2 kg m/cm^2 (30 ft lb) at -12°C (10°F) after quenching, tempering and stress relieving was about 10°C/min . The transition temperature

T_{130} at one quarter of plate thickness after hot forming, quenching, tempering and stress relieving was 30°C and the ND1 temperature was 25°C . Heat treatment standards for fabricating high quality heavy wall nuclear reactor vessels were established. (auth)

49 MANUFACTURE OF FUEL ELEMENTS FOR AN ATOMIC REACTOR. Schneider, G. Schweissen, Schneiden, 17 283-7(1965). (In German)

Information is presented concerning fuel element fabrication and production and cap welding to fuel element jackets. X-ray inspection and leak testing of cladding, corrosion testing in autoclaves and fuel element acceptance standards. (J R D)

50 (K-1632(Pt 2)) A GRAVIMETRIC GAS FLOW STANDARD. PART II PERFORMANCE AND EVALUATION. Collins, W. T., Selby, T. W. (Oak Ridge Gaseous Diffusion Plant, Tenn.) Apr. 15 1966. Contract W-7405-eng-26 78p. (CONF-660902-1) Dep. mn. CISTI \$3.00 cy, \$0.75 mn.

For Presentation at American Society of Mechanical Engineers Symposium, Pittsburgh, Pa.

Performance and evaluation of the Gravimetric Gas Flow Standard are reported. Precision estimates based on the standard deviation of linear fits to flow versus pressure relationships for critically operated flow elements were $\pm 0.035\%$ over the range of 0.05 to 1725 grams of dry air per minute and 0.060 to 0.065 for the flow rates from 0.3 to 1650 grams per minute. The principal sources of uncertainty are discussed and methods proposed for reducing their effect. It was concluded that the gravimetric method has a potential precision significantly less than 0.10 standard deviation and that the concept could be extended for calibrating gas flow rates of several thousand standard cubic feet per minute. (auth)

51 QUALIFICATION STANDARD FOR WELDING AND BRAZING PROCEDURES, WELDERS, BRAZERS AND WELDING AND BRAZING OPERATORS. 1965 Edition. Formulated by the Boiler and Pressure Vessel Committee ASME Boiler and Pressure Vessel Code Section IX. New York, American Society of Mechanical Engineers 1965 80p.

Requirements for ferrous materials, requirements for nonferrous materials and requirements for brazing ferrous and nonferrous materials are given. Definitions, recommended administrative forms and information on etching processes and reagents are included. (J R D)

52 (TRG Report 1) (Pt 1) STANDARD RELAY MODULES FOR SAFETY AND CONTROL CIRCUITS. PART 2 IN STRUCTURE AND MAINTENANCE MANUAL. Maple, B. J., Cooper, A. C. (Reactor Group, United Kingdom Atomic Energy Authority, Risley, England) Mar. 21 1966. 10p. Dep. BIS \$1.80. HMSO.

Standard relay modules have been designed to meet the need for relay logic on experimental plant. The design can be constructed without prior knowledge of the plant requirements and can be made to suit a particular application by the simple expedient of arranging links in a removable connector. (auth)

53 (ORNL-P-2615) CODES, SPECIFICATIONS AND ACCEPTANCE STANDARDS FOR WELDMENTS. Miller, Edward C. (Oak Ridge National Lab., Tenn.). Sept. 28, 1966. Contract W-7405-eng-26. 19p. (CONF-660936-1). Dep. mn. CISTI \$3.00 cy, \$0.65 mn.

From Symposium on Weld Imperfections, Palo Alto, Calif.

A general description of problems confronting industry, users and governmental regulatory agencies in development of meaningful and workable welding codes and standards is presented. The necessity for correlation between hydrostatic, radiographic and ultrasonic tests and magnetic particle and penetrant examination is stressed. The limitations of each method of inspection are appraised. (P G C)

54 (KAPL-A-FOS-1) THE ELEMENTS OF SPECIFICATIONS (REVISED). Hirschmann, W. I. (Knolls Atomic Power Lab., Schenectady, N. Y.) Nov. 15, 1966. Contract W-31-109-eng-52. 9p. Dep. mn. CISTI \$3.00 cy, \$0.65 mn.

The structure of a specification is a reflection of the nature of

the specified item, whether novel or a modification of a common product, and of the purchaser-vendor relationship, depending on the policies employed in vendor selection. Together with format and phraseology, "The Elements of Specifications" considers those aspects of specifications in which management decisions play a major role. It discusses at length the engineering input required for the development of specifications of the performance and design type. Because of their general importance, some phases of material specifications are discussed separately. Though "specification engineering" is substituted for the commonly used term "specification writing," format and phraseology are covered as an important and necessary tool. The text is intended as a guide for engineers (auth).

- 55** NIM SYSTEM REGULATED POWER SUPPLY [2832] (Engineering Materials). (Oak Ridge National Lab., Tenn.) (CAPE-1463).

15 drawings

The power supply was designed to be rear-mounted on a NIM Standard Bin (see CAPE-1477). The supply provides ± 12 V and ± 24 V at a maximum current of 1 A. Each voltage is independently current limited at ~ 1.2 A. The power supply provides remote sensing at a laminated Cu power distribution bus located on the bin. A thermostat located in the supply will close when the ambient temperature is $55^\circ\text{C} \pm 3^\circ\text{C}$ and will open at $46^\circ\text{C} \pm 4^\circ\text{C}$. On the ORNL bin this will turn on an ambient lamp located on the front of the bin. Another thermostat located on the power supply heat sink will open at $95^\circ\text{C} \pm 3^\circ\text{C}$ and close at $75^\circ\text{C} \pm 8^\circ\text{C}$. On the ORNL bin this will turn on an overload lamp located on the front of the bin and will turn off the power supply until the heat sink has cooled (For details see TID-4100 Suppl. 38) (F S.)

- 56** NIM SYSTEM ± 12 V, ± 24 V POWER SUPPLY, 50ma [Q-3004] (Engineering Materials) (Oak Ridge National Lab Tenn.) (CAPE 1536)

9 drawings

The power supply is packaged in a single width NIM standard module for use in a NIM standard bin. It is used on bins that do not have the NIM Type III Power Supply attached (Q-2832 see CAPE-1463). The module will supply ± 12 V or ± 24 V at a maximum current of 50 mA. Each output is independently current-limited at ~ 55 mA. The temperature coefficient is $0.001\%/^\circ\text{C}$ for an ambient temperature of 0°C to 50°C . Less than 1 mV peak-to-peak noise and ripple were observed on a 50 mc bandwidth oscilloscope (For details see TID-4100 Suppl. 39) (F S.)

- 57** NUCLEAR MATERIALS MANAGEMENT RELATIONS FUEL FABRICATOR AND REACTOR OPERATOR. Donovan, H. W. (General Electric Co., Cincinnati). pp 169-74 of Institute of Nuclear Materials Management Sixth Annual Meeting. Columbus, Ohio, Institute of Nuclear Materials Management, 1965.

The need for the development of accepted uranium measuring standards and practices for adoption on an industry-wide basis and which are capable of being audited in a manner similar to that practiced in other industries is discussed. Present inventory audit procedures of reactor operators and their financial responsibility in handling leased U are described (F S.)

- 58** (N-66-29753) DEVELOPMENT OF A PROTOTYPE PLASTIC SPACE ERECTABLE SATELLITE. Quarterly Report, March-May 1966. D'Agostino, Vincent; Keusch, Preston; Raffo, John (RAI Research Corp., Long Island City, N. Y.). June 27, 1966. Contract NAS5-3923. 67p. (NASA-CR-76045; RAI-368). CFSTI \$3.00 cy, \$0.65 mn.

High density and standard density polyethylene films were tested to determine their tensile properties, and the data are tabulated. The standard polyethylene film was found acceptable, and samples were irradiated and heat treated under different ambient conditions to evaluate the effect of atmosphere on the processed film. Results indicate little influence on the mechanical properties. Calculations were also made to determine the thickness of film required to withstand a buckling pressure of five times solar pressure. Findings show a thickness requirement in the 0.50 to 1.48 mils range (STAR)

- 59** PROPOSED GUIDE FOR THE DESIGN OF A NUCLEAR POOL FACILITY. REVISION 11. Savolainen, Ann W. (ed.). Nucl. Eng. Bull., 4. 8p.(Dec. 1966).

Recommendations for the design of a facility comprising a body of water for attenuating nuclear radiation from a reactor and/or stored radioactive materials are presented. The recommendations apply only to the design of light-water filled pools. Measures developed to cope with health and safety hazards are emphasized (J R D)

- 60** QUALITY ASSURANCE AS A MATTER OF PUBLIC POLICY IN THE SAFETY OF ATOMIC POWER PLANTS

Ramey, James T. (Atomic Energy Commission, Washington, D. C.). Nucl. Energy, 45-50(Mar.-Apr. 1967).

The history of the Commission's safety program and licensing procedure is reviewed. The roles of the Commission and industry are discussed in relation to the development of and adherence to standards appropriate to the safe design, construction and operation of nuclear power plants (UK)

- 61** SAFETY STANDARD FOR DESIGN, FABRICATION, AND MAINTENANCE OF STEEL CONTAINMENT STRUCTURES FOR STATIONARY NUCLEAR POWER REACTORS. ASA N6.2-1965. New York, American Society of Mechanical Engineers, 1965. 13p.

Minimum requirements and their applications are presented for a reactor vessel containment structure. The design of the containment vessel and the plant location must be adapted to each reactor type (J C W)

- 62** (PINSTECH/HP-01) MANUAL OF RADIATION SAFETY AND CONTROL FOR PAKISTAN RESEARCH REACTOR. Ahmad, Mansoor; Siddiqi, Aziz A. (Pakistan Inst. of Nuclear Science and Technology, Islamabad. Health Physics Div.). 1966. 34p. Dep.

Radiation standards and procedures are established for the safety of the PRR and its operations staff. Procedures are outlined for the general control of radiological hazards, handling of waste disposal, storage of radioactive material, internal transportation of radioactive material, decontamination procedures, and emergencies. (M L S)

- 63** (AECL-2682) CONCEPT OF A STANDARD SITE. Barry, P. J. (Atomic Energy of Canada Ltd., Chalk River (Ontario)). Mar. 1967. 16p. Dep. CFSTI. AECL \$0.50.

Containment limits the release of radioactive material from a reactor to the atmosphere. Correct siting increases the probability that the material will be well diluted before it reaches centers of population. The differences between the atmospheric dispersion rates at different power reactor sites are insignificant. A standard site is therefore proposed. The new approach to dispersion estimates the probability that any given rate will occur. With the information in this form a properly calculated risk can be taken when the required degree of containment is specified. The results of a direct experimental determination of the required probabilities are presented (auth)

- 64** (CONF-660904-Vol.1 and 2, pp 75-6) SUGGESTIONS ON SPECIFICATION WRITING FOR ABSOLUTE FILTERS. Allan, A. R. Jr. (Flanders Filters, Inc., Riverhead, N. Y.).

The establishment of certain basic specification requirements is essential to the procurement of suitable high-efficiency particulate air filters with a minimum of difficulty and cost. Problems have been experienced in the manufacture and procurement of these filters because of inconsistent, ambiguous, and conflicting specification requirements as well as requirements that are not restrictive enough. The requirements for high-efficiency particulate air filters presented in this paper are intended to guide the specification writer toward standards that will produce uniformity in construction and testing practices to bring the cost of these units down to reasonable levels without sacrificing the necessary performance. A list of 20 references is given (auth)

- 65** (LA-DC-8410) DETERMINATION OF NEW STANDARDS FOR SHOCK WAVE EQUATION-OF-STATE WORK. McQueen, R. G.; Marsh, S. P.; Carter, W. J. (Los Alamos Scientific Lab., N. Mex.). [1965]. Contract W-7405-eng-36. 12p. (CONF-670914-10). Dep. CFSTI.

From International Symposium on the Behavior of Dense Media Under High Impulsive Pressures, Paris, France.

Three materials were investigated in establishing new shock wave standards. Aluminum alloy 921-T and aluminum 2024 representing low-shock-impedance material, deoxidized annealed Cu representing the intermediate range, and uranium alloy representing high-shock-impedance were investigated for use as standards for obtaining Hugoniot equation-of-state data by means of the shock-wave impedance match technique (F S)

- 66** (ORNL-P-3319) COMMENTS ON SHIELDING STANDARDS. Straker, E. A. (Oak Ridge National Lab., Tenn.). [1967]. Contract W-7405-eng-26. 10p. (CONF-670602-26). Dep. CFSTI.

From 13th Annual Meeting of the American Nuclear Society, San Diego, Calif.

Some brief comments are given on the need for setting up shielding standards or standard references. Some recent measurements made at the ORNL-TSF are discussed (W.J.M.)

- 67** REACTOR SAFETY AND SITING: A PROPOSED RISK CRITERION. Farmer, F. R. (United Kingdom Atomic Energy

Authority, Risley, Eng.). Trans. Amer. Nucl. Soc., 10: 328 (June 1967).

From 13th Annual Meeting of the American Nuclear Society, San Diego, Calif., June 11-15, 1967. See CONF-670602.

68 CONSTRUCTION OF A BOILER-SUPERHEATER UNIT FOR USE IN THE KAHL NUCLEAR TEST POWER STATION Bechtel, Gerhard; Ruth, Heinrich; Hoechel, Jochen (Allgemeine Elektrizitätsgesellschaft, Frankfurt am Main). At. Strom, 13 76-80 (May-June 1967). (In German).

The manufacture of 12 boiler-superheater fuel tubes, the machining of the element components and the assembly of a complete boiler-superheater unit is described. The experience gained in the manufacture and assembly of the fuel elements serves as the basis for manufacturing specifications for the superheated-steam reactor element (auth)

69 (NASA-SP-9000) NASA SPECIFICATIONS AND STANDARDS. (National Aeronautics and Space Administration, Washington, D. C. Scientific and Technical Information Div.). May 1967. 380p. CFSTI.

Equipment specifications and standards originated by NASA through December 1966 are assembled and presented in one publication. The specifications are arranged in sections. Section I lists the specifications and standards by the alpha-numeric designation assigned by the originating organizations. Section II is an alphabetical listing of subject headings. Section III groups the specifications and standards by NASA Center of origin (T C I).

70 (AD-650323) DEVELOPMENT OF STANDARD FIRE TEST RATING SYSTEMS FOR SHELTER COMPONENTS. Final Report, September 30, 1963-February 20, 1966. Labes, Willis G.; Waterman, Thomas E.; Varley, Reed B. (ITT Research Inst., Chicago, Ill.). Dec. 1966. Contract OCD-PS-64-50 164p. (ITRI-N6061). CFSTI.

Fire tests for the purpose of rating structural components of blast shelters and fallout shelters are considered. Existing fire test procedures for building construction and materials door assemblies, and window assemblies are analyzed to determine how results from these tests may be applied toward the development of a system for rating shelter components. Shelter component performance requirements in regard to heat transmission, smoke and toxic gas build-up in shelter areas, and fire spread and structural collapse are described. Fire exposures for the rating of shelter components are described and classified according to their characteristic modes of heat transfer. The sources of these exposures, described as exposures from fire within the shelter building, from fire in individual nearby buildings, from mass fire, and from debris fire, are analyzed and interim data presented on exposure severity. A useful concept for the comparison of fire exposures, based upon their effects on each type of component, is defined (TAB).

71 (ORNL-NSIC-36) INDEXED BIBLIOGRAPHY OF CURRENT NUCLEAR SAFETY LITERATURE-10. (Oak Ridge National Lab., Tenn.). Aug. 1967. Contract W-7405-eng-26. 373p. Dep. CFSTI.

A bibliography of nuclear safety information is presented. Topics covered include: general safety criteria, siting of nuclear facilities, transportation and handling of radioactive materials, aerospace safety, accident analysis, reactor transients, kinetics, and stability, fission product release, transport, and removal, sources of energy release under accident conditions, nuclear instrumentation, control, and safety systems, electrical power systems, containment of nuclear facilities, plant safety features, radiochemical plant safety, radionuclide release and movement in the environment, environmental surveys, monitoring and radiation exposure of man, meteorological considerations, operational safety and experience, safety analysis and design reports, bibliographies. A selector index and author index is provided. Availability for all items is listed (M L S).

72 RADIATIONNAYA VEZOPASNOST' NA YADERNYKH REAKTORAKH. (Radiation Safety in Nuclear Reactors). Sivintsev, Yu. V. Moscow, Atomizdat, 1967. 640p.

The standards for radiation safety in nuclear reactors are reviewed in detail. The maximum permissible radiation levels are outlined. Methods used for the dosimetry of external radiation and the shielding necessary are given. The retention of fission products in the fuel and primary coolant of nuclear reactors is discussed. The precautions required for radioactive gases and aerosols in reactors are described. Methods used for measuring the internal radiation of reactors are given (J S R).

73 ASPECTS OF THE ABANDONMENT AND CLEARANCE OF LOW POWER NUCLEAR REACTOR SITES. Jackson, E. W., Seager, C. (Ministry of Power, London). pp 319-41 of Proceedings of the First International Symposium on the Decontamination of Nuclear Installations, Harwell, England, May 4-6, 1966.

Blythe, H. J., Catherall, A., Cook, A., Well, H. (eds.). New York, Cambridge University Press, 1967.

See CONF-660520.

The legal and procedural aspects of the termination of absolute responsibility for a licensed nuclear site are discussed. Factors involved in the clearance and decontamination of the site are included. In Great Britain, nuclear reactor sites rather than installations are licensed, and criteria regarding the legal aspects not only of operation but also of abandonment are established by the Nuclear Installation Act of 1965. Legally, the licensee is responsible, in the event of nuclear site abandonment, for complete and absolute clearance of debris and for insurance of residual radiation levels below established criteria. Until both criteria are met the licensee may not terminate his contract for the site. Maximum acceptable radiation levels are determined by the criteria established by I C R P. These criteria regulate classification of workers, permissible radiation doses, maximum contamination levels, maximum airborne contamination, and disposal of radioactive wastes. A nuclear reactor site licensee may upon abandonment of a site surrender his license, but termination of his period of responsibility is contingent upon the satisfaction of the above criteria (E R B).

74 SITING CRITERIA A NEW APPROACH Farmer, F. R. (United Kingdom Atomic Energy Authority, Risley, Eng.). 22p. (CONF-670402-3) DTIE.

From IAEA Symposium on the Containment and Siting of Nuclear Power Plants, Vienna.

A proposal is made for a means of defining safety standards which will permit complete freedom in the siting of reactors for nuclear power plants. A means of assessing the ability of a reactor to meet the standards is given (L C L).

75 CLASSIFICATION SCHEME FOR NUCLEAR REACTORS At. Strom, 13 104-11 (July-Aug. 1967). (In German).

The compilation corresponds to the draft specification DIN 25,402 which was issued a short time ago. It was drawn up by Working Committee 1 "Terminology" of Technical Committee "Nuclear Engineering" (FNKe/AA 1) and it is in general agreement with the provisional reactor classification of the International Standards Organization (ISO), TC 85/SC1, in the work of which FNKe/AA 1 took part. (auth)

76 (AEEW-M-745) FUNDAMENTAL CALCULATIONS AND ESTIMATION OF ACCURACY IN HEAVY WATER STANDARDS Rowland, P. R. (Atomic Energy Establishment, Winfrith (England)). May 1967. 21p. Dep. CFSTI UK 38. 6d.

The theoretical relation between density and heavy water concentration was re-examined and it is shown that a simple linear relation exists between concentration expressed as weight fraction and reciprocal density. The fundamental constants in this equation are critically reviewed, and it is shown that world standards differ by an amount equivalent to 0.05% on Reactor Grade Water. In terms of neutron behaviour this represents 3% of the lifetime of a natural uranium reactor (200 MWD/tonne). The major sources of error in the estimation of heavy water by density determination are analysed and methods to obviate them are enumerated (auth).

77 NUCLEAR GRADE, URANIUM METAL MELT STOCK NUCLEAR GRADE, URANIUM DIOXIDE, SINTERABLE NUCLEAR GRADE, URANIUM DIOXIDE, COMPACTIBLE American Standards Association N5.4,5,6(1965). New York, American Institute of Chemical Engineers, 1965. 44p.

Specifications and standards developed by Sectional Committee N5 of the American Standards Association for nuclear grade U metal stock, sinterable nuclear grade UO_2 , and compactible grade UO_2 are presented. Particular items detailed are lot-size sampling, physical and chemical properties. For the sintering grade UO_2 , precise directions are given for conducting the sintering tests. A guide to provisions for purchasing, accounting for, and shipping nuclear materials and a glossary of terms relating to nuclear fuels is included (P G C).

78 (ORNL-TM-1986) ORNL NUCLEAR SAFETY RESEARCH AND DEVELOPMENT PROGRAM Bimonthly Report, July-August 1967. Cottrell, Wm. B. (Oak Ridge National Lab., Tenn.). Sept. 21, 1967. Contract W-7405-eng-26 115p. Dep. CFSTI.

Brief summaries of the ORNL nuclear safety research and development programs are presented. Areas of concentration include: water reactor program—chemical reactions and engineered safeguards, LOFT support work, ignition of charcoal adsorbers in reactor accidents, chemical aspects of gas-cooled reactor safety, pressure vessel and piping technology, standards, criteria, and analytics of safety hazards. (M.L.S.)

79 NUCLEAR POWER AND ITS RELATION TO AIR POLLUTION. Grob, John J. Jr. (Consolidated Edison Co., New York). 17p. (CONF-670609-2). DTIE.

From 60th Annual Meeting of the Air Pollution Control Association, Cleveland.

The use of nuclear energy to produce electricity provides a means by which the electric industry's contribution to air pollution may be essentially eliminated. Nuclear plants can be designed to operate at power without the continuous emission of radioactive waste. The wastes which do arise coincident to the operation of nuclear plants can be stored, processed and released under controlled conditions with due consideration of meteorological conditions and their effects on the environment. It has been proved possible to design the waste control system of nuclear plants so that the emissions are well within the requirements of Federal regulations. These standards are set at levels which have been found to result in undetectable effects on the environment except right at the source of emission. Radioactive gaseous releases from ordinary operation of nuclear plants consist of isotopes of the noble gases which do not enter man's food chain or body tissues. Concentrations of radioactive isotopes due to normal background are substantially higher than concentrations which might be caused by release of wastes due to nuclear power plant operation. It may be reasonably stated that operation of nuclear power plants has not and will not change the ecology. (auth)

80 PROPOSED STANDARD [FOR] CRITICALITY ACCIDENT ALARM SYSTEM Savolainen, Ann W (ed.) Nucl. Eng. Bull., 5 1-7 (Nov 1967)

A standard for criticality accident alarm systems is presented by ANS. Included are criteria for system design, evacuation and emergency planning, and post-accident analyses. (W.H.K.)

81 SPECIFICATION FOR CARBON AND LOW ALLOY STEEL CONTAINMENT STRUCTURES FOR STATIONARY NUCLEAR POWER REACTORS. British Standard 4208: 1967. London, British Standards Institution, 1967. 91p. 60s.

The design, construction, inspection and testing of structures for temperatures not exceeding 300°C are covered, such structures not being in contact with the reactor coolant during normal operation. Pressure-relieved structures are included, provided they are of a form that contains fission products or ensures their safe disposal. Attachments such as air locks or piping that are or may become directly connected between the interior of the containment structure and a closure, and may therefore contain radioactive material released during accidents, are considered part of the containment structure. (UK)

82 USA STANDARD PROPOSED DEFINITION OF RADIOACTIVE WASTE CATEGORIES New York, American Institute of Chemical Engineers, 1967. 10p (NP-17206).

Proposed definitions of categories of radioactive wastes as developed by the American Standards Association are presented. The following proposed categories are described: Class A (population level), Class B (occupational level), Class C (low level), Class D (intermediate level), and Class E (high level). (R.C.K.)

83 CONCEPT OF A STANDARD SITE. Barry, P. J. (Atomic Energy of Canada Ltd., Chalk River, Ont.). pp 205-18 of *Containment and Siting of Nuclear Power Plants*. Vienna, International Atomic Energy Agency, 1967.

From IAEA Symposium on the Containment and Siting of Nuclear Power Plants, Vienna. See STI/PUB-154, CONF-670402.

Containment limits the release of radioactive material from a reactor to the atmosphere. Correct siting increases the probability that the material will be well diluted before it reaches centers of population. Adequate provisions can be specified if the maximum acceptable consequences are defined and the rate of dispersal is known. It is shown that, with a few minor exceptions, the differences between the atmospheric dispersion rates at different power reactor sites are, for the practical purpose, insignificant. A standard site is therefore proposed (which, in concept, is comparable to that of standard man). The problem of providing a degree of containment suited to a particular site has always been difficult, mainly because the differences, like those between individual men, appear more important than they really are. The emphasis on details obscures the essential similarities. The definition of the standard site includes a new approach to the problem of estimating atmospheric dispersion rates. The usual approach is dominated by the concept of the minimum rate of dispersion in adverse weather of a maximum credible release of radioactive material. The new approach estimates not a minimum dispersion rate but the probability that any given rate will occur. With the information in this form a properly calculated risk can be taken when the required degree of containment is specified. The results of a direct experimental determination of the required probabilities are given. 25 references. (auth)

84 PROGRESS SUMMARY OF NUCLEAR SAFETY RESEARCH AND DEVELOPMENT PROJECTS. Savolainen, A. W.; Whetzel, H. B. Nucl. Safety, 9: 165-74 (Mar.-Apr. 1968).

Topics on various aspects of reactor safety are summarized according to the following broad areas: Fast Reactor Safety including fast reactor meltdown studies, coolant dynamics, material behavior and energy transfer, safety experimentation for fast reactor development, radioactivity and contamination control, core dynamics, characterization of energy and aerosols generated from sodium pool fires, accident analysis and safety evaluations, and fission product release studies; Gas-Cooled Reactor Safety including fission product behavior during steam-graphite reaction, fission product behavior in in-pile radiations of high temperature gas cooled reactor fuels, large scale steam-graphite tests, ORR capsule tests on fission products at high temperature, and behavior of gasborne fission products at high temperature; Effluent Control—Environmental Studies including soil moisture flow, laboratory and analytical studies of shipping casks, geo-hydrologic and gas-injection studies at NRTS, and model river systems studies; Effluent Control—Waste Treatment and Disposal Program including dispersion of radioactive aerosols and gases in the atmosphere, removal of organic iodides for reactor containment atmospheres, and development of analytical model to predict travel of radioactive gases discharged to the ground; General Safety Studies including Nuclear Safety Information Center activities, heavy section steel technology program, computer handling of reactor data—safety (CHORD-S), and RDT standards 52 references including 5 tentative RDT standards (M.L.S.)

85 MINIMUM THICKNESS OF A WATER-REFLECTED INFINITE SLAB OF AN AQUEOUS SOLUTION OF $^{235}\text{UO}_2\text{F}_2$ AT OPTIMUM CONCENTRATION. Webster, J. Wallace (Oak Ridge National Lab., Tenn.). Nucl. Sci. Eng., 32: 133-5 (Apr. 1968).

The establishment of limiting sizes at optimum uranium concentration in order to define safety standards for the storage, processing, and transport of solutions of fissile materials is discussed. The minimum critical thickness of an infinite slab of uranium-bearing solution is determined. Data are presented on the slab thickness required as a function of slab height (R.C.K.)

86 NUCLEAR GUIDELINES AND STANDARDS: AN INTERNATIONAL TASK. Kellermann, O., Patzelt, A. (Technische Überwachungs-Vereine eV, Cologne). Atomwirts., Atomtech., 12: 410-13 (Aug.-Sept. 1967). (In German).

The role of the various national governments in fixing past standards and guidelines for the nuclear is discussed. The role of the industry, itself, in the future development of these standards and procedures is evaluated. Standards, guides, and procedures of international scope are proposed. (M.L.S.)

87 AEC PROPOSES CRITERIA FOR PRESSURE VESSELS, INVITES COMMENTS. Reactor Fuel-Process. Technol., 10: 289-302 (Fall 1967).

To ensure that pressure vessels for reactor systems are built to the highest practicable quality standards, the U.S. Atomic Energy Commission issued on Aug. 23, 1967, a set of 34 criteria for the design, material, fabrication, inspection and testing of such vessels. The criteria are entitled "Tentative Regulatory Supplementary Criteria for ASME Code-Constructed Nuclear Pressure Vessels," and descriptions of the criteria are presented. (auth)

88 BENEATH THE FORMAL CLOAK. Paxton, Hugh C. Nucl. News, 11: 47-50 (Jan. 1968).

A discussion on power reactors—safety operation in terms of hazards evaluation, general experience, and problems encountered is presented. Methods for extracting safety standards and improvements from operation experiences are described. (D.C.C.)

89 NUCLEAR EQUIPMENT-MAINTENANCE STANDARDS ENHANCE REACTOR RELIABILITY. Clement, T. M. (Douglas United Nuclear, Inc., Richland, Wash.). Power, 112, No. 4, 90-2 (Apr. 1968).

A system of engineered maintenance controls for the Hanford production reactors is described. The system standards were developed to insure the functional reliability of any system that affects safety reactor life or operating availability. The maintenance controls detail requirements for critical equipment performance, including inspection and testing frequencies, provide specific procedures for functional test, periodic calibration, inspection, disassembly, and maintenance; and provide a system of records for auditing and evaluating equipment performance. (H.D.R.)

90 PROPOSED ASME PERFORMANCE TEST CODE FOR NUCLEAR REACTOR FUEL. Moore, W. T. (Babcock and Wilcox Co., Lynchburg, Va.). J. Eng. Power, 90: 199-204 (Apr. 1968).

In the process of drafting a Performance Test Code for Nuclear Reactor Fuel, a question has arisen as to whether the present state

of knowledge and experience will permit the writing of a useful code at this time. A summary is given of the information currently available, and what can be accomplished by the type of code which can be written now, and recommendations are made that the code be written, incorporating information currently available for immediate use and providing a framework for the addition of further information as it becomes available. (auth)

91 ENGINEERING INSPECTION OF NUCLEAR POWER PLANTS. Crossley, E. Atoomenergie Haar Toepass., 10. 76-82(Mar. 1968).

The standards of design, construction, and testing of steel vessels and heat-exchanger shells for gas-cooled, graphite-moderated power reactors are reviewed (H D R)

92 SAFETY TECHNIQUES IN NUCLEAR POWER STATIONS WITH BOILING WATER REACTORS. Kornbichler, H. (Fachgebiet Kernreaktoren, Frankfurt am Main). Atomwirts., Atomtech., 13: 50-3(Jan. 1968). (In German).

The safety standards by which the Wurgassen Power Reactor is being designed are given. These are prepared as general standards for boiling water reactors. The basic considerations used in postulating the maximum credible accident are tabulated (M L S)

93 (DOCKET-50309-8) MAINE YANKEE ATOMIC POWER STATION. [Preliminary Safety Analysis Report], Amendment 7. (Maine Yankee Atomic Power Co., Wiscasset). Apr. 30, 1968. 108p. Dep. CFSTI.

The design bases for Class I and Class II structures for the Maine Yankee Power Reactor are given, the structures are categorized. Containment construction procedures are described, applicable codes and standards are delineated. The research and development program for the control element assemblies and drives is discussed. The ability of the fuel to withstand reactor transients at the end of its anticipated lifetime is analyzed. The effectiveness of the Emergency Core Cooling System is analyzed with respect to size and location of cooling system failure. The heat transfer characteristics and effects of unintentional operation of the cooling spray system are evaluated. The effluent monitoring systems are described, the emergency power system is discussed (M L S.)

94 KRITICHESKIYE PARAMETRY SISTEM S DELYASH-CHIMISYA VESHCHESTVAMI I YADERNAYA BEZOPASNOST'; SPRAVOCHNIK. (Critical Parameters of Systems With Fissionable Materials and Nuclear Safety; a Handbook). Dubovskii, B. G., Kamaev, A. V., Kuznetsov, F. M.; (and others). Moscow, Atomizdat, 1966. 225p.

Presented is a handbook intended for specialists concerned with the problems of assuring nuclear safety, for persons calculating, designing, operating, and studying the physics of nuclear reactors of various types, and for students in associated departments. Methods of creating and maintaining conditions which will exclude the possibility of an accidental chain reaction during the processing, storage, and transportation of fissionable materials are discussed. The book is based mainly on the results of studies published before 1965. In addition to information on critical parameters of systems with fissionable materials, the fundamental concepts of criticality, principles for assuring nuclear safety, a review of cases of the occurrence of uncontrolled chain reactions, and the basic standards for nuclear safety are included. (ATD)

95 (KFK-800) ON MODERN SAFEGUARD IN THE FIELD OF PEACEFUL APPLICATION OF NUCLEAR ENERGY. I. BASIC CONSIDERATIONS. II. PREPARATIONAL CONSIDERATIONS FOR A SYSTEM ANALYSIS. Gmelin, W., Gupta, D.; Haefele, W. (Kernforschungszentrum, Karlsruhe (West Germany). Institut fuer Angewandte Reaktorphysik). May 1968. 38p. Dep.

The functions of nuclear safeguards are broadly defined, scope is outlined. Nine proposed standards for an international nuclear safeguards system are outlined. A systems approach to the development of the system is detailed. 11 references (M L S)

96 (AD-604478) FALLOUT SHELTER SURVEYS GUIDE FOR ARCHITECTS AND ENGINEERS. National Plan Appendix Series. (Office of Civil Defense, Washington, D. C.). May 1960. 54p. (OCD-NP-1(-2). CRSTI.

A guide is presented to provide architects and engineers with procedures and standards for evaluating the fallout shelter potential of existing structures and modifying structures from the standpoint of radiation shielding and habitability to improve their worth as fallout shelters. These same procedures and standards may be used for preliminary design to incorporate shelter into new structures. (auth) (USGRDR)

97 NUCLEAR POWER PIPING (USAS B31.7). Draft USA Standard Code for Pressure Piping. New York, American Society of Mechanical Engineers, 1968. 382p. \$5.00. (NP-17499).

A Nuclear Power Piping Code is presented which provides requirements for the design, materials, fabrication, assembly, erection, installation, and examination of three classes of piping systems for nuclear power plant service. The three classes which denote three levels of quality are described as follows: Class I Piping—those piping systems whose loss or failure could cause or increase the severity of a nuclear incident, Class II Piping—those piping systems whose loss or failure could cause a hazard to plant personnel but would represent no hazard to the public, Class III Piping—those piping systems that normally would be Class II piping except that the operating pressure shall not exceed 150 psig and temperature shall be below 212°F. The Code is divided into three major subsections, one for each of the three classes of piping. Each subsection is divided into chapters covering the following topics: scope and definitions, design, materials, dimensional requirements, fabrication, assembly, and erection; and examination and test (R C K)

98 STANDARDS AND REACTOR SAFETY. Shaw, Milton. (Atomic Energy Commission, Washington, D. C.). Nucl. Safety, 9: 337-42(Sept.-Oct. 1968).

Standards programs play an essential role in achieving and assessing reactor safety. The knowledge that a reactor is designed, built, tested, operated, and maintained to meet requirements mutually delineated by customer and vendor can best be established through the use of appropriate, accepted engineering standards. This knowledge provides assurance of safety margins and a basis for meaningful safety assessment. Nuclear industry use of accepted standards is needed to enable users and vendors inexperienced in this new technology to undertake complex power-reactor activities with an acceptable degree of success and safety. The Commission has recognized the need for standards in connection with its reactor development program and has undertaken a broad standards effort to ensure the safety and maximum availability of its experimental projects (auth)

99 (HW-78912) TECHNICAL CRITERIA AND BASES SUPPLEMENTAL REACTOR SAFETY CONTROL. IPD REACTORS. Nilson, R. (General Electric Co., Richland, Wash. Hanford Atomic Products Operation). [nd]. Contract AT(45-1)-1350. 19p. Dep. CFSTI.

A set of technical criteria for fundamental requirements for safety control systems is listed. Justification is given for each criterion, the control philosophy for the Hanford IPD reactors is outlined (M L S)

100 THE TESTING OF SAFETY OF NUCLEAR ENERGY PLANTS IN THE FEDERAL REPUBLIC OF GERMANY. Kellermann, Otto. Elektrotech. Maschinenbau, 85. 235-8(May 1968). (In German).

Legal requirements for testing are set forth. Special areas are designated as: boiler pressure container, electrical installation, regulation and distribution, lifting apparatus, heat transfer emission and immission protection, feed water, corrosion, and working materials. The organization of jurisdiction over such matters in Germany is outlined, the power over operations is jointly held by state authorities and the local Technical Supervision Union. The course of approval of installations is described and analysis of accidents is demonstrated as the foundation for testing for technical safety. Testing during construction is described. Repetitive testing while the unit is in use is noted and finally the way in which results of tests are used is described with statistical data (BBB)

101 PRINCIPAL CONSTRUCTION AND EXPERIMENTAL PROGRAMS OF THE REACTOR ECO. Toselli, Franco. (CCR-EURATOM, Ispra, Italy). Ing. Nucl., 9. No. 3, 11-18(May-June 1968). (In Italian).

Criteria for the dimensions of the zero power reactor ECO (Esperienza Critica Orgel) are outlined. Core, reflector and shielding are described, cutaways are shown. Design characteristics of reference fuel elements are given. Hydraulic and auxiliary circuits are described, a schematic is shown. Control systems and instrumentation are described briefly. The proposed experimental program is outlined (M L S.)

102 (LMC-68-20) LIQUID METAL ENGINEERING CENTER (LMEC). Quarterly Technical Progress Report, April-June 1968. (Atomic International, Canoga Park, Calif. Liquid Metal Engineering Center). Contract AT(64-3)-700. 112p. Dep. CFSTI.

Progress in the development of engineering standards and practices for liquid metal systems and components is reported. Drawings and specifications for reconstruction of the high pressure steam piping system for the Sodium Component Test Installation to obtain performance data on intermediate heat exchangers and steam generators under steady state and transient conditions were completed and fabrication contracts issued. Opti-

mization and preliminary design studies for a large sodium pump and component test installation were completed. A thermal transient flow mixing and control analog computer program for use in the Sodium Pump Test Facility was developed. A site and the requirements for the Sodium Cleaning Facility were selected. Designs for the Seal Test Facility were submitted and the basic test rig for testing gas or oil type seals was completed. Overall conceptual design and test capability requirements for the hydrostatic and hydrodynamic bearing test facility were submitted. Static contact tests to determine self welding characteristics of 54 material combinations were completed. Sliding contact wear tests in sodium environments are summarized. The final system design for the HNPFP pump test loop and the FFTF flowmeter position test were completed. Work on instrumentation standards is reported, and the evaluation of strain gages is presented in tabular form. Sodium level indicators for core, supply, and drain tanks were checked out. (F.S.)

103 (ISO-875) CPD JETS- STANDARD GROUPINGS AND PROCESS SPECIFICATIONS. Nordahl, J. H. (Isochem Inc., Richland, Wash.). May 31, 1967. 40p. Dep. CFSTI.

Standard group specifications were revised and updated as required and the list of Purex jet applications also updated. Future orders for CPD jets should be made in accordance with the standard group data listed. Listings of Purex jet applications, organized by the equipment number as used on engineering flow diagrams are given. The data for the standard jet groups are also presented. Certified Performance Data are not included but are maintained and are available on request. (F.S.)

104 NONDESTRUCTIVE INSPECTIONS OF WELDS. CLASSIFICATION OF RADIOGRAPHS FOR WELDS. Senda, Tomio (Osaka Univ.). Yosetsu Gakkaishi, 37 942-52(Sept. 1968). (In Japanese).

Standards for the radiographic inspection of welds are discussed. Difficulties in the use of the standard are described. To cope with the situation, the inspection by Irradiation Committee of Japan Welding Engineering Society, Welding Techniques for Light Metals Society, and Japan Nondestructive Inspection Society established their own standards, and the new JIS standard enacted for welds of steel and aluminum. The method for classifying and taking radiographs in the standard "The Radiographic Testing Method and the Classifying Method of Radiographs for Steel Welds JIS Z 3104" are explained. (NSA of Japan)

105 ASME CODE ULTRASONIC EXAMINATION OF WELDS- AN ANALYSIS. Roehrs, Robert J. (Quality Assurance Nooter Corp., St. Louis). pp 288-371 of Proceedings 1968 Symposium on the NDT of Welds and Materials Joining. Evanston, Ill., The American Society for Nondestructive Testing, Inc., 1968.

From 3rd Annual Symposium on Nondestructive Testing of Welds and Materials Joining, Los Angeles, Calif. See CONF-680304.

A workable ultrasonic weld examination code prepared by the ASME Sub Group on Ultrasonics is described. Procedures for the detection, location, and evaluation of defects by the pulse-echo ultrasonic method are discussed. The continual advancement of the state of the art is largely dependent on the wide distribution of up-to-the-minute technical information; therefore, this analysis is being presented almost concurrently with the issuance of the code documents. It includes a technical discussion and explanation of the advantages and disadvantages of using various calibration reflectors. In addition, other areas discussed include the proposed calibration procedure, the reasoning behind the calibration transfer technique, as well as some of the thinking that prompted the ASME Sub Group on Ultrasonics to add many other concepts. (auth)

106 SAFETY REQUIREMENTS OF REACTOR PRESSURE VESSELS IN NUCLEAR POWER STATIONS. Wiesenack, G. Tech. Ueberwach., 9: 122-8(Apr. 1968). (In German).

The principle reactor types under development are reviewed. Pressure vessel design, materials, fabrication, and testing are discussed, and German and international safety standards are outlined. (H.D.R.)

107 (LMEC-69-1) LIQUID METAL ENGINEERING CENTER (LMEC). Semiannual Technical Progress Report, July-December 1968. (Atomics International, Canoga Park, Calif. Liquid Metal Engineering Center). Contract AT-(04-3)-700. 281p. Dep. CFSTI.

Progress is reported on the activities of the Liquid Metal Engineering Center (LMEC) in support of the LMFBR development program. Operating and functional requirements for large valves for LMFBR were established. Design parameters for liquid metal pumps were selected. Post operation examination of HNPFP valves was continued. Existing and proposed LMEC test facilities and test rigs were evaluated. Draft standards were prepared for the

sodium-cooled reactor vessel, circulating cold trap, 100 to 15,000 gpm mechanical free-surface Na pump, an ac electromagnetic Na pump, Na blocking valve, and Na quality. Historical Na reactor failure data were collected and are being evaluated. A micro film data storage and retrieval system were acquired for storing this data. Development of the Quality Assurance Manual continued. A system was implemented whereby purchase requisitions are reviewed for material quality. Reconstruction of the Sodium Components Test Installation main steam line was continued. The Alco steam generator was opened, inspected, and cleaned. Performance criteria were developed for the Sodium Pump Test Facility (SPTF). A pump envelope was developed for each pump size. To accommodate FFTF pump testing, two alternate design concepts were developed. Cost analysis will determine which design will be used. An analog simulation model was prepared for the main flow loops to determine SPTF system and control transient dynamics. System design descriptions for oil-type and gas-type seal test facilities were approved. A two-step program for developing radial bearings for Na bearing pumps was instituted and a detailed management plan developed. A literature search documenting information on mechanical devices operating in Na was compiled and published. Resultant wear rates are presented for sliding wear tests conducted on 82 material combinations in high temperature liquid and Na vapor, cobalt-base-Ni alloys were found to give the best wear performance. A journal bearing test plan was prepared. Test conditions are being established for a 2000 hr steady-state run of a steam generator. The capability of computer programs to evaluate pressure, thermal stresses, and vibration of tube sheets was demonstrated. (F.S.)

108 (CONF-680625-4) PRECISION MANUFACTURE OF NUCLEAR COMPONENTS. Burrows A. P. W. (Rolls-Royce Ltd., [Derby] (England)). [1968]. 5p. Dep.

From BNX/BNF Nuclear Power Meeting, Copenhagen, Denmark.

The limits, tolerances, and specification requirements of nuclear components for the civil reactor field are discussed, and the cost is related to the technical requirements. A number of examples of the limits worked to in nuclear component manufacture are given. The relationship of the designer to the manufacturer as it affects performance of the component in the plant, and the cost effect of correct interpretation by both parties is outlined. (UK)

109 STANDARD HANDBOOK OF LUBRICATION ENGINEERING. O'Connor, James J. (ed.). New York, McGraw-Hill Book Company, 1968. 1048p. \$27.50.

A separate abstract was prepared for one chapter on lubrication in nuclear power plants. The remaining 44 chapters discuss principles and engineering practices of lubrication and lubrication of specific equipment and in specific industries not within scope of NSA. (J.C.W.)

110 (NP-17851) ARTICLES ON PROBLEMS OF NUCLEAR PROTECTION. (Villamosenergiaparí Kutató Intézet, Budapest (Hungary)). 1967. 216p. (In Hungarian). Dep.

Information on problems of reactor safety and application of atomic energy is included under the following headings: safety problems in nuclear power plants, review of reactor accidents, safety problems in reactor control, safety evaluation of reactor sites, operational safety of nuclear power plants, radiation protection, administrative problems with reactor safety, and international and national instructions, agreements, and standards. Separate abstracts are included for each of the 8 sections presented. (D.C.C.)

111 (NP-17851, pp 73-100) SAFETY EVALUATION OF REACTOR SITES. Hej, Attila. (Villamosenergiaparí Kutató Intézet, Budapest (Hungary)). (In Hungarian).

Selection of a reactor site is influenced by economic, political, social, cultural and safety considerations. The latter include population density, distance from large cities, meteorological considerations, hydrological situation (level of the groundwater), the probability of earthquakes, and general topography. The basic assumption is that the risk to the population is decreased by increasing the distance between the nuclear power plant and large population centers. This raises problems in densely populated countries and affects the economic considerations because the power plant may be placed too far from its potential industrial consumers. The direction and velocity of prevailing winds must be taken into account, the tendency toward inversion in the chosen region is undesirable, but a strong upward flow of the air assists in the dilution and prevents the creation of inversion layers. Deep valleys are unsuited because they facilitate the accumulation of contaminated materials. For the same reason, open meadows and flat areas are to be preferred over rolling wooded areas. Operational experience of nuclear power plants indicated that no undue concentration of radioactive materials in the air, water, and the

ground above background level results from the regular operation. The safety principles applied in the USSR, USA, Great Britain and some other countries are examined. There is definite tendency toward reducing the strict requirements of great distance of the reactor plants from large cities. (TTT)

- 112 (UCRL-71605) STATISTICAL THEORY OF DESIGN FOR PLATING THICKNESS MEASUREMENTS BY RADIATION BACKSCATTER METHODS. Fox, Jerry D.; Taylor, Grover M. (California Univ., Livermore, Lawrence Radiation Lab.), July 1 1969. 33p. (CONF-691005-2). Dep. CFSTI.

From 29th National Convention on American Society for Non-destructive Testing, Philadelphia, Pa.

The application of statistical experimental design techniques to methods of plating thickness measurements such as x-ray fluorescence and beta-radiation backscatter is described. Factors discussed include number of standards, accuracy of standards, thickness range, and accuracy of radiation measurements for both the standard and the unknown thicknesses. A least-means-squares technique is applied for fitting the calibration curves, and analytical techniques are used to study the effect of variations in the above factors on the final uncertainty in determination of the unknown thicknesses. Tabulated experimental and theoretical data are included for guidance in designing non-destructive testing programs that use these techniques. (auth)

- 113 (TID-25176) A STUDY OF THE DESIGN AND CONSTRUCTION PRACTICES OF PRESTRESSED CONCRETE AND REINFORCED CONCRETE CONTAINMENT VESSELS. Final Report. Tan, Chen Pang (Franklin Inst. Research Labs., Philadelphia, Pa.), Aug. 1969. Contract W-7405-eng-26; Subcontract 2997. 506p. (FC-2121). Dep. CFSTI.

For Oak Ridge National Lab., Tenn.

The current practices in the design and construction of prestressed concrete and reinforced concrete containments for water-cooled nuclear reactors in civilian power application are reviewed. The features of the different types of concrete containments are described. The specified service and predicted environmental conditions are identified, along with an evaluation of the effects of these parameters on structural behavior. Modes of failure are examined and possible use of models to study the actual behavior is indicated. Criteria used in the design of concrete containments are presented. Problems in the earthquake-resistant, tornado-resistant designs as well as missile protection are deliberated. Materials properties along with methods of specifying and selecting critical materials for service in the environments of interest are summarized. The need and importance of quality assurance both in design and construction are emphasized. The codes and standards applied in the technology are discussed and areas where augmentation and/or revision to these standards appears warranted are identified. The need of developing operational testing requirements for concrete containments is indicated. (auth)

- 114 STANDARDS AND CODES CAN EASE LICENSING PATH. Joslin, Murray. Elec. World, 171: No. 15, 88-9 (Apr. 14, 1969).

The effects of nuclear power industry standards on licensing procedures in the U. S. are analyzed. (D.C.C.)

- 115 RADIOACTIVITY: BURDEN FROM A BOON. Strauss, Sheldon D. Power, 113: No. 10, 66-9 (Oct. 1969).

The adequacy of present AEC health and safety standards on the release of radioactive gases and liquids from nuclear power plants is questioned. The standards are discussed briefly. To date environmental contamination from nuclear stations has been well below safety hazard levels, but whether even this low level of contamination is permissible is pondered. (L.C.L.)

- 116 A TEMPERATURE CHART AND FORMULAS USEFUL WITH THE USAS B31.7 CODE FOR THERMAL STRESS IN NUCLEAR POWER PIPING. Brock, John E. (Naval Postgraduate School, Monterey, Calif.). Nucl. Eng. Design, 10: 79-82 (May 1969).

A chart and formulas give values of $\Delta T_{1\max}$, ΔT_2 , and N_{Fo} as functions of N_B for the case of sudden change in temperature of fluid flowing in a thin wall insulated pipe. These results are useful in designing according to the USAS B31.7 Code for Nuclear Power Piping. The procedure outlined is suitable at high values of heat transfer coefficient, as obtained with liquid metal-cooled and pressurized water reactors. 2 references. (auth)

- 117 SAFETY ASPECTS OF PIPING DESIGN FOR ATOMIC POWER STATIONS. Nakayama, Shuichi (Tokyo Shibaura Electric Co., Kawasaki, Japan). Haikan Gijutsu, 11: No. 7, 87-95 (July 1969). (In Japanese).

Safety aspects for piping in atomic power stations are described on the following design of the atomic-power station piping, and

its classification, design fundamentals in "Nuclear Power Piping (USAS B31.7)," including classification of stresses and allowable stresses, and fatigue analysis, earthquake proof design, stress calculation, and quality control for materials. (NSA of Japan)

- 118 REACTOR SAFETY STANDARDS: A PROBLEM IN OPTIMIZATION OF SOCIAL COSTS. Weisman, Joel (Univ. of Cincinnati). Trans. Amer. Nucl. Soc., 12: 685-6 (Nov. 1969). From 17th Conference on Remote Systems Technology, San Francisco, Calif. See CONF-691102.

- 119 (RT/PROT-(69)21) CLASSIFICATION OF INDUSTRIAL RADIOACTIVE WASTES. Branca, G.; Gera, F. (Comitato Nazionale per l'Energia Nucleare, Rome (Italy)). 1969. 19p. (In Italian). (CONF-690328-1). Dep. CFSTI (U. S. Sales Only).

From 4th Conference of the National Society of Sanitary Engineers, Milan, Italy.

Some general considerations on the classification of conventional wastes were developed and the classification standards of radioactive wastes in many countries are reported. The large differences and variability of wastes characteristics make rather doubtful the first choices of the classification parameters. Furthermore, even if the same parameters are selected, the comparison among the various classifications is rather uncertain on account of the different ranges adopted for the categories. Consequently the information exchange and the comparison of the technical and economical data concerning the treatments under examination are difficult. After a review of the most important parameters, a new classification of liquid and gaseous radioactive wastes is proposed. Both the intrinsic dangers of the wastes and the implications connected with the environment are taken into account. (auth)

- 120 NUCLEAR POWER AND ENVIRONMENT: AN INQUIRY. Proceedings of Conference Held at Stratton Mountain, Vermont, September 11-12, 1968. Bondville, Vt.; Conservation Society of Southern Vermont (1969). 85p. (CONF-680932).

Papers are presented which discuss the effects of nuclear power plants on the environment. Advantages and disadvantages of nuclear power plants are described. Safeguards and regulations for nuclear power plants are discussed. (D C C)

- 121 (CONF-690102-, pp 549-59) STANDARD FOR FAST BURST REACTORS. De La Paz, A. (White Sands Missile Range, N. Mex.).

The accumulated experience and continued development and use of fast burst reactors make it essential that a standard be developed for the operation of these reactors. The efforts of American Nuclear Society subcommittee N14 have led to the development of a standard based on the full use of the experience gained to date. This standard when formalized and issued, should be of considerable use to personnel involved in the design, operation, and regulatory review of fast burst reactors. (auth)

- 122 (UCRL-50743) TYPICAL REQUIREMENTS, STANDARDS, AND PROCEDURES FOR PLOWSHARE NUCLEAR UNDERGROUND ENGINEERING PROJECTS. Cramer, James L.; Peterson, Max G. (California Univ., Livermore, Lawrence Radiation Lab.), 8 Sep 1969. 38p. Dep. CFSTI.

A general description is given of typical operating requirements, standards, and procedures as used by the Lawrence Radiation Laboratory in fielding a Plowshare Project for underground engineering. Only underground engineering applications as opposed to excavation applications are included. The general roles of other agencies involved are briefly described. It is emphasized that the guidelines presented are for single detonation type experiments in a new location, and are not necessarily applicable to a multiple shot program in a well documented location. Certain items of work and equipment that have a direct effect on the success of the program, or are considered critical, are described in detail. (J.C.W.)

- 123 (GEAP-13545) INTERPRETATION OF THE ASME CODE FOR LOW-ALLOY STEELS IN BIMETALLIC SODIUM SYSTEMS. Comprelli, F. A.; Krankota, J. L. (General Electric Co., Sunnyvale, Calif. Breeder Reactor Development Operation). Sep 1969. Contract AT(04-3)-189. 14p. Dep. CFSTI.

An analysis has been made of the allowable stress and strain rate criteria set out in the ASME Boiler and Pressure Vessel Code, Section VIII. Particular emphasis was directed at the application of these criteria to the design limits for low-alloy steels in bimetallic sodium systems. Design limits were estimated for several feasible interpretations of the Code for several decarburizing conditions. Comment is also offered on the advisability of a strain or strain-rate controlled design limit under these conditions. (auth)

124 SOME TECHNICAL AND POLITICO-LEGAL IMPLICATIONS OF STATIONARY UNDERSEA REACTOR SYSTEMS. Roberts John J.; Croke, Edward J., Rose, Leonard. Argonne Nat. Lab. Rev., 5 109-15 (Oct 1969).

Standards required for undersea reactor systems are reviewed. Hazards involved with undersea sitings are discussed. 21 references (D C C)

125 (LMEC-69-30) LIQUID METAL ENGINEERING CENTER (LMEC) Semiannual Technical Progress Report, January-June 1969 (Atomics International, Canoga Park, Calif. Liquid Metal Engineering Center) 30 Nov 1969 Contract AT(04-3)-700 253p Dep CFSTI

Activities at the LMEC were directed toward support of the LMFBR during the period. Progress is reported on support projects in codes and standards, maintenance and malfunction analysis, quality assurance operation of sodium components test installation, liquid metals information center, sodium pump test facility, sodium seal testing, sodium bearing testing, precision mechanisms testing, steam generator performance, instrument testing, metallurgical research, and operation of test loops (J R D)

126 A STATISTICAL THEORY OF DESIGN FOR PLATING THICKNESS MEASUREMENTS BY RADIATION BACKSCATTER METHODS. Fox, Jerry D.; Taylor, Grover M. (Univ. of California, Livermore). Mater. Eval. 28 17-24 (Jan. 1970).

The application of statistical experimental design techniques to two methods of plating thickness measurements, x-ray, fluorescence and beta-radiation backscatter is described. The following factors are discussed: number of standards, accuracy of standards, thickness range and accuracy of radiation measurements for both the standard and the unknown thicknesses. A least-means-squares technique is applied for fitting the calibration curves, and analytical techniques are used to study the effect of variations in the above factors on the final uncertainty in determination of the unknown thicknesses. Tabulated experimental and theoretical data are included for guidance in designing nondestructive testing programs that use these techniques. (auth)

127 (ORNL-4400, pp 57-68) CORROSION AND CHEMICAL BEHAVIOR IN REACTOR AND DESALINATION ENVIRONMENTS (Oak Ridge National Lab., Tenn.).

Progress is reported on assessment of water technology in boiling- and pressurized-water reactors, water chemistry studies in a small state-of-the-art pressurized-water reactor, preparation of standards for primary coolant systems of water reactors, studies of corrosion of electrodeless plated nickel on aluminum at high heat fluxes, corrosion studies of materials in iodine-absorbing reactor containment spray solutions, studies of corrosion of copper alloys in sodium chloride solutions, and carbon dioxide scale suppression studies. Establishment of the Office of Saline Water Materials Information Center is reported (M C G)

128 ISO CODES FOR NUCLEAR REACTOR PRESSURE VESSELS. Com. Naz. Energ. Nucl., Notiz.; 15: No. 10, 81-4 (Oct 1969). (In Italian).

The activities of the International Standards Organization (ISO) are discussed with respect to reactor pressure vessels. The considerations involved in developing standards are discussed. Materials, fabrication, and operations acceptability are considered (M L S)

129 ON THE DRAFT STANDARDS OF JIS FOR THE STEEL FORGINGS FOR NUCLEAR USE. Hasegawa, Masayoshi (Waseda Univ., Tokyo). Chuko To Tanko; No. 187, 31-8 (Sep 1969). (In Japanese).

In Japan, atomic power stations are being built one after another, and the demands for nuclear-use steels are growing, and the demand for their domestic production has increased. In this connection, the draft standards of JIS have been completed by a committee, composed of members from the Government offices, academic circles, users, fabricators, and makers. The draft standards are based on those of ASTM, and will be subject to alterations in the future. Draft standard for the forgings of vacuum treated and heat treated carbon steel, and low alloy steel for pressure vessels, and draft standard for the forgings of heat treated carbon steel and low alloy steel for pressure-vessel parts are reviewed. (NSA of Japan)

130 COMMENT ON CURRENT AND PROPOSED BRITISH STANDARD REQUIREMENTS FOR NOTCH DUCTILITY. Cotton, H. C., Thomas, D. B. J. (British Petroleum Co., Ltd., London). pp K1-16 of Practical Fracture Mechanics for Struc-

tural Steel. /Dobson, M. O. (ed.). London, Chapman and Hall, Ltd. (1969).

From Symposium on Fracture Toughness Concepts for Weldable Structural Steel, Risley, England. See CONF-690440.

Current and proposed British Standard requirements for notch ductility are based on the accumulated data derived from the series of Wells Wide Plate Tests conducted at The Welding Institute. Crack Opening Displacement Tests indicate that the results of some of the Wells Wide Plate Tests may have been influenced by the properties of the weld metal and heat affected zones. The use of Crack Opening Displacement Tests to examine various critical zones in weldments is reported (auth) (UK)

131 RULES FOR INSERVICE INSPECTION OF NUCLEAR REACTOR COOLANT SYSTEMS. 1970 EDITION. ASME Boiler and Pressure Vessel Code, Section XI. New York; American Society of Mechanical Engineers (1970). 42p. \$6.00.

132 CRITERIA AND PRINCIPLES OF NUCLEAR POWER PLANT LOCATION. Veljkovic, Tomislav, Jovic, Branko, Mitrovic, Srdan, Petrovic, Slavoljub. Nukl. Energ., 5 No 3-5, 72-5 (1968-69) (In Serbo-Croatian)

From Annual Meeting on Perspectives and Planning of Nuclear Power Plant, Belgrade, Yugoslavia. See CONF-681079

The similarity and the specific dissimilarities of accidents in conventional and nuclear plants are analyzed. Principles of analyzing accidents and of preparing safety documents are described. The basic protective measures against dangers to the plant environment are reviewed. The most vital elements related to the siting of the plant include geographic position, geologic hydrologic and seismic conditions, meteorological conditions, population and the other elements of environment. The basic design values (from the recommendations of the International Atomic Energy Agency or from the practice of the developed countries) used in evaluating the feasibility of sites are described (auth)

133 FISSION MATERIAL CONTROL IN KARLSRUHE. Gupta, D. (Kernforschungszentrum, Karlsruhe, Ger.) Atomwirt., Atomtech.; 15 35-41 (Jan 1970) (In German)

Based on the nuclear non-proliferation treaty, the rights of an international control commission to inspect the use of fissile material in commercial nuclear installations were discussed. A system for the control of fissile material was developed and tested at the nuclear center Karlsruhe. From the experimental results, it was concluded that only minor modifications are necessary to make an existing commercial power plant conform to international inspection standards. Five tables, three diagrams, and three pictures are included (H B G)

134 (ACNP-68505-J) LA CROSSE BOILING WATER REACTOR OPERATING MANUAL VOLUME X HEALTH PHYSICS PROCEDURES (Allis-Chalmers Mfg. Co., Bethesda, Md. Atomic Energy Div.) Jun 1968 Contract AT(11-1)-850 76p Dep CFSTI

The operating manual contains information related to health physics under the following headings: responsibilities, radiation protection guides, radiation area posting requirements, personnel dosimetry, radiation monitoring instrumentation, radiation and contamination control, decontamination, radioactive material disposal, storage and shipment, and orientation and training (D C C)

135 PERIODIC INSPECTION OF REACTOR VESSELS. Maroto, J. (Junta de Energia Nuclear, Madrid) Energ. Nucl. (Madrid), 13 351-60 (Jul-Aug 1969) (In Spanish)

The code developed under the auspices of the International Atomic Energy Agency for the periodic inspection of reactor vessels is outlined. The necessity for such an inspection and the factors which can contribute to the failure of reactor vessels are described. Structural factors contributing to vessel failure and other possible causes of failure are discussed. The most common inspection methods are described (J S R)

136 STOCK STANDARDS FOR THE NUCLEAR FUEL RESERVE IN NUCLEAR POWER PLANTS. Steinbock, P. (Technische Univ., Dresden). Kernenergie, 13: 41-5 (Feb 1970). (In German)

An economical stochastic decision model is described which enables nuclear fuel reserve stock standards to be determined in order to eliminate random assembly defects in nuclear power plant operation. Starting from defined reliability of supply, an economical comparison of some versions is made by using a special form of Poisson distribution and covering the relevant expenditures for procuring and floating capital obligations which results in finding reserve stock standard, maximum reserve stock and supply cycle

Particular features of nuclear power plants can be taken into account 6 references (auth)

137 NUCLEAR SAFETY RESPONDING TO THE CRITICS. Power Eng.; 74 No. 5, 26-34 (May 1970).

A discussion is presented concerning the safety standards and guides used in regulating U.S. power reactor radioactive effluents. The effectiveness of present standards and the possible hazards presented by power reactor growth are analyzed (D C C)

138 NUCLEAR SAFETY: RESPONDING TO THE CRITICS. 2. Power Eng.; 74: No. 6, 45-9 (Jun 1970).

A discussion is presented concerning the safety standards and guides used in regulating U.S. power reactor radioactive effluents. The effectiveness of present standards and the possible hazards presented by power reactor growth are analyzed (D C C)

139 NUCLEAR SAFETY CRITERIA FOR THE DESIGN OF STATIONARY PRESSURIZED-WATER REACTOR PLANTS.

Moore, J. S. (Westinghouse Electric Corp., Pittsburgh). Trans. Amer. Nucl. Soc.; 13: 214-15 (Jun-Jul 1970).

From American Nuclear Society Meeting, Los Angeles, Calif. See CONF-700608.

140 NUCLEAR SAFETY CRITERIA FOR THE DESIGN OF STATIONARY PRESSURIZED-WATER REACTOR PLANTS: SYSTEM DESIGN CRITERIA. Owen, W. H. (Duke Power Co., Charlotte, N. C.). Trans. Amer. Nucl. Soc.; 13: 215 (Jun-Jul 1970).

From American Nuclear Society Meeting, Los Angeles, Calif. See CONF-700608.

141 (BNWL-MA-3) RADIOLOGICAL DESIGN CRITERIA. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.). 25 Mar 1970. 50p. Dep. CFSTI.

The Radiological Design Criteria Manual, prepared to assist management and design engineers in the planning and design of Battelle-Northwest buildings where radioactive materials or radiation generating machines are to be used, is presented. The criteria in this manual are intended to characterize the physical protective features which are required in the design or modification of such a building. These criteria, from a radiation protection point of view, relate to operability of the building within the rigorous protection standards applied to the work force. Since this manual will not necessarily satisfy all radiation safety requirements, the professional assistance of Radiation Standards, Safety and Standards Division, may be necessary (auth)

142 (NP-18352) DRAFT ASME CODE FOR PUMPS AND VALVES FOR NUCLEAR POWER. (American Society of Mechanical Engineers, New York). Nov 1968. 217p. ASME, New York \$3.00.

The rules of the code constitute requirements for the design materials manufacture examination inspection pressure testing and certification of pumps and valves for use in the nuclear energy system of water cooled commercial nuclear power plants. A nuclear energy system is that part of a power plant that serves the purpose of producing and controlling an output of thermal energy from nuclear fuel. The scope of these rules covers the strength and pressure integrity of the structure of pumps and valves whose failure would violate the pressure boundary. They are not intended to be applicable to valve operators controllers position indicators, pump impellers pump drives or other accessories and devices unless such items themselves are pressure parts. These rules provide requirements for new construction. They cover mechanical and thermal stresses but do not cover deterioration that may occur in service as a result of corrosion radiation effects and instability of material (auth)

143 (CONF-700810-29) THERMAL STANDARDS IN THE UNITED STATES OF AMERICA. Mount, Donald I. (National Water Quality Lab., Duluth, Minn.). [nd]. 7p. (SM-146/15).

From Symposium on Environmental Aspects of Nuclear Power Stations, New York, N. Y.

Temperature standards specifying permissible water temperatures for interstate rivers and lakes of the United States have been established. Mostly they are based on the uses of the water that now exist, or may exist in the future. Usually, the protection of desirable aquatic life is most limited. Standards for aquatic life must ensure a seasonal temperature cycle, and so twelve maximum monthly temperatures are the minimum to describe desired conditions. In streams a 5°F rise may be permitted as long as the resulting temperature does not exceed the appropriate monthly maximum. In lakes a 3°F rise may be used with an additional requirement that the hypolimnion cannot be warmed or changed in volume. Stricter restrictions are applied to lakes in

order to reduce the algal growth problem. Mixing zones pose a difficult regulatory problem. They are difficult to restrict as to size and shape especially because the effects of mixing zones on receiving water depend, in part, on the number of mixing zones and the size of the lake or river. There seems to be no simple way to establish them but certain guidelines can be used. Lethal concentrations should not be permitted. The size should be defined and fixed and objectionable nuisances such as undesirable vegetation or debris should not be permitted. Where cooling devices are required, the standards do not specify the type to be used. The frequency that devices will not meet the standards has not been well defined except in a general way. Obviously the acceptable probability depends in part on the value of the receiving water and the probable damage if the standards are exceeded. If no safety margin is permitted, standards must be more complex in order to ensure acceptable conditions (auth)

144 PROPOSED INDUSTRIAL STANDARD FOR NUCLEAR PLANT QUALITY ASSURANCE PROGRAM REQUIREMENTS.

Bernsen, S. A. (Bechtel Corp., San Francisco). Trans. Amer. Nucl. Soc.; 13 Suppl., 3-4 (1970).

From Conference on Power Reactor Systems and Components, Williamsburg, Virginia. See CONF-700904.

145 RDT STANDARDS PROGRAM. Crawford, J. W. (Atomic Energy Commission, Washington, D. C.). Trans. Amer. Nucl. Soc.; 13 Suppl., 12 (1970).

From Conference on Power Reactor Systems and Components, Williamsburg, Virginia. See CONF-700904.

146 NUCLEAR POWER STANDARDS DEVELOPMENT IN IEEE. Russ, John C. (General Electric Co., San Jose, Calif.). Trans. Amer. Nucl. Soc.; 13 Suppl., 13 (1970).

From Conference on Power Reactor Systems and Components, Williamsburg, Virginia. See CONF-700904.

147 CURRENT STATUS AND PHILOSOPHY OF AEC REGULATORY STANDARDS DEVELOPMENT. Case, Edson G. (Atomic Energy Commission, Washington, D. C.). Trans. Amer. Nucl. Soc.; 13 Suppl., 13 (1970).

From Conference on Power Reactor Systems and Components, Williamsburg, Virginia. See CONF-700904.

148 INDUSTRY PARTICIPATION IN THE NUCLEAR STANDARDS PROGRAM. Joslin, Murray. Trans. Amer. Nucl. Soc.; 13 Suppl., 13 (1970).

From Conference on Power Reactor Systems and Components, Williamsburg, Virginia. See CONF-700904.

149 (BNL-50205, pp 33-4) EVALUATION AND TECHNICAL ASSISTANCE GROUP. Raseman, C. J. (Brookhaven National Lab., Upton, N. Y.).

Analysis of potential hydroelectric pumped storage power sources combined with nuclear power plant operations is presented. Operation and maintenance costs for nuclear power plants are analyzed. Codes and standards for power reactor construction and operation are reviewed. (D C C)

150 (CONF-700810-8) STANDARDS FOR EFFLUENTS IN SWITZERLAND. Courvoisier, P. (Federal Office of Energy, Wuerenlingen (Switzerland)), Mueller, B. (Federal Office of Water Protection, Bern (Switzerland)). [1968]. 15p. (SM-146/14). Dep. CFSTI (U. S. Sales Only).

From Symposium on Environmental Aspects of Nuclear Power Stations, New York, N. Y.

Maximum permissible levels for the release of effluents are stated by different laws, ordinances, or guidelines in Switzerland. Policies followed will be outlined. A recent addition of general interest is the recommendation of limits for thermal pollution. As the production of electric energy in Switzerland has been until very recently nearly exclusively by hydroelectric plants, the natural régime of the rivers has not been changed to any appreciable extent by their use as receivers of cooling water. It is possible, therefore, to use the rivers for the direct cooling of a first group of nuclear power stations. However, the permissible limits for this use of river water had to be identified and fixed in the light of the goals for water protection stated by the Swiss law. An extensive study was made to this end which will be reported briefly. The results of it will be compared to other studies on the same subject which have appeared since the publication of the Swiss study. This study has demonstrated the need to set up careful planning for the disposal of heat in rivers (auth)

151 (CONF-700810-36) U. S. REGULATIONS FOR THE CONTROL OF RELEASES OF RADIOACTIVITY TO THE

ENVIRONMENT IN EFFLUENTS FROM NUCLEAR FACILITIES. Rogers, Lester; Gamertsfelder, Carl C. (Division of Radiation Protection Standards (AEC), Washington, D. C.). [1968]. 24p. (SM-146/8). Dep. CFSTI.

From Symposium on Environmental Aspects of Nuclear Power Stations, New York, N. Y.

Releases of radioactivity in air and water effluents from nuclear facilities are regulated under the provisions of the Atomic Energy Commission's regulations, Parts 20 and 50. The basic considerations in translating into regulatory limits the radiation protection guides recommended by the Federal Radiation Council (FRC) and approved by the President, the recommendations of the National Council on Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP) are described. Limits on concentrations and/or quantities of radioactivity that may be released in effluents from nuclear facilities and how these limits are applied to take into account all important pathways of exposure so as to assure that exposures to the public remain well within FRC radiation protection guides are discussed. Operating experience is reviewed which shows that radioactivity in water and air effluents from nuclear power reactors has generally been less than a few per cent of the limits specified in Part 20 and exposures to the public in the immediate vicinity of operating power reactors have usually been small fractions of FRC guides. Recent proposed amendments to the Commission's regulations in Parts 20 and 50 to improve the regulatory framework for assuring that reasonable efforts are made to keep exposures to radiation and releases of radioactivity in effluents as low as practicable consistent with FRC guidance are discussed. (auth)

152 PREPARATION AND USE OF RDT STANDARDS FOR THE LMFBR PROGRAM. Nicholson, James O. (Atomics International, Canoga Park, Calif.). Trans Amer. Nucl. Soc., 13 Suppl., 12-13 (1970).

From Conference on Power Reactor Systems and Components, Williamsburg, Virginia. See CONF-700904.

153 (CONF-700810-33) THE UNITED KINGDOM APPROACH TO THE APPLICATION OF ICRP STANDARDS TO THE CONTROLLED DISPOSAL OF RADIOACTIVE WASTE RESULTING FROM NUCLEAR POWER PROGRAMMES. Preston, A. (Ministry of Agriculture, Fisheries and Food, Lowestoft (England), Fisheries Radiobiological Lab.). [1969]. 14p. (SM-146/9). Dep. CFSTI (U. S. Sales Only).

From Symposium on Environmental Aspects of Nuclear Power Stations, New York, N. Y.

United Kingdom policy for the routine control of radioactive effluents originating from a nuclear power program is outlined, and, using specific examples, it is shown how the ICRP recommended standards are applied to the controlled release of radioactive waste material to the environment. It is shown that the practical application of basic dose criteria to diverse environmental situations necessitates a quantitative evaluation of the possible exposure pathways in each situation, and in some cases the identification of a critical population group, before recommended limits expressed in terms of dose can be applied. Final authorizations for waste disposal, while always subject to the absolute limitations of safety, are also carefully related to justifiable operational needs. (auth)

154 SITING OF CEBG NUCLEAR POWER STATIONS. Adams, C. A.; Faux, F. (Central Electricity Generating Board, London). pp 37-43 of British Nuclear Energy Society Symposium on Safety and Siting, London, March 28, 1969. London; Institution of Civil Engineers (1969).

See CONF-690347.

Except in the case of Hartlepool, all the nuclear power station sites at present licensed to the C. E. G. B. were selected on the basis of the siting criteria proposed in 1955. These criteria required sites to be remote from large populations and technical considerations at the time favored coastal or estuarial areas. To ensure the best use of national resources, both in amenity and economic aspects, it was thus very desirable to examine the basis for the siting policy. Alternative proposals are described which resulted from these re-examinations. The policy which finally emerged and allowed the licensing of Hartlepool in 1968 is expressed primarily in qualitative terms. The probability approach to safety assessment provides a formal basis to which further siting principles can be related. A reference is made to some possible developments in this field. A principle based on the reduction of individual risk to some agreed level is advocated. This enables the safety assessment of a reactor to be linked to exclusion distance and to emergency actions, both in terms of distance and type. In addition, the method enables due regard to be paid to any special features of the installation which affect the dependence of individual

risk on distance. Whether this basis or one of the many possible specifications of acceptable population risk is used, it is recommended that the requirements be stated in their most simple and fundamental form. Any derived standard concerned with acceptable population numbers is likely at some time to be questioned. If the basic requirement is known the licensee bears the responsibility of showing that it is satisfied for the specific combination of site and plant for which he has obtained a license. (auth) (UK)

155 (CONF-671061-(Vol.3), pp 907-15) LEAK TESTING IN NUCLEAR ENERGY INSTALLATIONS. Kittner, Manfred (VEB Kombinat Kernenergetik, Berlin). (In German).

The bases for the leak specifications of nuclear installations are summarized. The leak rate is defined and the relation between leak mass and leak volume is given. The relation between the leak masses of air and water is also considered. The detection sensitivity of testing methods is compared, and practical examples of the uses of these methods are given. (J S R)

156 (AECI-3685) WASTE CONTROL PROBLEMS IN AN EXPANDED NUCLEAR POWER INDUSTRY. Barry, P. J.; Ophel, I. L. (Atomic Energy of Canada Ltd., Chalk River (Ontario), Chalk River Nuclear Labs.). [1970]. 16p. (CONF-700810-2, SM-146/11). Dep. CFSTI (U. S. Sales Only).

From Symposium on Environmental Aspects of Nuclear Power Stations, New York, N. Y.

Some of the practical difficulties that arise when trying to predict the transfer of radionuclides from the point of release to individual members of the population, particularly that part of the transfer that occurs through food chains, are discussed. The current radiation protection standards applying to the release of radioactive materials from nuclear power stations are considered. It was concluded that there should be a change in emphasis by defining maximum permissible doses and hence release rate, and that the maximum dose rate to the individual should in the future be replaced by a maximum per population dose rate. (D H M)

157 (GEAP-12114-1) PLANT INSTRUMENTATION PROGRAM. First Quarterly Report, April-June 1970. Bishop, D. M.; Aitken, E. A. (comps.) (General Electric Co., Sunnyvale, Calif. Breeder Reactor Development Operation). Jul 1970. Contract AT(30-1)-68. 25p. (BHO-68-1). Dep. NTIS.

Work was initiated on the Plant Instrumentation Program during mid-April 1970 immediately after contract receipt. The program is directed toward the evaluation of nondestructive techniques and equipment for assaying special nuclear materials under fuel fabrication plant conditions. Work scope and fuel standards are defined. Gamma counting assay techniques and calorimetric assay equipment are described. A spectral stripping technique is proposed to permit the assay of plutonium content in mixed oxide fuels with a sodium iodide gamma counting system. (auth)

158 NUCLEAR TECHNOLOGY AND RADIATION PROTECTION. Tech. Ueberwach.; 11: 185-96 (1970). (In German).

The activities of the VdTUEV are reviewed for the period 1968/69 in the following fields: legal basis and atomic law safety examination for nuclear reactors, Institute for Reactor Safety (IRS), reactor pressure vessels, working groups for nuclear techniques, rules for nuclear techniques, especially standards, and radiation protection, including monitoring of hot fallout particles. (INIS)

159 NUCLEAR POWER PIPING, USAB B31.7-1969. USA Standard Code for Pressure Piping. New York; American Society of Mechanical Engineers (1969). 226p. \$10.00.

The piping code provides requirements for the design, materials fabrication, assembly, erection, installation, and examination of three classes of nuclear piping systems for nuclear power plant service. The three classes of piping systems denote three levels of quality which are required for varying service limits. (D C C)

160 STANDARDS AGREEMENT FOR IAEA REACTOR SAFETY CONTROL. Boulanger, W. Atomwirt., Atomtech., 15: 521-2 (Nov 1970). (In German).

The board of governors of the IAEA accepted a standard agreement proposed by a special Control Committee. The agreement was proposed as preliminary guidelines for negotiations about safety measures of the IAEA with those countries that ratified the nuclear non-proliferation treaty. In the first section of the agreement, principles for application of IAEA control standards are outlined as well as verification procedures with respect to responsibilities of the countries concerned. (tr-auth)

161 (CONF-700810-41) CONSIDERATIONS AND EVALUATION OF THE RECOMMENDATIONS OF ICRP FOR CONTROL

OVER RADIOACTIVITY IN DISCHARGES FROM NUCLEAR POWER PLANTS. Belitski, A. S.; Turkin, A. D. (Ministerstvo Zdravookhraneniya SSSR, Moscow Institut Biofiziki); Kozlov, V. M. (Ministerstvo Zdravookhraneniya SSSR, Moscow). [1970]. 13p. (In Russian) (SM-146/7) Dep. CFSTI (U. S. Sales Only)

From Symposium on Environmental Aspects of Nuclear Power Stations, New York, N. Y.

On the basis of national legislative documents on radiation safety in the USSR, both in legislation before 1969 (SP No. 333-60) and in the new norms of radiation protection, the recommendations of the ICRP are considered. On the basis of the recommendations of the ICRP for operational control over radiation conditions, permissible concentrations of radioactive materials in air and water were established in the USSR. The maximum permissible release to the air of radioactive gases and aerosols by the AEC was regulated. The design and operation of atomic power plants in accordance with legislation existing in the USSR guarantee their operational safety. (tr-auth)

162 (BNWL-SA-3093(Vol.1), pp IV.1-29) BIOLOGICAL EFFECTS OF RADIATION. Bunch, W. L. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.).

From Lecture series, fast reactor safety technology and practices. Volume I. Safety practices and background information.

The causes and effects of biological damage by radiation, definitions of dosage terms, and regulatory agencies and standards are discussed. The effects of radiological factors on reactor facility design are examined. (10 references) (H. D. R.)

163 (ORNL-TM-3251) ACTIVITIES OF THE ANS-6 SUB-COMMITTEE ON RADIATION SHIELDING STANDARDS. Claiborne, H. Clyde, Dudziak, Donald J., Schaeffer, Norman M. (Oak Ridge National Lab., Tenn.) Dec 1970. Contract W-7405-eng-26 17p. Dep. NTIS

A special report is given on the activities of the ANS-6 Subcommittee on Radiation Shielding Standards that was prepared for presentation at the special session entitled "Current Status of Nuclear Standards Development" at the 1970 winter meeting of the American Nuclear Society at Washington, D. C. A brief discussion of the history, organization, and philosophy of the ANS-6 Subcommittee and a report on the accomplishments and current activities of the existing working groups are presented, which include shielding cross section standards, benchmark problems shield performance evaluation, shield materials, and shielding nomenclature. (auth)

164 (ORNL-tr-2402) GAS PRESSURE APPARATUS PRESTRESSED CONCRETE NUCLEAR REACTOR VESSELS. Translated for Oak Ridge National Lab., Tenn., from J. Offic. Repub. Fr., No. 70-103, 3207-38 (Jun 1970). 54p. Dep. NTIS. Presented is a decree from the French Minister of Industrial and Scientific Development dealing with regulations for the design, construction, testing, and operation of prestressed concrete pressure vessels for reactors. Included is a circular which discusses the factors involved in the application of various technical provisions of the new regulations. (H. D. R.)

165 (SSI-70-27) ON THE SWEDISH POLICY WITH REGARD TO THE LIMITATION OF RADIOACTIVE DISCHARGES FROM NUCLEAR POWER STATIONS: AN INTERPRETATION OF CURRENT INTERNATIONAL RECOMMENDATIONS. Hedgran, Arne; Lindell, Bo. (National Inst. of Radiation Protection Stockholm (Sweden)). Jun 1970. 25p. Dep. NTIS (U. S. Sales Only).

The protection measures applied to the normal operation of nuclear reactors guarantee that no individuals will suffer acute radiation injury. The remaining risks relate to the late occurrence of cancer or hereditary damage. Since they are very low and of random nature, they are controlled by limitation of the activity output rather than by limiting activity concentrations in the environment. The restrictions on the discharges of radioactive material are intended to satisfy the following criteria: no individual in the neighborhood shall receive a radiation dose such that the dose contribution from the operation of the reactor exceeds a certain fraction of the ICRP dose limits (0.5 rems per year in the case of whole body exposure), the total population exposure caused by the activity released from a reactor shall not exceed $\frac{1}{2}$ manrem per MW-year (thermal power), and all appropriate measures should be taken to reduce both the individual doses and the number of manrems as much as practicable, considering that a justifiable expense in the field of radiation protection is often about \$200 per manrem. For accidental situations some compulsory action levels for doses and activity concentrations in the environment have been recommended. Remedial action is often appropriate at lower levels, however,

deliberate action levels cannot be specified until the actual situation is known. For widespread contamination non-action levels have been mentioned, one recommendation on a non-action level relates to iodine-131 in dairy milk. (auth) (Sweden)

166 NEEDED NUCLEAR ENGINEERING STANDARDS. Schmidt, R. A. (Oak Ridge National Lab., Tenn.). Power Eng., 74 No. 12, 42-5 (Dec 1970).

The requirement of nuclear engineering standards in the development of nuclear power plants is reviewed. The roles of international codes and standards, RDT standards, and AEC regulatory standards are analyzed. (D. C. C.)

167 (EACRP-L-74) PROPOSAL FOR A STANDARD SPECTRUM TO CHECK TECHNIQUES OF FAST NEUTRON SPECTRUM MEASUREMENTS. Kuechle, M.; Wattecamp, E. (Kernforschungszentrum, Karlsruhe (West Germany)). [nd]. 14p. (CONF-690225-1). Dep. NTIS (U. S. Sales Only).

From 11th EACRP Meeting, London, England.

In order to allow a cross check of neutron spectra measurements in fast critical assemblies, a standard assembly is proposed. The assembly composition which is concluded to be the optimum for a standard spectrum is U with a 10% average enrichment moderated with polyethylene so that the atomic ratio of H to U is 0.15 (H.D.R.)

168 CROSS-SECTIONS AND TECHNIQUES FOR HIGH-PRECISION NEUTRON NUCLEAR DATA MEASUREMENTS. Deruytter, A. J. (EURATOM, Geel, Belg.). pp 127-49 of Nuclear Data for Reactors, Vol. I. Vienna: International Atomic Energy Agency (1970).

From 2nd International Conference on Nuclear Data for Reactors, Helsinki, Finland. See STI/PUB-259 (Vol. 1); CONF-700605- (Vol. 1).

The accuracy requirements for cross-sections of structural and fuel materials needed for the design of nuclear reactors (and for precision neutron dosimetry) have stimulated the investigation and selection of standard cross-sections and the improvement of the precision in neutron flux measuring techniques. The present status in these fields is reviewed. Considerable attention is given to standard cross-sections, i.e. cross-sections that are used to obtain other cross-sections by comparison and especially to the so-called "primary" standards as, e.g. the cross-sections of the $^{10}\text{B}(n,\alpha)^7\text{Li}$, $\text{H}(n,n)\text{H}$ -reactions. Further, improvements in the knowledge of other "working standard" cross-sections such as $^6\text{Li}(n,\alpha)$ and $^3\text{He}(n,p)$ are discussed. Some special attention is given to the normalization of $^{235}\text{U}(n,f)$ and $^{239}\text{Pu}(n,f)$ -reactions in the resonance region, as these cross-sections are both important reactor requests and, at the same time, may play the role of secondary standards. Also the situation of the absolute neutron-flux determination is briefly reviewed. Finally, stringent requirements for improvements are set forth for the preparation and handling of samples for precise measurements with respect to chemical definition, isotopic analysis and enrichment, and absolute counting (half-lives of α -active fissile isotopes). (92 references) (auth)

169 (SAN-781-217) REVIEW OF PIPING AND PRESSURE VESSEL CODE DESIGN CRITERIA. Technical Report 217. (Braun (C. F.) and Co., Alhambra, Calif.). 18 Apr 1969. Contract AT(04-3)-781. 55p. (CFB-4122-217). Dep. NTIS.

A review of existing and past U. S. codes for the design of pressure vessels and piping systems is presented. An evaluation is made to determine their applicability to LMFBR environment. 12 references. (auth)

170 20545. Seaborg, Glenn T. (Atomic Energy Commission, Washington, D. C.). pp 43-53 of Northwest Conference on the Role of Nuclear Energy. Portland, Oreg., Governor's Nuclear Development Coordinating Committee (1970).

From 2nd Annual Governor's Conference on Conservation, Portland, Oreg. See CONF-691223.

The energy requirements for the U. S. are described. The ability of fossil fuel and nuclear power plants to meet the energy requirements is analyzed. Safety standards regulating nuclear power plants and the relationship between nuclear power plants and the environment are discussed. AEC responsibilities to the public and to electric utilities are reviewed. (D. C. C.)

171 AMERICAN STANDARD. REFEREE METHODS FOR THE CHEMICAL ANALYSIS OF NUCLEAR FUELS. ANSI N 5.7 1965. New York: American Institute of Chemical Engineers (1965). 60p. Available from American National Standards Inst., New York.

The Referee Methods for determining uranium isotopes. uranium

content, UO₂ stoichiometry, moisture content, fluoride and chloride, nitrogen, carbon, and impurities are given (MCCG).

172 USA STANDARD: PROPOSED DEFINITION OF RADIO-ACTIVE WASTE CATEGORIES. ANSI N 5.5-196. New York, American Institute of Chemical Engineers (1969). 7p. Available from American National Standards Inst., New York.

The major parameter used for waste categorization proposals is the ratio of radionuclide concentration in the waste at the time of consideration to the maximum permissible concentration of the same waste constituents in water or in solids. Five major categories of wastes, classes A, B, C, D, and E, in ascending order of radionuclide concentration are proposed (MCCG).

173 USA STANDARD: CODE FOR PRESSURE PIPING; NUCLEAR POWER PLANT PIPING. ANSI B 31.7 1969. New York, American Society of Mechanical Engineers (1969). 226p. Available from American National Standards Inst., New York.

Requirements are presented for the design, materials, fabrication, assembly, erection, installation, and examination of three classes of nuclear piping systems for power plant service. The three classes indicate levels of quality required for the intended service (H D R).

174 USA STANDARD: SELECTION AND TRAINING OF NUCLEAR POWER PLANT PERSONNEL. ANSI N 18.1D 1970. Hinsdale, Ill.; American Nuclear Society (1970). 24p. Available from American Nuclear Society, Hinsdale, Ill.

Criteria for the qualifications, responsibilities, and training of personnel for the safe and efficient operation of nuclear power plants are presented. The standard is limited to personnel who have a direct relationship to technical aspects: operation or maintenance of the plant (H D R).

175 NUCLEAR SAFETY CRITERIA FOR THE DESIGN OF STATIONARY PRESSURIZED WATER REACTOR PLANTS. ANSI N 18.2 D 1970. Hinsdale, Ill.; American Nuclear Society (1970). 128p. Available from American Nuclear Society, Hinsdale, Ill.

Criteria intended for use in the design of the nuclear safety aspects of pressurized water reactor (PWR) power plants are presented. The criteria are intended to amplify the U.S. AEC general design criteria for nuclear power plants, and deal principally with functional requirements of PWR structures, components, and systems (H D R).

176 AMERICAN STANDARD: SAFETY STANDARD FOR DESIGN, FABRICATION, AND MAINTENANCE OF STEEL CONTAINMENT STRUCTURES FOR STATIONARY NUCLEAR POWER REACTORS. ANSI N 6.2 1965. New York, American Society of Mechanical Engineers (1965). 9p. Available from American National Standards Inst., New York.

Criteria are presented for the design, construction, testing and maintenance of welded steel pressure containment shells for power reactors. Normal pressure vessel requirements and special requirements imposed by service, structural conditions, and loadings are examined (H D R).

177 USA STANDARD: NUCLEAR REACTOR CLASSIFICATION SYSTEM. ANSI N 10.1 1968. Hinsdale, Ill.; American Nuclear Society (1969). 4p. Available from American National Standards Inst., New York.

Nuclear reactors are classified into three primary categories in an effort to standardize reactor nomenclature. The three categories are purpose, thermomechanical design, and nuclear design. Major classes within each category are listed, and identifying reactor names associated with each class are presented (H D R).

178 AMERICAN NATIONAL STANDARD: SAFETY IN CONDUCTING SUBCRITICAL NEUTRON-MULTIPLICATION MEASUREMENTS IN SITU. ANSI N 16.3 1969. Hinsdale, Ill.; American Nuclear Society (1970). 3p. Available from American Nuclear Society, Hinsdale, Ill.

Safety guidelines are presented for conducting subcritical neutron multiplication measurements in areas where physical protection of personnel against the consequences of a criticality accident is not provided (H D R).

179 REVIEW OF ENGINEERING STANDARDS DEVELOPMENT FOR NUCLEAR POWER SYSTEMS. Joslin, W. Murray; Moore, James S.; Russ, John C. Nucl. Safety; 12: 217-26 (May-June 1971).

The efforts being made by the American National Standards Institute, Inc., the American Nuclear Society, and the Institute of Electrical and Electronics Engineers in promoting engineering

standards-development programs for nuclear power systems are discussed. Some examples are given of the difficulties and the satisfactions, and some suggestions are made for solving the problems. The reviewers present a general conclusion that the time elapse from inception to adoption needs to be shortened and that more participation and closer coordination are needed among groups having overlapping interests (auth).

180 TENTATIVE REGULATORY SUPPLEMENTARY CRITERIA FOR ASME CODE-CONSTRUCTED NUCLEAR PRESSURE VESSELS. Washington, D. C.; Atomic Energy Commission (1967). 49p. Available from United States Atomic Energy Commission, Washington, D. C.

Proposed general design criteria for nuclear power plant construction requires that nuclear pressure vessels be designed, fabricated, and inspected to quality standards which supplement those specified by existing engineering codes. Regulatory criteria developed to supplement ASME Nuclear Vessel Code specifications as to safety objectives and long-term reliability are presented (H D R).

181 SEISMIC AND GEOLOGIC SITING CRITERIA FOR NUCLEAR POWER PLANTS. TENTATIVE REGULATORY CRITERIA. Washington, D. C.; Atomic Energy Commission (1969). 29p. Available from United States Atomic Energy Commission, Washington, D. C.

The principal seismic and geologic criteria which guide the USAEC in evaluating proposed sites for nuclear power plants and the seismic design suitability of the plants are presented (H D R).

182 INSTRUMENT LINES PENETRATING PRIMARY REACTOR CONTAINMENT. AEC Safety Guide 11 1971. Washington, D. C.; Atomic Energy Commission (1971). 3p. Available from United States Atomic Energy Commission, Washington, D. C.

General Design Criteria 55 and 56 require that each line that penetrates primary reactor containment and is part of the reactor coolant pressure boundary or that is connected directly to the containment atmosphere have one automatic valve inside and one automatic valve outside containment "unless it can be demonstrated that the design is acceptable on some other defined basis." A suitable basis which may be used to implement General Design Criteria 55 and 56 for demonstrating the acceptability of a particular group of these lines, namely, instrument lines is presented (auth).

183 THERMAL SHOCK TO REACTOR PRESSURE VESSELS. AEC Safety Guide 2 1970. Washington, D. C.; Atomic Energy Commission (1970). 2p. Available from United States Atomic Energy Commission, Washington, D. C.

Proposed General Design Criterion 35 specifies design and operating conditions necessary to assure that the reactor coolant pressure boundary will behave in a nonbrittle manner. To provide protection against loss of coolant accidents, present designs provide for the injection of large quantities of cold emergency coolant into the reactor coolant system. The effect on the reactor pressure vessel of this cold water injection is of concern because the reactor vessel is subjected to greater irradiation than other components of the reactor coolant pressure boundary and thus has a greater potential for becoming brittle. A suitable program which may be used to implement General Design Criterion 35 to assure that the reactor pressure vessel will behave in a nonbrittle manner under loss of coolant accident conditions is described (auth).

184 NET POSITIVE SUCTION HEAD FOR EMERGENCY CORE COOLING AND CONTAINMENT HEAT REMOVAL SYSTEM PUMPS. AEC Safety Guide 1 1970. Washington, D. C.; Atomic Energy Commission (1970). 1p. Available from United States Atomic Energy Commission, Washington, D. C.

Proposed General Design Criterion 41 requires that the emergency cooling and containment heat removal systems be capable of accomplishing their required safety functions assuming partial loss of installed capacity. In current designs the ability to accomplish these safety functions reliably depends in part on the proper performance of system pumps which, in turn, depends on the conditions under which the pumps must operate. One of these conditions is suction pressure. A suitable relationship between increases in containment pressure caused by postulated loss of coolant accidents and the net positive suction head (NPSH) of emergency core cooling and containment heat removal system pumps which may be used to implement General Design Criterion 41 is described (auth).

185 CONTROL OF COMBUSTIBLE GAS CONCENTRATIONS IN CONTAINMENT FOLLOWING A LOSS OF COOLANT ACCIDENT. AEC Safety Guide 7 1971. Washington, D. C.; Atomic Energy Commission (1971). 3p. Available from United States Atomic Energy Commission, Washington, D. C.

General Design Criterion 41 requires that systems to control hydrogen, oxygen, and other substances which may be released into the reactor containment be provided as necessary to control their concentrations following postulated accidents to assure that containment integrity is maintained. An acceptable method of implementing this criterion is described (auth).

186 INDEPENDENCE BETWEEN REDUNDANT STANDBY (ONSITE) POWER SOURCES AND BETWEEN THEIR DISTRIBUTION SYSTEMS. AEC Safety Guide 6 1971. Washington, D. C.; Atomic Energy Commission (1971). 2p. Available from United States Atomic Energy Commission, Washington, D. C.

General Design Criterion 17 requires that onsite electrical power systems have sufficient independence to perform their safety functions assuming a single failure. An acceptable degree of independence between redundant standby (onsite) power sources and between their distribution systems is described (auth).

187 SELECTION OF DIESEL GENERATOR SET CAPACITY FOR STANDBY POWER SUPPLIES. AEC Safety Guide 9 1971. Washington, D. C.; Atomic Energy Commission (1971). 3p. Available from United States Atomic Energy Commission, Washington, D. C.

General Design Criterion 17 requires that the onsite (standby) power supply for a nuclear power plant be of sufficient capacity and capability to assure that specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences, and the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents. Diesel generator sets have been widely used as the power source for the standby power supplies. An acceptable basis for the selection of diesel generator sets of sufficient capacity and margin to implement General Design Criterion 17 is presented (auth).

188 PERSONNEL SELECTION AND TRAINING. AEC Safety Guide 8 1971. Washington, D. C.; Atomic Energy Commission (1971). 1p. Available from United States Atomic Energy Commission, Washington, D. C.

Subdivision 50.34 (b) (6) (i) of 10 CFR Part 50 requires that nuclear power plant operating license applications include information concerning organizational structure, personnel qualifications, and related matters. An acceptable method of implementing this portion of the Commission's regulations with regard to personnel qualifications is described (auth).

189 ASSUMPTIONS USED FOR EVALUATING THE POTENTIAL RADIOLOGICAL CONSEQUENCES OF A LOSS OF COOLANT ACCIDENT FOR PRESSURIZED WATER REACTORS. AEC Safety Guide 4 1970. Washington, D. C.; Atomic Energy Commission (1970). 6p. Available from United States Atomic Energy Commission, Washington, D. C.

Section 50.34 of 10 CFR Part 50 requires that each applicant for a construction permit or operating license provide an analysis and evaluation of the design and performance of structures, systems and components of the facility with the objective of assessing the risk to public health and safety resulting from operation of the facility. The design basis loss of coolant accident (LOCA) is one of the postulated accidents used to evaluate the adequacy of these structures, systems and components with respect to the public health and safety. Acceptable assumptions are presented that may be used in evaluating the radiological consequences of this accident for a pressurized water reactor. In some cases unusual site characteristics, plant design features, or other factors may require different assumptions which will be considered on an individual case basis (auth).

190 ASSUMPTIONS USED FOR EVALUATING THE POTENTIAL RADIOLOGICAL CONSEQUENCES OF A LOSS OF COOLANT ACCIDENT FOR BOILING WATER REACTORS. AEC Safety Guide 3 1970. Washington, D. C.; Atomic Energy Commission (1970). 13p. Available from United States Atomic Energy Commission, Washington, D. C.

Section 50.34 of 10 CFR Part 50 requires that each applicant for a construction permit or operating license provide an analysis and evaluation of the design and performance of structures, systems and components of the facility with the objective of assessing the risk to public health and safety resulting from operation of the facility. The design basis loss of coolant accident (LOCA) is one

of the postulated accidents used to evaluate the adequacy of these structures, systems and components with respect to the public health and safety. Acceptable assumptions are presented that may be used in evaluating the radiological consequences of this accident for a boiling water reactor. In some cases unusual site characteristics, plant design features, or other factors may require different assumptions which will be considered on an individual case basis (auth).

191 ASSUMPTIONS USED FOR EVALUATING THE POTENTIAL RADIOLOGICAL CONSEQUENCES OF A STEAM LINE BREAK ACCIDENT FOR BOILING WATER REACTORS. AEC Safety Guide 5 1971. Washington, D. C.; Atomic Energy Commission (1971). 4p. Available from United States Atomic Energy Commission, Washington, D. C.

Section 50.34 of 10 CFR Part 50 requires that each applicant for a construction permit or operating license provide an analysis and evaluation of the design and performance of structures, systems and components of the facility with the objective of assessing the risk to public health and safety resulting from operation of the facility. The steam line break accident is one of the postulated accidents used to evaluate the adequacy of these structures, systems and components with respect to the public health and safety. Acceptable assumptions that may be used in evaluating the radiological consequences of this accident for a boiling water reactor are presented (auth).

192 (RUBIN/1814) CODE OF DESIGN FOR RESEARCH APPARATUS CONTAINING MOLYBDENUM. Stewart, V. J., (Central Electricity Generating Board, Berkeley (England). Berkeley Nuclear Labs., Oct 1970. 28p. Dep. NTIS (U. S. Sales Only).

This code gives guidance to design engineers on the application of the design of molten sodium systems and deals specifically with sodium containment, demountable joints, overpressure systems, pressure relief, and other important auxiliaries. There is also a section on heat transfer which includes useful heat transfer correlations. Appendices deal in more detail with the most essential design and calculation used in the design of old types (auth) (UK).

193 MECHANICAL (COLDWELD) SPLICES IN REINFORCING BARS OF CONCRETE CONTAINMENTS. AEC Safety Guide 10 1971. Washington, D. C.; Atomic Energy Commission (1971). 3p. Available from United States Atomic Energy Commission, Washington, D. C.

A safety guide is presented which describes an acceptable method for the sampling and testing of mechanical spllices in reinforcing bars used in concrete containment structures. This testing must be performed to determine whether the spllices meet safe design and fabrication standards (auth) (U. S.).

194 FUEL STORAGE FACILITY DESIGN BASIS. AEC Safety Guide 13 1971. Washington, D. C.; Atomic Energy Commission (1971). 3p. Available from United States Atomic Energy Commission, Washington, D. C.

Standards are presented for the design of reactor fuel storage facilities which will assure adequate safety under normal and postulated accident conditions. These systems must be designed to prevent significant reduction in the coolant inventory of the storage facility under accident conditions and must include appropriate containment, confinement and filtering systems (auth) (U. S.).

195 SELECTION AND TRAINING OF NUCLEAR POWER PERSONNEL. ANSI SC-21.5 1971. Hinsdale, Ill.; American Nuclear Society (1971). 20p. Available from American Nuclear Society, Hinsdale, Ill.

Criteria for the selection and training of personnel for stationary nuclear power plant are presented. The qualifications, responsibilities, and training of personnel in operating and support organizations appropriate for the safe and efficient operation of nuclear power plants are described. Test mobile and experimental reactors as well as reactors not subject to Atomic Energy Commission licensing are excluded because of differences in operational practices and construction requirements (auth).

196 STANDARD METHOD FOR MEASUREMENT OF DELAYED NEUTRON-EMITTING FISSION PRODUCTS IN NUCLEAR REACTOR COOLANT WATER DURING REACTOR OPERATION. ASTM D 2470-70. Philadelphia; American Society for Testing and Materials (1970). 7p. Available from American Society for Testing and Materials, Philadelphia.

197 PROPOSED GUIDE FOR THE DESIGN OF A NUCLEAR POOL FACILITY, REVISION 11. ANSI Z39.1-1966. Hinsdale,

Ill., American Nuclear Society (1966). 3p. Available from American Nuclear Society, Hinsdale, Ill.

Recommendations for the design of a nuclear pool facility are presented. A nuclear pool is defined as a contained body of water for attenuating nuclear radiation from a reactor or cooling and storing radioactive materials or both. The top surface of the water is usually exposed to the atmosphere. This guide is applicable only to the design of light-water filled pools. Particular emphasis is given to design recommendations developed to cope with the health and safety hazards that will be associated with the radioactive materials in the pool. These hazards shall be considered in the design and construction of a nuclear pool facility. Design features such as piping design, concrete structural design, and welding design, insofar as they pertain to structural strength, are not considered because they are covered by existing standards, codes, and practices, viz., those of ASA, AWS, ASME, ACI. Where not specifically designated herein applicable parts of the existing standards, codes and practices shall be used as agreed upon between buyer and seller. Specific recommendations are: piping containing radioactive or potentially radioactive fluids should be designed in accordance with ASA B31.1, Code for Pressure Piping and applicable Special Rulings; valves in these systems shall conform to ASA B16.5, Code for Steel Pipe Flanges and Flanged Fittings, and tanks or other fabricated vessels that will contain radioactive or potentially radioactive fluids shall be designed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII. Where existing standards, codes and practices must be modified because of radiation effects, nuclear hazards, and the need to prevent contamination of the environment, this guide shall apply. This guide does not recommend or endorse any particular design or product or limit in any way the choice of design or construction to conform with the guide. (auth)

198 GUIDE FOR THE CLASSIFICATION OF NUCLEAR SHIPS. ABS-01 1962. New York, American Bureau of Shipping (1962). 16p. Available from American Bureau of Shipping, New York.

Information relating to guides for the design and development of nuclear powered merchant ships is presented under the following headings: hull, containment, pressure vessels, nuclear piping and ductwork systems, reactor core and fuel elements, control and instrumentation, standby components, emergency components, spare parts, special nuclear considerations, and surveys. (D C C)

199 LEAKAGE-RATE TESTING OF CONTAINMENT STRUCTURES. ANS 7.60 1970. Hinsdale, Ill.; American Nuclear Society (1970). 17p. Available from American Nuclear Society, Hinsdale, Ill.

Uniform methods are described for determining the ability of a reactor container to retain within the limits of permissible leakage rates any gases, vapors, liquid or other fluid materials that would be of a hazardous nature if not contained and which might be present in the containment structure as a result of an energy release, rupture or leak in the nuclear reactor components or accessories. The need for restriction of leakage from the containment structure is based on the maintenance of public health and safety. The provisions of this standard specify the practices and test requirements for the quantitative determination of leakage rates of containment structures for the housing of operating nuclear reactors. The provisions apply to containment structures for nuclear power test research, and training reactors wherever a gas-tight containment structure is specified as a condition for operation. (auth)

200 GUIDE FOR SPECIFYING CLEANLINESS OF REACTOR SYSTEM COMPONENTS. Hinsdale, Ill.; American Nuclear Society (1965). 3p. Available from American Nuclear Society, Hinsdale, Ill.

Classes of cleanliness are defined and methods for specifying degrees of cleanliness for components to be installed in nuclear systems are described. Examples drawn from industrial experience are cited as typical of applications appropriate to cleanliness classes. These examples should be considered only as guides. This standard does not set cleanliness requirements for particular components. The class of cleanliness and the cleaning procedures and processes used to attain the class of cleanliness shall be subject to the purchaser's approval. (auth)

201 PROGRAM FOR TESTING BIOLOGICAL SHIELDING IN NUCLEAR REACTOR PLANTS. ANS 6.3 1967. Hinsdale, Ill.; American Nuclear Society (1967). 4p. Available from American Nuclear Society, Hinsdale, Ill.

An operational shield testing program that is to be used in evaluating the installed biological shielding in nuclear plants is described. A general testing procedure is outlined and the neces-

sary radiation measurements and types of radiation-measuring instruments are prescribed. (auth)

202 TENTATIVE STANDARD FOR LAMINAR FLOW CLEAN AIR DEVICES. AACC CS-2T 1968. Boston, American Association for Contamination Control (1968). 20p. Available from American Association for Contamination Control, Boston.

A standard is presented which covers definitions, procedures for evaluating performance, and the major requirements of laminar-flow clean air devices. A clean air device is defined as a clean bench, clean work station, wall module or other device (except a clean room) which incorporates at least one HEPA filter for the purpose of cleaning air supplied to a controlled work space. Laminar airflow is air in which the entire body of air within a confined area moves with unit velocity along parallel flow lines. (I C L)

203 TENTATIVE STANDARD FOR HEPA FILTERS. AACC CS-1T 1968. Boston, American Association for Contamination Control (1968). 9p. Available from American Association for Contamination Control, Boston.

A standard is presented which covers the basic requirements of HEPA (high-efficiency particulate air) filters for use in clean air devices and in supply air and contaminated exhaust systems where extremely high collection efficiencies (99% or higher) for submicron particles is required. Three levels of performance and 3 grades of construction are included. This standard is intended as a basis for agreement between buyers and sellers. (L C L)

204 TENTATIVE STANDARD FOR TESTING AND CERTIFICATION OF PARTICULATE CLEAN ROOMS. AACC CS-6T 1970. Boston, American Association for Contamination Control (1970). 31p. Available from American Association for Contamination Control, Boston.

Methods are specified for the performance testing of air cleaning systems which use HEPA filters to achieve clean rooms. (L C L)

205 AMERICAN STANDARD DESIGN GUIDE FOR A RADIOISOTOPE LABORATORY (TYPE B). ANSI Z39.2 1963. New York, American Institute of Chemical Engineers (1964). 15p. Available from American National Standards Inst., New York.

Recommendations are made for the essential features of a Type B laboratory in which radioisotopes are used. This standard does not prescribe detailed requirements for all possible isotope laboratories, but does identify the general requirements for the categories of radioisotope laboratories listed. The amounts and kinds of isotopes which can be safely handled in laboratories of various designs are categorized. The laboratory designation conveys the radiotoxicity of the isotopes involved and the maximum quantity which is to be manipulated. Some 100 isotopes in four hazard-potential categories are tabulated, as well as the type of laboratory identified with the amount and kind of isotope manipulated. The topics discussed include general arrangements of facilities, construction, required building services, such as ventilation, waste disposal, and fire prevention facilities, and the laboratory work area. (L C L)

206 CENTRIFUGAL PUMPS. PTC 5.2 1963. New York, American Society of Mechanical Engineers (1966). 34p. Available from American Society of Mechanical Engineers, New York.

Standards are presented for conducting and reporting tests on centrifugal pumps, including those of the mixed flow and axial flow types. (L C L)

207 BYPASS AND DRAIN CONNECTION STANDARD. MSS Standard Practice SP-45 1953. Arlington, Va., Manufacturers Standardization Society of the Valve and Fittings Industry (1953). 8p. Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

A standard is presented, for the design of valve and fitting drains, regardless of material or pressure, and fabricated by bypasses for ferrous valves for all pressures wherever a bypass is required. The standard covers standard symbols and locations of opening for drains and bypasses, standard size of drains and bypass openings, minimum thread lengths in drain and bypass tapings, minimum diameter and depth of socketweld connection for drain and bypass, butt-welding connection for drain and bypass, bosses for drain and bypass connection, and method of designating outlets of reducing fittings. (L C L)

208 150 LB CORROSION RESISTANT CAST FLANGES AND FLANGED FITTINGS. MSS Standard Practice SP-51 1949. Arlington, Va.; Manufacturers Standardization Society of the Valve and Fittings Industry (1957). 7p. Available from Manu-

facturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

A standard is presented for the design of 150 lb cast flanges and flanged fittings, designated categorically as 'corrosion resistant and customarily made of austenitic types of stainless steel. The standard covers pressure-temperature ratings, identification markings, material, dimensions and tolerances, facing finish, thread of screwed flanges, and gaskets. (L C L)

209 150 LB CORROSION RESISTANT CAST FLANGED VALVES. MSS Standard Practice SP-42 1949. Arlington, Va., Manufacturers Standardization Society of the Valve and Fittings Industry (1959). 8p. Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

A standard is presented for the design of 150 lb cast flanged valves designated categorically as 'corrosion resistant and customarily made of austenitic types of stainless steel. These valves are made with bolted bonnets, with the exception of the y-pattern swing check valve which is made with a threaded cap. The standard covers pressure-temperature ratings, identification markings, materials, fittings, seats, dimensions and tolerances, gaskets, and bolting. (L C L)

210 HIGH PRESSURE CHEMICAL INDUSTRY FLANGES AND THREADED STUBS FOR USE WITH LFNS GASKETS. MSS Standard Practice SP-65 1962. Arlington, Va., Manufacturers Standardization Society of the Valve and Fittings Industry (1962). 8p. Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

A standard is presented for the design and testing of cast and forged steel flanges (welding neck and straight threaded) and threaded stubs particularly designed for acid connections making use of lens gaskets. The standard covers a pressure rating of 6000 lb at 750 F; size, identification markings, materials for gaskets and valves, facing, welding, end preparation, threads for screwed flanges, and testing. (L C L)

211 PIPE HANGERS AND SUPPORTS MATERIAL AND DESIGN. MSS Standard Practice SP-58 1959. Arlington, Va., Manufacturers Standardization Society of the Valve and Fittings Industry (1967). 12p. Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

A standard is presented for the material design and fabrication criteria to be used in the manufacture of standard types of pipe hanger components meeting designated minimum design working loads and temperature ratings. (L C L)

212 PIPE HANGERS AND SUPPORTS SELECTION AND APPLICATION. MSS Standard Practice SP-69 1966. New York, Manufacturers Standardization Society of the Valve and Fittings Industry (1966). 11p. Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

A standard is presented for the selection and application of pipe hangers and supports for all service temperatures. Hangers and supports are of the types specified in MSS SP-58 Pipe Hangers and Supports. Materials and Design. Reference is also made to other pipe supporting and controlling elements such as guides, restraints and slides and swivels. (L C L)

213 STANDARD METHOD OF MAGNETIC PARTICLE TESTING AND INSPECTION OF HEAVY STEEL FORGINGS. ASTM A 275-68. Philadelphia, American Society for Testing and Materials (1968). 7p. Available from American Society for Testing and Materials, Philadelphia.

A procedure for magnetic particle inspection of steel forgings is specified. The procedure will produce consistent results upon which acceptance standards can be based. (L C L)

214 STANDARD METHOD AND SPECIFICATION FOR LONGITUDINAL-WAVE ULTRASONIC INSPECTION OF STEEL PLATES FOR PRESSURE VESSELS. ASTM A 435-67. Philadelphia, American Society for Testing and Materials (1969). 2p. Available from American Society for Testing and Materials, Philadelphia.

The examination procedure and acceptance standards are presented for pulse-echo ultrasonic inspection of rolled carbon and alloy steel plates $\frac{3}{8}$ in. (19.05 mm) in thickness and over of fully killed pressure vessel quality. This standard was developed to assure delivery of steel free from gross internal discontinuities such as pipe ruptures or laminations and is to be used whenever the inquiry, contract, order or specification states that the plates are to be subjected to ultrasonic inspection. (L C L)

215 RECOMMENDED PRACTICE FOR ULTRASONIC TESTING AND INSPECTION OF HEAVY STEEL FORGINGS. ASTM

A 388-67. Philadelphia, American Society for Testing and Materials (1967). 6p. Available from American Society for Testing and Materials, Philadelphia.

Examination procedures are recommended for the pulse-echo ultrasonic inspection of heavy steel forgings by longitudinal and angle beam techniques. This standard is to be used whenever the inquiry, contract, order or specification states that forgings are to be subjected to ultrasonic inspection in accordance with ASTM Specification A 388. (L C L)

216 RADIOGRAPHIC QUALITY STANDARD FOR STEEL CASTINGS FOR VALVES, FLANGES, FITTINGS, AND OTHER PIPING COMPONENTS. MSS Standard Practice SP-4 1959. Arlington, Va., Manufacturers Standardization Society of the Valve and Fittings Industry (1960). 4p. Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

A standard method is presented for the radiographic inspection of steel castings either as-cast or after welding to repair casting defects. The purpose of the guide is to provide a standard practice which will limit the number of possible variables in the procedure. Among the variables specified are: type of gamma ray intensity types of castings to be radiographed, number and size of radiographs required, specimen preparation and thickness, type of radiographic film and equipment to be used. (L C L)

217 QUALITY STANDARD FOR STEEL CASTINGS FOR VALVES, FLANGES, AND FITTINGS AND OTHER PIPING COMPONENTS (VISUAL METHOD). MSS Standard Practice SP-55 1961. Arlington, Va., Manufacturers Standardization Society of the Valve and Fittings Industry (1961). 17p. Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

A standard of acceptability for visual inspection of surfaces on steel castings for valves, flanges, and fittings is presented. A series of reference photographs typical of the various surface irregularities common to steel pressure castings and illustrations of generally acceptable and generally unacceptable quality are provided. (L C L)

218 HYDROSTATIC TESTING OF STEEL VALVES. MSS Standard Practice SP-61 1961. Arlington, Va., Manufacturers Standardization Society of the Valve and Fittings Industry (1961). 6p. Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

A standard is presented for the hydrostatic seat and shell pressure testing of steel angle, check, gate and globe valves designed and made of materials to meet the rating established in American Standard ASME B 16.1 1957. (L C L)

219 QUALITY STANDARD FOR STEEL CASTINGS FOR VALVES, FLANGES, AND FITTINGS AND OTHER PIPING COMPONENTS (DRY POWDER MAGNETIC PARTICLE INSPECTION METHOD). MSS Standard Practice SP-53 1957. Arlington, Va., Manufacturers Standardization Society of the Valve and Fittings Industry (1958). 6p. Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

A standard is presented for the magnetic particle inspection of steel castings for valves, fittings, flanges and other piping components. Such inspection is primarily intended for use to assure that such components in oil refinery use under stipulated pressure and temperature conditions meet safety code requirements. (L C L)

220 AMERICAN STANDARD SAFETY STANDARD FOR OPERATIONS WITH FISSIONABLE MATERIALS OUTSIDE REACTORS. ANSI N 6 1 1964. New York, American Society of Mechanical Engineers (1964). 3p. Available from American National Standards Inst., New York.

This standard provides guidance in the prevention of nuclear chain reactions in all procedures outside reactors for handling, storing, processing, transporting, and treating fissionable materials. Generalized basic criteria are presented to achieve this purpose. Solutions to specific problems may be derived from the referenced literature. (L C L)

221 AMERICAN NATIONAL STANDARD NUCLEAR CRITICALITY SAFETY IN OPERATIONS WITH FISSIONABLE MATERIALS OUTSIDE REACTORS. ANSI N 16 1 1969. Hinsdale, Ill., American Nuclear Society (1970). 7p. Available from American Nuclear Society, Hinsdale, Ill.

This standard is applicable to operations with ^{239}Pu , ^{235}U and other fissionable materials outside of nuclear reactors except the assembly of these materials under controlled conditions such as in critical experiments. Generalized basic criteria are presented and limits are specified for some simple single

fissionable units but not for multiunit arrays. This standard does not include the details of administrative controls, the design of processes or equipment, the description of instrumentation for process control, or detailed criteria to be met in transporting fissionable materials. (L C L)

222 USA STANDARD: QUALITY CONTROL FOR PLATING OF URANIUM-ALUMINUM FUEL ELEMENTS. ANSI N 8.1-1967. Hinsdale, Ill.; American Nuclear Society (1967). 4p. Available from American Nuclear Society, Hinsdale, Ill.

The minimum quality control including inspection requirements for the manufacture of plate-type uranium-aluminum fuel elements generally used in research and test reactors are outlined. The fuel elements consist of flat or curved plates of uranium-aluminum alloy that is clad with aluminum. This standard is applicable to fuel elements in which the fuel plates are mechanically fastened or welded to side plates for structural rigidity, but it does not apply to elements in which the fuel plates are brazed to the side plates. (L C L)

223 STANDARD METHOD OF TEST FOR MOISTURE IN GRAPHITE. ASTM C 562-69. Philadelphia; American Society for Testing and Materials (1969). 2p. Available from American Society for Testing and Materials, Philadelphia.

This method covers the determination of the percentage of moisture in graphite. This method is feasible only for the volatile moisture present on the graphite due to absorption from the atmosphere and is not intended to give representative moisture data for graphite which was exposed to liquid water, such as rain, puddles, etc. It is not likely that nuclear graphite would be subjected to any high liquid water concentrations so that this type of water is not germane to analyses of graphite. (with)

224 STANDARD METHODS FOR PHYSICAL TESTING OF GYPSUM BOARD PRODUCTS AND GYPSUM PARTITION TILE OR BLOCK. ASTM C 473-68. Philadelphia; American Society for Testing and Materials (1969). 7p. Available from American Society for Testing and Materials, Philadelphia.

A standard is presented for methods for the physical testing of gypsum board products, including gypsum lath and gypsum partition tile or block. The test methods described are used to determine compressive strength, flexural strength, weight and thickness of paper surfacing, nail retention, board edge thickness, and water resistance. (L C L)

225 USA STANDARD: PROTECTIVE COATINGS (PAINTS) FOR THE NUCLEAR INDUSTRY. ANSI N 5.1-1967. New York, American Institute of Chemical Engineers (1968). 13p. Available from American National Standards Inst., New York.

A standard is presented for facilities for the manufacture of which protective coatings (paints) for surfaces in a nuclear complex may be compared and selected by reproducible tests. The environmental conditions of these complexes are such that a paint may be deteriorated by exposure to any, all, or a combination of the following conditions: ionizing radiation, contamination by radioactive materials and decontamination processes, chemicals, immersion in highly purified water, and abrasion or wear. This standard specifically applies to the surfaces of such facilities as reactors, fuel reprocessing plants, and laboratories and hot cells. (L C L)

226 NUCLEAR VESSELS. ASME BOILER AND PRESSURE VESSEL CODE. SECTION III. WINTER 1970 ADDENDA. New York, American Society of Mechanical Engineers (1970). 45p. Available from American Society of Mechanical Engineers, New York.

Revised requirements for the materials, design, fabrication, inspection, testing, and certification of vessels for use in nuclear power plants are presented. (H D R)

227 NUCLEAR VESSELS. ASME BOILER AND PRESSURE VESSEL CODE. SECTION III. SUMMER 1970 ADDENDA AND ERRATA. New York, American Society of Mechanical Engineers (1970). 30p. Available from American Society of Mechanical Engineers, New York.

Revised requirements for the materials, design, fabrication, inspection, testing, and certification of vessels for use in nuclear power plants are presented. (H D R)

228 RULES FOR INSERVICE INSPECTION OF NUCLEAR REACTOR COOLANT SYSTEMS. ASME BOILER AND PRESSURE VESSEL CODE. SECTION XI. New York, American Society of Mechanical Engineers (1970). 25p. Available from American Society of Mechanical Engineers, New York.

Requirements for in-service inspection of pressure-containing components of water-cooled reactor cooling systems, associated

auxiliary systems, and emergency core cooling systems, are presented. The requirements cover classification of areas subject to inspection, responsibilities, provisions for accessibility, definitions of examination methods, examination techniques, personnel qualifications, frequency of inspection, records, mapping, evaluation of inspection results, and disposition and repair criteria. (H D R)

229 NUCLEAR VESSELS. ASME BOILER AND PRESSURE VESSEL CODE. SECTION III. WINTER 1968 ADDENDA. New York, American Society of Mechanical Engineers (1968). 14p. Available from American Society of Mechanical Engineers, New York.

Revised requirements for the materials, design, fabrication, inspection, testing, and certification of vessels for use in nuclear power plants are presented. (H D R)

230 NUCLEAR VESSELS. ASME BOILER AND PRESSURE VESSEL CODE. WINTER 1968 ADDENDA. New York, American Society of Mechanical Engineers (1968). 8p. Available from American Society of Mechanical Engineers, New York.

Revised requirements for the materials, design, fabrication, inspection, testing, and certification of vessels for use in nuclear power plants are presented. (H D R)

231 NUCLEAR VESSELS. ASME BOILER AND PRESSURE VESSEL CODE. SECTION III. WINTER 1969 ADDENDA. New York, American Society of Mechanical Engineers (1969). 13p. Available from American Society of Mechanical Engineers, New York.

Revised requirements for the materials, design, fabrication, inspection, testing, and certification of vessels for use in nuclear power plants are presented. (H D R)

232 RULES FOR CONSTRUCTION OF NUCLEAR VESSELS. ASME BOILER AND PRESSURE VESSEL CODE. SECTION III. New York, American Society of Mechanical Engineers (1968). 230p. Available from American Society of Mechanical Engineers, New York.

Requirements for the materials, design, fabrication, inspection, testing, and certification of vessels for use in nuclear power plants are presented. Vessels specified by the code include those which are designed to contain the reactor coolant or moderator, separate the coolant or moderator from the heat transfer medium, and collect nuclear waste from the system. Requirements for new construction and for mechanical and thermal stresses due to cyclic operation are provided. (H D R)

233 NUCLEAR STEAM SUPPLY SYSTEMS. PTC 3.1-1969. New York, American Society of Mechanical Engineers (1969). 30p. Available from American Society of Mechanical Engineers, New York.

Procedures for conducting tests to determine the thermal performance of water-cooled reactor steam supply systems are presented. The tests include capacity, reactor power level, efficiency, steam pressure, moisture content, solids in the steam, and other related operating characteristics. A supplement on the selection and calibration of the instruments used is included. (H D R)

234 DRAFT ASME CODE FOR PUMPS AND VALVES FOR NUCLEAR POWER. New York, American Society of Mechanical Engineers (1968). 213p. Available from American Society of Mechanical Engineers, New York.

Proposed rules for the materials, design, manufacture, examination, testing, and certification requirements for pumps and valves for water-cooled nuclear power plant applications are presented. The pumps and valves are divided into three classes or quality levels and the requirements for each class are discussed in separate sections. (H D R)

235 NUCLEAR VESSELS. ASME BOILER AND PRESSURE VESSEL CODE. SUMMER 1969 ADDENDA. New York, American Society of Mechanical Engineers (1969). 49p. Available from American Society of Mechanical Engineers, New York.

Revised requirements for the materials, design, fabrication, inspection, testing, and certification of vessels for use in nuclear power plants are presented. (H D R)

236 DRAFT ASME CODE FOR IN-SERVICE TESTING OF VALVES IN NUCLEAR POWER PLANTS. New York, American Society of Mechanical Engineers (1970). 15p. Available from American Society of Mechanical Engineers, New York.

Rules are presented for conducting and reporting periodic in-service tests and inspections of valves in water-cooled nuclear power plants. The rules apply to valves whose function is vital

to systems for the prevention of accidents or to the mitigation of the consequences of accidents (H D R)

237 STANDARD MARKING SYSTEM FOR VALVES, FITTINGS, FLANGES, AND UNIONS. MSS Standard Practice SP-25 1934. Arlington, Va.; Manufacturers Standardization Society of the Valve and Fittings Industry (1964). 24p. Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

This marking system applies to the various classes of valves (including cocks), flanges, fittings, and unions, hereinafter termed products, of whatever material made, which manufacturers recognize as regularly available products. Examples of marking regular products are illustrated. The term valve applies to such types as gate, globe, angle cross, plug, needle ball butterfly check of both the lift and swing type, and stop check. It is recommended that this marking system also be used in so far as possible for such products as pop, safety, relief, reducing, regulating, and other valves that require special markings to indicate the particular class of service for which the valve is made (auth)

238 INSTRUMENTATION FOR EARTHQUAKES. AEC Safety Guide 12 1971. Washington, D. C.; Atomic Energy Commission (1971). 2p. Available from United States Atomic Energy Commission, Washington, D. C.

A program of instrumentation is described for promptly determining the seismic response of a nuclear power plant and comparing such response with that used as the design basis. This comparison is needed to decide whether the plant can continue to be operated safely (R W R)

239 USA AND IEEE GUIDE FOR CLASSIFYING ELECTRICAL INSULATING MATERIALS EXPOSED TO NEUTRON AND GAMMA RADIATION. ANSI N 4.1 1967. New York; Institute of Electrical and Electronics Engineers, Inc. (1968). 5p. Available from Institute of Electrical and Electronics Engineers, New York.

A guide to classify the environmental conditions of gamma radiation, neutron flux, and temperature in which electrical insulating materials must operate is presented. These environmental classifications are applicable to the specification and selection of the appropriate types of electrical insulation for nonmilitary equipment and devices that will be exposed to nuclear radiation. Maximum exposure limits are tabulated (W H K)

240 WELDING FERROUS MATERIALS FOR NUCLEAR POWER PIPING. AWS D10.5-59 1959. New York; American Welding Society (1959). 14p. Available from American Welding Society, New York.

The changes that are necessary in welding procedures because of the application to nuclear power service of ferrous materials now used for conventional pressure piping systems in nonradioactive service are indicated. The report represents a compilation and review of many welding procedures and specifications for nuclear and non-nuclear power piping applications. No major changes in many existing welding procedures for materials in high pressure piping are necessary, except for increased cleanliness and crevice elimination. The emphasis should be on conforming to present specifications completely and as intended. In any case, no limitations or additions should be made to existing specifications unless they actually contribute to better service or are improvements that are significant enough to justify any increased cost. In addition, such variations in specifications must be attainable practically. The most obvious differences in service conditions are in increased thermal shock if liquid metal coolants are used, greater corrosion potential for certain aqueous or molten fuel systems, and possible changes in material properties because of radiation effects. In addition, there is a biological hazard from radiation and the effects of particles of radioactive materials, which makes any leakage dangerous and maintenance difficult or even, in some cases, impossible. Because of factors such as these, the highest quality product possible and practical is desired. (auth)

241 SAFETY IN WELDING AND CUTTING. USAS Z49.1 1967. New York; American Welding Society, Inc. (1968). 70p. Available from American Welding Society, New York.

A standard for the protection of persons from injury and illness and the protection of property (including equipment) from damage by fire and other causes arising from welding and cutting is presented. Specific provisions are included for gas welding, shielded metal-arc welding, submerged arc welding, gas shielded-arc welding, brazing, and resistance welding. However, the requirements of this standard are generally applicable to other welding processes. No attempt has been made to include all particular

hazards which may be inherent when welding and cutting equipment is used in special industries (auth)

242 WROUGHT STAINLESS STEEL BUTT-WELDING FITTINGS. INCLUDING REFERENCE TO OTHER CORROSION RESISTANT MATERIALS. MSS Standard Practice SP-43 1950. Arlington, Va.; Manufacturers Standardization Society of the Valve and Fittings Industry (1959). 12p. Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

This standard covers overall dimensions, tolerances, and marking for wrought stainless steel butt-welding fittings. In this standard wrought is used to denote fittings made of pipe, tubing, plate, bar, sheet, strip or forgings. This standard covers only fittings made for use with Schedule 5S or 10S pipe except that short pattern stub ends suitable for use with Schedule 40S pipe are also shown. Stainless steel fittings for butt welding to standard wall or heavier pipe should be produced in accordance with ASA B16.9 (auth)

243 STANDARD SPECIFICATION FOR NICKEL-CHROMIUM-IRON ALLOY PLATE, SHEET, AND STRIP. ASTM B 168-70. Philadelphia; American Society for Testing and Materials (1970). 13p. Available from American Society for Testing and Materials, Philadelphia.

This specification is general and covers rolled nickel chromium iron alloy plate, sheet, and strip. Provision is made herein for material suitable for the general run of drawing, forming, stamping, bending, joining operations and all other common methods of fabrication. Since the material may be used for purposes where the requirements of the operations are too particular to be prescribed in a general specification, it is advisable in these instances for the purchaser to submit samples or detailed information to the manufacturer and secure an adjustment of processing to suit the conditions for which the material is intended (auth)

244 STANDARD SPECIFICATION FOR SEAMLESS NICKEL AND NICKEL ALLOY CONDENSER AND HEAT EXCHANGER TUBES. ASTM B 163-66. Philadelphia; American Society for Testing and Materials (1967). 12p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers seamless cold-drawn tubes of nickel and nickel alloys for use in condenser and heat-exchanger service. Provision is made for two carbon levels in nickel (only) in order that the low-carbon nickel may be selected for corrosive and elevated temperature applications where it may be preferred to that of commercially pure, wrought nickel. The sizes covered by this specification are 3 in. and under in outside diameter with minimum wall thicknesses of 0.148 in. and under, and with average wall thicknesses of 0.165 in. and under. Tubes shall be specified to two dimensions only, for example, outside diameter and minimum wall thickness or outside diameter and average wall thickness. The inside diameter shall not be specified (auth)

245 STANDARD SPECIFICATION FOR TITANIUM AND TITANIUM ALLOY STRIP, SHEET AND PLATE. ASTM B 265-69. Philadelphia; American Society for Testing and Materials (1969). 7p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers annealed titanium and titanium alloy strip, sheet, and plate as follows: Grades 1 to 4—unalloyed titanium, Grade 5—titanium alloy (6 percent aluminum, 4 percent vanadium), Grade 6—titanium alloy (5 percent aluminum, 2.5 percent tin), and Grade 7—unalloyed titanium plus palladium (auth)

246 STANDARD SPECIFICATION FOR FERRITIC AND AUSTENITIC STEEL CASTINGS FOR HIGH-TEMPERATURE SERVICE. ASTM A 351-70. Philadelphia; American Society for Testing and Materials (1970). 7p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers ferritic and austenitic steel castings for valves, flanges, fittings, and other pressure containing parts intended for high-temperature and corrosive service. One grade of ferritic and 17 grades of austenitic steel castings are included in this specification. Selection will depend on design and service conditions, mechanical properties, and the high-temperature and corrosion-resistant characteristics (auth)

247 STANDARD SPECIFICATION FOR NICKEL-CHROMIUM-IRON ALLOY ROD AND BAR. ASTM B 166-70. Philadelphia; American Society for Testing and Materials (1970). 8p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers nickel-chromium-iron alloy in the

form of hot-finished and cold-drawn rounds, squares, hexagons, and rectangles. This specification is general. Provision is made herein for material suitable for hot- and cold-working operations, machining, and all other common methods of fabrication. Since the material may be used for purposes where the requirements of the operations are too particular to be prescribed in the general specification, it is advisable in these instances for the purchaser to submit samples or detailed information to the manufacturer and secure an adjustment of processing to suit the actual conditions for which the material is intended. (auth)

248 SPOT FACING FOR BRONZE, IRON, AND STEEL FLANGES. MSS Standard Practice SP-9 1929. Arlington, Va.; Manufacturers Standardization Society of the Valve and Fittings Industry (1970). 4p. Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

This MSS standard applies primarily to the spot facing of pipe flanges in brass, iron, or steel when cast integral with valves and fittings, as well as the companion flanges used with these products. (auth)

249 STANDARD SPECIFICATION FOR SEAMLESS AUSTENITIC STEEL PIPE FOR HIGH-TEMPERATURE CENTRAL-STATION SERVICE. ASTM A 376-70. Philadelphia; American Society for Testing and Materials (1970). 7p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers seamless austenitic steel pipe intended for high-temperature central-station service. Among the ten grades covered are five H grades which are specifically intended for high-temperature service. Optional supplementary requirements specify additional tests which will be made only when stated in the order, together with the number of such tests required. (auth)

250 STANDARD SPECIFICATION FOR ELECTRIC-FUSION-WELDED AUSTENITIC CHROMIUM-NICKEL ALLOY STEEL PIPE FOR HIGH-TEMPERATURE SERVICE. ASTM A-358-70. Philadelphia, American Society for Testing and Materials (1970). 6p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers electric fusion-welded austenitic chromium-nickel alloy steel pipe suitable for corrosive or high-temperature service, or both. (Although no restrictions are placed on the sizes of pipe which may be furnished under this specification, commercial practice is commonly limited to sizes not less than 8-in. nominal diameter.) This specification covers seven grades of alloy steel. The selection of the proper alloy and requirements for heat treatment shall be at the discretion of the purchaser, dependent on the service conditions to be encountered. Two classes of pipe are covered as follows: Class 1—all welded joints to be completely examined by radiography, and Class 2—no radiographic examination required. Optional requirements of a supplementary nature are provided for pipe where a greater degree of examination is desired. These supplementary requirements call for additional tests to be made and, when desired, one or more of these may be specified in the order. (auth)

251 STANDARD SPECIFICATION FOR ALLOY-STEEL AND STAINLESS STEEL BOLTING MATERIALS FOR HIGH-TEMPERATURE SERVICES. ASTM A 193-70. Philadelphia; American Society for Testing and Materials (1970). 8p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers alloy and stainless steel bolting material for pressure vessels, valves, flanges, and fittings for high-temperature service. The term bolting material as used in this specification covers bars, bolts, screws, studs, and stud bolts. The bars may be hot-rolled, forged, centerless ground, or cold-drawn ferritic steels, or carbide-solution treated (annealed) annealed and strain-hardened austenitic stainless steels. Eight grades are covered, including four ferritic steels and four austenitic stainless steels. Selection will depend upon design, service conditions, mechanical properties, and high-temperature characteristics. Nuts for use with this bolting material are covered. (auth)

252 STANDARD SPECIFICATION FOR ALLOY STEEL FORGINGS FOR SEAMLESS DRUM HEADS AND OTHER PRESSURE VESSELS. ASTM A 336-70a. Philadelphia; American Society for Testing and Materials (1970). 8p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers forged alloy steel hollow drums, headers, barrels, nozzles, and similar parts for use in pressure vessels and also alloy steel forgings for heads, covers, plugs, and other component parts for pressure vessels. Sixteen classes are covered, including ten ferritic steels and six austenitic

steels. Forgings made of steel grades listed in ASTM Specification A 335 seamless ferritic alloy steel pipe for high-temperature service may also be ordered under this specification. The chemical, tensile, heat treatment, and marking requirements of Specifications A 335 shall apply except the forgings shall conform to the chemical requirements of Specifications A 335 only with respect to ladle analysis. On check analysis they may deviate from these limits to the extent permitted in this specification. For closed-in forgings the requirements of this specification shall apply. (auth)

253 STANDARD SPECIFICATION FOR NICKEL-CHROMIUM-IRON ALLOY SEAMLESS PIPE AND TUBE. ASTM B 167-70. Philadelphia; American Society for Testing and Materials (1970). 9p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers nickel-chromium-iron alloy in cold-drawn and hot-finished seamless pipe and tube intended for general corrosive service and for heat-resisting applications. Cold-drawn pipe and tube is available in sizes of $\frac{1}{8}$ in. and under in outside diameter, and 0.382 in. and under in wall thickness. Cold-drawn pipe is available in various schedules. Hot-finished tube is available in sizes $\frac{1}{4}$ in. and under in outside diameter and 1.0 in. and under in wall thickness. Pipe and tube may be specified to two dimensions only as follows: outside diameter and average wall, outside diameter and inside diameter, or inside diameter and average wall. (auth)

254 STANDARD SPECIFICATION FOR TITANIUM SPONGE. ASTM B 299-69. Philadelphia; American Society for Testing and Materials (1969). 3p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers virgin titanium metal melting stock. This virgin metal is commonly designated as sponge titanium because of its porous, spongelike texture. (auth)

255 STANDARD SPECIFICATION FOR SEAMLESS AND WELDED AUSTENITIC STAINLESS STEEL TUBING FOR GENERAL SERVICE. ASTM A 269-69. Philadelphia; American Society for Testing and Materials (1969). 5p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers grades of stainless steel tubing for general corrosion resisting and low- or high-temperature service. (auth)

256 STANDARD SPECIFICATION FOR WELDED AUSTENITIC STEEL BOILER SUPERHEATER, HEAT-EXCHANGER, AND CONDENSER TUBES. ASTM A 249-65. Philadelphia; American Society for Testing and Materials (1968). 5p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers welded tubes made from austenitic steels with various grades intended for such use as boiler superheater, heat exchanger, or condenser tubes. Grades TP304H, TP316H, TP321H, TP347H, and TP348H are modifications of grades TP304, TP316, TP321, TP347, and TP348 and are intended for high-temperature service such as for superheaters and reheaters. This specification covers tubes $\frac{1}{2}$ to 5 in. inclusive, in outside diameter and 0.035 to 0.320 in. inclusive, in minimum wall thickness. (auth)

257 STANDARD SPECIFICATION FOR SEAMLESS AND WELDED AUSTENITIC STAINLESS STEEL PIPE. ASTM A 312-70a. Philadelphia; American Society for Testing and Materials (1970). 8p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers seamless and welded austenitic steel pipe intended for high-temperature and general corrosive service. Sixteen grades are covered. Grades 1P 304H, TP 316H, 1P 321H, 1P 347H, and 1P 348H are modifications of Grades 1P 304, TP 316, TP 321, TP 317, and TP 348 and are intended for high-temperature service. Optional supplementary requirements are provided for pipe where a greater degree of testing is desired. These supplementary requirements call for additional tests to be made and when desired one or more of these may be specified in the order. (auth)

258 STANDARD FINISHES FOR CONTACT FACES OF PIPE FLANGES AND CONNECTING-END FLANGES OF VALVES AND FITTINGS. MSS Standard Practice SP-6 1929. Arlington, Va.; Manufacturers Standardization Society of the Valve and Fittings Industry (1963). 4p. Available from Manufacturers Standardization Society of the Valve and Fittings Industry, Arlington, Va.

Several types of contact faces for flanges are illustrated. The standard finishes for contact faces of pipe flanges and connecting end flanges of valves and fittings of bronze, cast iron, and steel or ductile iron are described. (G.M.C.)

259 STANDARD SPECIFICATION FOR GENERAL REQUIREMENTS FOR CARBON FERRITIC ALLOY AND AUSTENITIC ALLOY STEEL TUBES ASTM A 450-70 Philadelphia, American Society for Testing and Materials (1970) 8p Available from American Society for Testing and Materials Philadelphia

This specification covers a group of common requirements which, when specified in the purchase order or in an individual specification, shall apply to hot-finished and cold-drawn, welded and seamless carbon steel, and ferritic and austenitic alloy steel under each of the specifications issued by the American Society for Testing and Materials (auth)

260 STANDARD SPECIFICATION FOR CENTRIFUGALLY CAST AUSTENITIC COLD-WROUGHT PIPE FOR HIGH-TEMPERATURE SERVICE ASTM A 452-65 Philadelphia, American Society for Testing and Materials (1966) 7p Available from American Society for Testing and Materials Philadelphia

This specification covers austenitic steel pipe made by the centrifugal casting process, subsequently cold worked, and given a recrystallizing anneal. Pipe ordered to this specification is suitable for use in high-pressure, high-temperature services and shall be suitable for bending and other forming operations and for fusion welding. Selection will depend on design, service conditions, mechanical properties, and high-temperature characteristics. Several grades of austenitic steels are covered. Optional supplementary requirements are provided which call for additional tests, and when desired, shall be so stated in the purchase order together with the number of such tests required (auth)

261 STANDARD SPECIFICATION FOR SEAMLESS AND WELDED TITANIUM TUBE FOR CONDENSERS AND HEAT EXCHANGERS ASTM B 338-65 Philadelphia, American Society for Testing and Materials (1965) 5p Available from American Society for Testing and Materials Philadelphia

This specification covers six grades of seamless and welded titanium tubes intended for use in surface condensers, evaporators, and heat exchangers (auth)

262 STANDARD SPECIFICATION FOR TITANIUM AND TITANIUM ALLOY FORGINGS ASTM B 381-69 Philadelphia, American Society for Testing and Materials (1969) 4p Available from American Society for Testing and Materials Philadelphia

This specification covers seven grades of annealed titanium and titanium alloy forgings as follows: Grade F-1 to F-4 unalloyed titanium, Grade F-5—titanium alloy (6 percent aluminum, 4 percent vanadium), Grade F-6—titanium alloy (5 percent aluminum, 2.5 percent tin), and Grade F-7—unalloyed titanium plus palladium (auth)

263 STANDARD SPECIFICATIONS FOR REMELTED LITHIUM METAL IN INGOT FORM, ASTM B 357-66 Philadelphia, American Society for Testing and Materials (1967) 1p Available from American Society for Testing and Materials Philadelphia

These specifications cover one grade of remelted lithium metal in ingot form (auth)

264 STANDARD SPECIFICATION FOR CENTRIFUGALLY CAST AUSTENITIC STEEL PIPE FOR HIGH-TEMPERATURE SERVICE ASTM A 451-66 Philadelphia, American Society for Testing and Materials (1966) 6p Available from American Society for Testing and Materials Philadelphia

This specification covers austenitic alloy steel pipe made by the centrifugal casting process intended for use in high-temperature or nuclear-pressure service. Several grades of austenitic stainless steel are covered. Optional supplementary requirements are provided which call for additional tests to be made if desired (auth)

265 STANDARD SPECIFICATIONS FOR FORGED OR ROLLED STEEL PIPE FLANGES, FORGED FITTINGS, AND VALVES AND PARTS FOR HIGH-TEMPERATURE SERVICE ASTM A 105-68 Philadelphia, American Society for Testing and Materials (1968) 4p Available from American Society for Testing and Materials Philadelphia

These specifications cover forged or rolled steel pipe flanges, forged fittings, and valves and parts for high-temperature service. The term forgings shall be understood to cover one or all of the products mentioned above, either forged or rolled. Two grades of material are covered, designated grades I and II respectively, and are classified in accordance with their mechanical properties (auth)

266 STANDARD SPECIFICATIONS FOR SEAMLESS CARBON STEEL PIPE FOR HIGH-TEMPERATURE SERVICE ASTM A 106-68 Philadelphia, American Society for Testing and Materials (1968) 10p Available from American Society for Testing and Materials Philadelphia

These specifications cover seamless carbon steel pipe for high-temperature service in nominal sizes 1/2 to 26 in. inclusive, with nominal (average) wall thickness as given in ANSI B31.10-1953. Pipe having other dimensions may be furnished provided such pipe complies with all other requirements of these specifications. Pipe ordered under these specifications shall be suitable for bending, flanging, and similar forming operations. Supplementary requirements of an optional nature are provided for seamless pipe intended for use in central stations having steam service pressures of 100 psi and over and high temperatures or other applications where a superior grade of pipe is required. These supplementary requirements call for additional tests to be made (auth)

267 STANDARD SPECIFICATION FOR COLUMBIUM AND COLUMBIUM ALLOY STRIP, SHEET, FOIL, AND PLATE ASTM B 393-64 Philadelphia, American Society for Testing and Materials (1965) 7p Available from American Society for Testing and Materials Philadelphia

This specification covers unalloyed niobium and niobium alloy strip, sheet, foil, and plate as follows: Type 1—reactor grade unalloyed niobium; Type 2—commercial grade unalloyed niobium; and Type 3—reactor grade niobium alloy containing 1 zirconium (auth)

268 STANDARD SPECIFICATION FOR COLUMBIUM AND COLUMBIUM ALLOY INGOTS ASTM B 391-64 Philadelphia, American Society for Testing and Materials (1965) 5p Available from American Society for Testing and Materials Philadelphia

This specification covers unalloyed niobium and niobium alloy ingots prepared by fusion, compressing and sintering of powder or other suitable means to produce consolidated metal for processing to various basic shapes. The materials covered by this specification are: Type 1—reactor grade unalloyed niobium; Type 2—commercial grade unalloyed niobium; and Type 3—reactor grade niobium alloy containing 1 zirconium. When an alloy not listed in this specification is desired, the purchaser may specify changes in chemical composition and other requirements needed to obtain the desired material (auth)

269 STANDARD SPECIFICATION FOR COLUMBIUM AND COLUMBIUM ALLOY BAR, ROD, AND WIRE ASTM B 392-64 Philadelphia, American Society for Testing and Materials (1965) 6p Available from American Society for Testing and Materials Philadelphia

This specification covers unalloyed niobium and niobium alloy bar, rod, and wire as follows: Type 1—reactor grade unalloyed niobium; Type 2—commercial grade unalloyed niobium; and Type 3—reactor grade niobium alloy containing 1 zirconium (auth)

270 STANDARD SPECIFICATION FOR PRIMARY COLUMBIUM METAL ASTM B 383-64 Philadelphia, American Society for Testing and Materials (1965) 5p Available from American Society for Testing and Materials Philadelphia

This specification covers primary niobium metal, including virgin niobium metal for consolidation or melting. It also covers powder, roundels, beads, sponge, and other forms in which the primary metal may be produced. Two grades, reactor and commercial, are included (auth)

271 STANDARD SPECIFICATION FOR ELECTRIC-FUSION-WELDED STEEL PIPE FOR HIGH-PRESSURE SERVICE ASTM A 155-70 Philadelphia, American Society for Testing and Materials (1970) 7p Available from American Society for Testing and Materials Philadelphia

This specification covers electric-fusion-welded steel pipe suitable for high-pressure service and for use at high, intermediate, or lower temperatures, depending upon grade of material specified, in outside diameters 16 in. and larger with wall thicknesses up to 3,000 in. Pipe having other dimensions may be furnished provided such pipe complies with all other requirements of this specification. Pipe ordered under this specification shall be suitable for bending, flanging (vanstoning), corrugating, and similar forming operations. Several grades of carbon steel and alloy steel plates are covered, of different minimum specified tensile strengths and of flange or firebox quality, also, two different classes of welded joint quality as defined by heat treatment and radiographic requirements. Two classes of pipe are covered as follows: Class 1—all pipe to be heat treated and

radiographed and Class 2—all alloy steel pipe to be heat treated and carbon steel pipe $\frac{1}{4}$ in. and over in thickness to be heat treated (auth)

272 STANDARD SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS FOR BOLTS FOR HIGH-PRESSURE AND HIGH-TEMPERATURE SERVICE ASTM A 194-69 Philadelphia American Society for Testing and Materials (1969) 8p Available from American Society for Testing and Materials Philadelphia

This specification covers steel nuts for bolts used in high pressure or high temperature service in both twelve grades of mechanical properties varying in degree of severity are covered Grades 1 1 6 7 8 8C 8M 8F and 8F for service under the most severe conditions and Grades 1 and 1H for less severe service conditions (auth)

273 STANDARD SPECIFICATION FOR SEAMLESS FERRITIC AND AUSTENITIC ALLOY STEEL BOILER SUPERHEATER AND HEAT EXCHANGER TUBES ASTM A 213-70 Philadelphia American Society for Testing and Materials (1970) 7p Available from American Society for Testing and Materials Philadelphia

This specification covers seamless ferritic and austenitic steel boiler and superheater tubes and austenitic steel heat exchanger tubes designated Grades T 9 11 304 Grades 1P 304H 11 16H 1P 321H 1P 347H and 11 348H are modifications of Grades 11 304 11 316 1P 31 11 347 and 1P 348 and are intended for high temperature service such as for superheaters and reheaters This specification covers tubes to $\frac{1}{2}$ in. inclusive in outside diameter and 0.035 to 0.500 in. inclusive in minimum wall thickness (auth)

274 STANDARD SPECIFICATION FOR CARBON STEEL PLATES FOR PRESSURE VESSELS FOR INTERMEDIATE AND HIGHER TEMPERATURE SERVICE ASTM A 515-70 Philadelphia American Society for Testing and Materials (1970) 5p Available from American Society for Testing and Materials Philadelphia

This specification covers carbon-silicon steel plates in four tensile strength ranges designated Grades 55 60 65 and 70 intended primarily for intermediate or high temperature service in boilers and other pressure vessels It is expected that plates will be manufactured in accordance with coarse grain practice The maximum thickness plates of Grade 55 shall be 12 in. and Grade 60 65 and 70 shall be 8 in. This material is intended for fusion welding Welding technique is of fundamental importance and it is presupposed that welding procedure will be in accordance with approved methods (auth)

275 STANDARD SPECIFICATION FOR CARBON STEEL PLATES FOR PRESSURE VESSELS FOR MODERATE AND LOWER TEMPERATURE SERVICE ASTM A 516-70a Philadelphia American Society for Testing and Materials (1970) 5p Available from American Society for Testing and Materials Philadelphia

This specification covers carbon-manganese-silicon steel plates in four tensile strength ranges designated Grades 55 60 65 and 70 intended primarily for service at temperatures in pressure vessels where improved notch toughness is important The maximum thickness of plates of Grade 55 shall be 12 in. and of Grades 60 65 and 70 shall be 8 in. This material is intended for fusion welding Welding technique is of fundamental importance and it is presupposed that welding procedure will be in accordance with approved methods (auth)

276 STANDARD SPECIFICATION FOR STAINLESS AND HEAT-RESISTING CHROMIUM AND CHROMIUM-NICKEL STEEL PLATE SHEET AND STRIP FOR FUSION-WELDED UNFIRED PRESSURE VESSELS ASTM A 240-70 Philadelphia American Society for Testing and Materials (1970) 6p Available from American Society for Testing and Materials Philadelphia

This specification covers chromium-nickel stainless and heat resisting steel plate sheet and strip for fusion welded unfired pressure vessels (auth)

277 STANDARD SPECIFICATIONS FOR FORGED OR ROLLED ALLOY-STEEL PIPE FLANGES FORGED FITTINGS AND VALVES AND PARTS FOR HIGH-TEMPERATURE SERVICE ASTM A 182-69 Philadelphia American Society for Testing and Materials (1969) 9p Available from American Society for Testing and Materials Philadelphia

These specifications cover forged or rolled alloy steel pipe flanges forged fittings and valves and parts intended for high temperature service The term forgings shall be understood to cover one or all of the products mentioned above either forged

or rolled Twenty five grades are covered including eleven ferritic steels and fourteen austenitic steels Selection will depend upon design and service conditions mechanical properties and the high temperature characteristics The H grades of the 300 series are modifications of the standard 300 grades and intended for service above 1000 F (auth)

278 TENTATIVE SPECIFICATION FOR UNALLOYED URANIUM CASTINGS ASTM B 419-64T Philadelphia American Society for Testing and Materials (1965) 7p Available from American Society for Testing and Materials Philadelphia

A specification covering unalloyed uranium castings prepared from primary and secondary melting stock or both is presented (auth)

279 STANDARD SPECIFICATION FOR PRIMARY HAFNIUM METAL SPONGE AND OTHER FORMS ASTM B 414-67 Philadelphia American Society for Testing and Materials (1968) 4p Available from American Society for Testing and Materials Philadelphia

A specification is presented covering virgin hafnium metal commonly designated as sponge because of its porous sponge like texture it may also be in other forms such as chunklets The specification does not cover crystal bar (auth)

280 STANDARD SPECIFICATION FOR MANGANESE-MOLYBDENUM AND MANGANESE-MOLYBDENUM-NICKEL ALLOY STEEL PLATES FOR PRESSURE VESSELS ASTM A 302-70 Philadelphia American Society for Testing and Materials (1970) 5p Available from American Society for Testing and Materials Philadelphia

A specification covering manganese-molybdenum and manganese-molybdenum-nickel steel plates in two high tensile strength ranges designated Grades A B C and D for use in boilers and other pressure vessels is presented The minimum thickness of plates to be furnished to this specification is $\frac{1}{4}$ in. The maximum thickness is limited only by the capacity of the selected composition to respond to the heat treatment and meet the specified mechanical tests Welding technique is of fundamental importance and it is presupposed that welding procedure shall be in accordance with approved methods for this class of material (auth)

281 STANDARD METHOD OF TEST FOR DENSITY IN AIR OF MANUFACTURED CARBON AND GRAPHITE ARTICLES BY PHYSICAL MEASUREMENTS ASTM C 559-69 Philadelphia American Society for Testing and Materials (1969) 2p Available from American Society for Testing and Materials Philadelphia

A method covering the determination of the density of manufactured articles of carbon and graphite from measurements of weight and dimensions in air at 25 C is described The method is also applicable to boronated carbon or graphite a dispersion of boron in either carbon or graphite shapes used for control rods and neutron shielding in nuclear technology (auth)

282 TENTATIVE SPECIFICATION FOR UNALLOYED URANIUM MELTING STOCK ASTM B 420-64T Philadelphia American Society for Testing and Materials (1965) 6p Available from American Society for Testing and Materials Philadelphia

A specification covering unalloyed primary and secondary uranium melting stock or both is presented (auth)

283 STANDARD SPECIFICATION FOR COLUMBIUM AND COLUMBIUM ALLOY SEAMLESS AND WELDED TUBES ASTM B 394-70 Philadelphia American Society for Testing and Materials (1970) 6p Available from American Society for Testing and Materials Philadelphia

This specification covers wrought niobium and niobium alloy seamless and welded tubes as follows Type 1—reactor grade unalloyed niobium Type 2—commercial grade unalloyed niobium and Type 3—reactor grade niobium alloy containing 1 percent zirconium (auth)

284 AMERICAN STANDARD NUCLEAR GRADE, URANIUM METAL MELT STOCK, NUCLEAR GRADE URANIUM DIOXIDE, SINTERABLE, NUCLEAR GRADE, URANIUM DIOXIDE, COMPACTIBLE ANSI N 5 4, 5 5 5 6 1965 New York, American Institute of Chemical Engineers (1965) 40p Available from American National Standards Inst., New York

A specification is given for unalloyed nuclear grade primary uranium metal stock which includes depleted natural or enriched uranium metal of an available ^{235}U content in the form of debies buttons or cut pieces Specifications for nuclear

grade uranium dioxide as sinterable powder or compactible material cover depleted natural or enriched material of any available ^{235}U content. The physical and chemical requirements are defined (G M C)

285 LICENSING OF PRODUCTION AND UTILIZATION FACILITIES. 10 CFR 50 1969. Washington, D. C.; Superintendent of Documents, GPO (1970). 43p. Available from Superintendent of Documents, GPO, Washington, D. C.

Minimum requirements for quality assurance in the design of U.S. nuclear power plants employing water-cooled reactors are presented (H D R)

286 (WCAP-7669) NUCLEAR INSTRUMENTATION SYSTEM TOPICAL REPORT. Lipchak, J. B.; Stokes, R. A. (comps.) (Westinghouse Electric Corp., Pittsburgh, Pa. Nuclear Energy Systems [Div.]) Apr 1971. 56p.

The Nuclear Instrumentation System (NIS) is an integral part of the nuclear steam supply system provided for pressurized water reactor power plants. It monitors the power level of the reactor at all times and is used primarily for plant protection. It also provides appropriate alarm functions during plant operating and shutdown conditions. In addition, it provides a secondary control function, and indicates reactor status during start-up and power operation. The three overlapping ranges of instrumentation (source, intermediate and power) provide overpower trip protection at increasing levels during startup and at power operation. A functional description of the standard nuclear instrumentation system used on PWR plants is presented. The sensor types and the signal processing equipment for each of the channels are described (auth).

287 NATIONAL FIRE CODES. A COMPILATION OF NFPA CODES, STANDARDS, RECOMMENDED PRACTICES, AND MANUALS. VOLUME 9. OCCUPANCY STANDARDS AND PROCESS HAZARDS, 1970-71. Boston; National Fire Protection Association (1970). 826p. Available from National Fire Protection Association, Boston.

A selected group of standards and manuals on occupancies and process hazards is presented. Included are NFPA 801 Recommended Fire Protection Practice for Facilities Handling Radioactive Materials, and NFPA 802 Recommended Fire Protection Practice for Nuclear Reactors (H D R)

288 RECOMMENDED FIRE PROTECTION PRACTICE FOR NUCLEAR REACTORS. NFPA 802 1960. Boston, National Fire Protection Association (1960). 71p. Available from National Fire Protection Association, Boston.

Potential fire and explosion hazards in nuclear reactor facilities are discussed. Fire protection practices are described and problems of specific reactor types are examined (H D R)

289 LEGAL STANDARDS FOR NAVIGATION OF NUCLEAR SHIPS. de los Santos Lasuregui, Alfonso; Palomo, Luz Corretjer (Junta de Energia Nuclear, Madrid). Energ. Nucl. (Madrid); 15: No. 69, 41-51 (Jan-Feb 1971). (In Spanish).

The navigation of nuclear ships requires legal standards different from those that regulate the navigation of conventional ships. In turn, these standards, while forming part of what is called "Nuclear Law" have to be distinct from those that apply to fixed installations or to the transport of nuclear substances. This is the reason that there have been so many arrangements in connection with these ships, in spite of the small number of them, including two multilateral conventions and various bilateral accords as well as much national legislation occupied with the legal problems that surround nuclear ships (tr-auth)

290 SPECIAL CONSTRUCTION, ARRANGEMENT, AND OTHER PROVISIONS FOR NUCLEAR VESSELS. 46 CFR 37 1968. Washington, D. C.; Superintendent of Documents, GPO (1968). 2p. Available from Superintendent of Documents, GPO, Washington, D. C.

Requirements for the design, construction, inspection, certification, safety, and operation of ships utilizing nuclear energy for propulsion or for any other purpose are presented (H D R)

291 PIPING SYSTEMS AND APPURTENANCES. 46 CFR 56 1968. Washington, D. C.; Superintendent of Documents, GPO (1968). 30p. Available from Superintendent of Documents, GPO, Washington, D. C.

Specific limitations or modifications to USAS Code B31.1 for pressure and power piping to apply to ships and barges are presented (H D R)

292 SPECIAL CONSTRUCTION, ARRANGEMENT, AND OTHER PROVISIONS FOR NUCLEAR VESSELS. 46 CFR 79 1968. Washington, D. C.; Superintendent of Documents, GPO

(1968). 2p. Available from Superintendent of Documents, GPO, Washington, D. C.

Requirements for the design, construction, inspection, certification, safety, and operation of ships utilizing nuclear energy for propulsion or for any other purpose are presented (H D R)

293 SPECIAL CONSTRUCTION, ARRANGEMENT, AND OTHER PROVISIONS FOR NUCLEAR VESSELS. 46 CFR 99 1968. Washington, D. C.; Superintendent of Documents, GPO (1968). 3p. Available from Superintendent of Documents, GPO, Washington, D. C.

Requirements for the design, construction, inspection, certification, safety, and operation of ships utilizing nuclear energy for propulsion or for any other purpose are presented (H D R)

294 PROVISIONAL RULES FOR THE CLASSIFICATION OF NUCLEAR SHIPS. London; Lloyd's Register of Shipping (1965). 9p. Available from Lloyd's Register of Shipping, London.

Criteria for the design, fabrication, and operation of ships equipped with nuclear reactors for main propulsion are presented. Requirements are included for the hull, pressure vessels and components, reactor engineering, reactor control, complementary installations, and maintenance (H D R)

295 NUCLEAR PRESSURE VESSELS. 46 CFR 55 1968. Washington, D. C.; Superintendent of Documents, GPO (1968). 3p. Available from Superintendent of Documents, GPO, Washington, D. C.

Specific limitations or modifications to Section III of the ASME Code for nuclear vessels are presented (H D R)

296 STANDARD SPECIFICATION FOR TANTALUM ROD AND WIRE. ASTM B 365-70. Philadelphia; American Society for Testing and Materials (1970). 2p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers rods and wires of unalloyed tantalum in the following grades: powder metallurgy arc cast and electron-beam cast (auth)

297 STANDARD SPECIFICATION FOR ZIRCONIUM AND ZIRCONIUM ALLOY SHEET, STRIP, AND PLATE FOR NUCLEAR APPLICATION. ASTM B 352-67. Philadelphia; American Society for Testing and Materials (1968). 9p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers hot- and cold-rolled zirconium and zirconium alloy sheet, strip, and plate. Three grades designated as reactor grade zirconium and zirconium-tin alloys RA-1, RA-1, and RA-2 suitable for use in nuclear application are described. The products covered in this specification include the following forms and sizes: sheet 24 in. or more in width, under 0.187 in. in thickness; strip, less than 24 in. in width, under 0.187 in. in thickness, and plate, over 10 in. in width, 0.187 in. and over in thickness (auth)

298 STANDARD SPECIFICATION FOR WROUGHT ZIRCONIUM AND ZIRCONIUM ALLOY SEAMLESS AND WELDED TUBES FOR NUCLEAR SERVICE. ASTM B 353-69. Philadelphia; American Society for Testing and Materials (1969). 6p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers seamless and welded wrought zirconium and zirconium-alloy tubes for nuclear application. Three grades designated as reactor grade zirconium R-1, and zirconium-tin alloys RA-1 and RA-2, suitable for nuclear application are described (auth)

299 STANDARD METHOD FOR MEASUREMENT OF LATTICE SPACING OF NUCLEAR GRAPHITE. ASTM C 558-69. Philadelphia; American Society for Testing and Materials (1969). 2p. Available from American Society for Testing and Materials, Philadelphia.

This method covers the measurement of the characteristic lattice space in the (001) and (110) crystallographic directions in nuclear graphite (auth)

300 (CONF-710512-13) NUCLEAR CODE CLASS, SAFETY CLASS, AND QUALITY ADMINISTRATION; HOW THEY TIE TOGETHER. Seth W. B. (Westinghouse Electric Corp. Pittsburgh, Pa. PWR Systems Div.). 12 Feb 1971. 7p. (71-PVP-56). ASME, New York \$2.00.

From first national congress on pressure vessels and piping, San Francisco, Calif. (10 May 1971).

The Atomic Energy Commission in their General Design Criteria for Nuclear Power Plants Construction Permits set criteria for the power plants with the intent that industry would prepare

codes and standards to implement these General Design Criteria The 1971 ASME Boiler and Pressure Vessel Code Section III, Rules for Construction of Nuclear Power Plant Components defines three levels of "quality" in the code classes for pumps, valves, pipes and vessels but looks to systems safety criteria for guidance in selection of the appropriate code class for a specific application The American Nuclear Society has developed their Nuclear Safety Criteria for the Design of Stationary Pressurized-Water Reactor Plants which identifies safety classes for safety related systems in a pressurized-water reactor plant and correlates the code class to the safety class The applications of the correct ASME CODE Class to the ANS Safety Class and of Quality Administration (how sure you are that you got the quality you asked for) to justify the use of appropriate code class equipment in specific safety class systems are described (auth)

301 (A/CONF 49/P-43) **ROLE OF CODES AND STANDARDS IN ACHIEVING SAFE DEPENDABLE, AND ECONOMIC NUCLEAR POWER.** Joslin, Murray (Consultant), Lee, William S (Duke Power Co., Charlotte, N C.); Bender, Myer (Oak Ridge National Lab., Tenn.); Landis, John (Gulf General Atomic, Inc., San Diego, Calif.); Case, Edson (Division of Reactor Standards (AEC), Washington, D C.); Rosen, M A (Division of Reactor Development and Technology (AEC), Washington, D C.); Ramey, James T (Atomic Energy Commission, Washington, D C.) Sep 1971 13p (CONF-710901-4) Dep. NTIS.

Prepared for fourth international conference on the peaceful uses of atomic energy, Geneva Switzerland (6 Sep 1971)

The current nuclear standards program is described, which particular emphasis on organization and procedural features designed to expedite standards production It includes the standards organizations of the technical societies that do the vast bulk of standards drafting and updating work Statistics showing the number of workers supplied by various sectors of industry and government are included Methods by which priorities are established and progress in the principal priority efforts are indicated The various ways in which the USAEC is supporting the program are also described (auth)

302 (CONF-710416-, Paper 5) **ANS 3.1 QUALIFICATION STANDARD.** Reed, Glenn A. (Wisconsin Michigan Power Co., Appleton, Wis.). 22p.

From Symposium on training of nuclear facility personnel; Gatlinburg, Tenn. (19 Apr 1971).

In Papers presented at the symposium on training of nuclear facility personnel (1971).

A proposed standard for the selection and training of personnel for U S power reactors is presented (D C C)

303 **PRESSURE VESSEL CODES THEIR APPLICATION TO NUCLEAR REACTOR SYSTEMS. FINDINGS FROM A SURVEY BY THE INTERNATIONAL ATOMIC ENERGY AGENCY.** Technical Reports Series No. 56, 1966. Vienna; International Atomic Energy Agency (1966). 25p. Available from International Atomic Energy Agency, Vienna.

The replies of 15 member states to an inquiry concerning the problems of applying national pressure vessel codes to nuclear reactors are presented Included in the discussion are regulatory aspects of codes, scope and content of national codes, code applications, nuclear codes, and special requirements of codes for application to nuclear vessels 21 references (H D R)

304 **SAFETY CONSIDERATIONS FOR NUCLEAR POWER PLANTS ON MERCHANT SHIPS.** Technical and Research Bulletin No. 3-18 1965. New York; Society of Naval Architects and Marine Engineers (1965). 35p. Available from Society of Naval Architects and Marine Engineers, New York.

Guides for the design, construction, and operation of surface merchant ships containing nuclear power plants are presented. The guides cover containment, shielding, waste disposal, reactor loading and startup, controls and instrumentation, standby and emergency components, personnel, inspection and maintenance, and operating restrictions. (H D R)

305 (RDT-M-1-5-T) **SURFACING WELDING RODS AND ELECTRODES.** (Division of Reactor Development and Technology (AEC), Washington, D C.). 3 Apr 1968. 4p. RSO.

A standard prescribing requirements for surface welding rods and electrodes for use in nuclear and associated applications is presented (auth)

306 (RDT-E-4-6-T) **INTERMEDIATE HEAT EXCHANGER FOR LIQUID METAL SYSTEMS.** (Division of Reactor Development and Technology (AEC), Washington, D C.). Apr 1971. 47p. LMEC.

A standard prescribing requirements for intermediate heat ex-

changer for liquid metal systems for use in nuclear and associated applications is presented (auth)

307 (RDT-E-4-5-T) **FORCED-CIRCULATION COLD TRAP ASSEMBLY FOR REMOVAL OF SODIUM IMPURITIES** (Division of Reactor Development and Technology (AEC), Washington, D C.). Dec 1970 23p. LMEC.

A standard prescribing requirements for forced-circulation cold trap assembly for removal of sodium impurities for use in nuclear and associated applications is presented. (auth)

308 (RDT-C-17-1-T) **HIGH-TEMPERATURE ELECTRICAL CONNECTORS AND HERMETIC SEALS.** (Division of Reactor Development and Technology (AEC), Washington, D C.). Mar 1970 3p. LMEC

A standard prescribing requirements for high-temperature electrical connectors and hermetic seals for use in nuclear and associated applications is presented (auth)

309 **STANDARD SPECIFICATION FOR SHEATHED ELECTRICAL RESISTANCE HEATERS FOR NUCLEAR OR OTHER SPECIALIZED SERVICE.** ASTM E 420 1971. Philadelphia; American Society for Testing and Materials (1971). 13p. Available from American Society for Testing and Materials, Philadelphia.

Specifications are presented for the material, fabrication, design, inspection, and testing of cylindrical metal-sheathed electrical resistance heaters operated at a maximum heat-element temperature of 1050°C in nuclear or other special environments (L C L)

310 (RDT-M-2-9-T) **ZIRCONIUM AND ZIRCONIUM ALLOY FORGINGS AND EXTRUSIONS (ASTM B356 WITH ADDITIONAL REQUIREMENTS).** (Division of Reactor Development and Technology (AEC), Washington, D C.). May 1970. 10p. RSO.

A standard prescribing requirements for zirconium and zirconium alloy forgings and extrusions (ASTM B356 with additional requirements) for use in nuclear and associated applications is presented (TSS)

311 (RDT-M-2-8-T) **QUENCHED AND TEMPERED ALLOY STEEL FORGINGS FOR PRESSURE VESSEL COMPONENTS (MODIFIED ASTM A541).** (Division of Reactor Development and Technology (AEC), Washington, D C.). 22 Nov 1967. 8p. RSO

A standard prescribing requirements for quenched and tempered alloy steel forgings for pressure vessel components (Modified ASTM A541) for use in nuclear and associated applications is presented (TSS)

312 (RDT-M-8-1-T) **HELICAL AGE-HARDENABLE NICKEL-CHROMIUM-IRON ALLOY SPRINGS.** (Division of Reactor Development and Technology (AEC), Washington, D C.). 14 Feb 1969. 13p. RSO.

A standard prescribing requirements for helical age-hardenable nickel-chromium-iron alloy springs for use in nuclear and associated applications is presented (TSS)

313 (RDT-M-9-1-T) **MATERIAL AND FABRICATION REQUIREMENTS FOR Ni-Cr-Fe ALLOY SEAL APPLICATIONS.** (Division of Reactor Development and Technology (AEC), Washington, D C.). 14 Feb 1969. 4p. RSO

A standard prescribing requirements for material and fabrication requirements for Ni-Cr-Fe alloy seal applications for use in nuclear and associated applications is presented (TSS)

314 (RDT-C-7-14-T) **METAL SHEATH, CERAMIC INSULATED, THERMOCOUPLE, CABLE, AND HEATER BULK MATERIAL.** (Division of Reactor Development and Technology (AEC), Washington, D C.) Mar 1970. 12p. LMEC

A standard prescribing requirements for metal sheath, ceramic-insulated thermocouple, cable, and heater bulk material for use in nuclear and associated applications is presented (TSS)

315 (RDT-M-7-12-T) **NICKEL WIRE.** (Division of Reactor Development and Technology (AEC), Washington, D C.). Mar 1970. 3p. LMEC.

A standard prescribing requirements for nickel wire for use in nuclear and associated applications is presented (TSS)

316 (RDT-M-2-2-T) **STAINLESS AND HEAT-RESISTING STEEL FORGINGS (MODIFIED ASTM A182).** (Division of Reactor Development and Technology (AEC), Washington, D C.). 7 Feb 1969. 17p. RSO.

A standard prescribing requirements for stainless and heat-

resisting steel forgings (Modified ASTM A182) for use in nuclear and associated applications is presented (TSS)

- 317** (RDT-M-7-7-T) COBALT-CHROMIUM ALLOY BARS AND SHAPES. (Division of Reactor Development and Technology (AEC), Washington, D. C.). 1 Mar 1968. 7p. RSO.

A standard prescribing requirements for cobalt-chromium alloy bars and shapes for use in nuclear and associated applications is presented (TSS)

- 318** (RDT-M-7-6-T) CHROMIUM-NICKEL STEEL BARS AND FORGINGS, CORROSION RESISTANT, PRECIPITATION HARDENING. (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 17p. RSO

A standard prescribing requirements for chromium-nickel precipitation hardening corrosion resistant steel in wrought form for use in nuclear and associated applications is presented (TSS)

- 319** (RDT-M-7-9-T) ZIRCONIUM AND ZIRCONIUM ALLOY BARS, ROD AND WIRE (ASTM B351 WITH ADDITIONAL REQUIREMENTS). (Division of Reactor Development and Technology (AEC), Washington, D. C.). May 1970. 8p. RSO.

A standard prescribing requirements for zirconium and zirconium alloy bars, rod and wire (ASTM B351 with additional requirements) for use in nuclear and associated applications is presented (TSS)

- 320** (RDT-M-7-5-T) WROUGHT COBALT-CHROMIUM-TUNGSTEN-NICKEL ALLOY ROUNDS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 8p. RSO.

A standard prescribing requirements for wrought cobalt-chromium-tungsten-nickel alloy rounds for use in nuclear and associated applications is presented (TSS)

- 321** (RDT-M-7-13-T) CERAMIC INSULATED MAGNET WIRE. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1970. 6p. LMEC.

A standard prescribing requirements for ceramic-insulated magnet wire for use in nuclear and associated applications is presented (TSS)

- 322** (RDT-M-7-8-1) ALLOY WIRE, CORROSION AND HEAT RESISTANT, NICKEL BASE, ANNEALED. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 2p. RSO

A standard prescribing requirements for annealed corrosion and heat-resistant nickel-base alloy wire for use in nuclear and associated applications is presented (TSS)

- 323** (RDT-M-7-4-T) NICKEL-CHROMIUM-IRON ALLOY ROD, BAR, AND FORGINGS (MODIFIED ASTM B166). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 11p. RSO.

A standard prescribing requirements for nickel-chromium-iron alloy rod, bar, and forgings (modified ASTM B166) for use in nuclear and associated applications is presented (TSS)

- 324** (RDT-M-7-2-T) NICKEL-CHROMIUM-IRON AGE-HARDENABLE ALLOY BAR, ROD, AND FORGINGS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). 16 Jan 1968. 7p. RSO.

A standard prescribing requirements for nickel-chromium-iron age-hardenable alloy bars, rods, and forgings for use in nuclear and associated applications is presented (TSS)

- 325** (RDT-M-7-3-1) STAINLESS AND HEAT-RESISTING STEEL BARS AND SHAPES (MODIFIED ASTM A479). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 7 Feb 1969. 14p. RSO.

A standard prescribing requirements for stainless and heat-resistant steel bars and shapes (modified ASTM A479) for use in nuclear and associated applications is presented (TSS)

- 326** (RDT-E-10-3-T) TANK-LIQUID METAL SERVICE (Division of Reactor Development and Technology (AEC), Washington, D. C.). Sep 1970. 22p. LMEC.

A standard prescribing requirements for fabrication of austenitic stainless steel vessels for use in liquid metal service for use in nuclear and associated applications is presented (TSS)

- 327** STANDARD SPECIFICATION FOR ZIRCONIUM SPONGE AND OTHER FORMS OF VIRGIN METAL FOR NUCLEAR APPLICATION. ASTM B 349-67. Philadelphia; American Society for Testing and Materials (1968). 4p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers virgin zirconium metal commonly designated as sponge because of its porous, sponge-like texture, but it may also take other forms such as chunklets. One grade is described which is designated as reactor grade R-1 suitable for use in nuclear application. The most important characteristic of the reactor grade is its low nuclear cross section as achieved by removal of hafnium and careful quality control in manufacturing procedures to prevent contamination with other high cross-section materials (auth)

- 328** TENTATIVE SPECIFICATION FOR ZIRCONIUM AND ZIRCONIUM ALLOY INGOTS FOR NUCLEAR APPLICATION. ASTM B 350-67. Philadelphia; American Society for Testing and Materials (1968). 4p. Available from American Society for Testing and Materials, Philadelphia

This specification covers vacuum-arc-melted zirconium and zirconium alloy ingots for nuclear application. Three grades designated as reactor grade zirconium R-1 and zirconium-tin alloys RA-1 and RA-2 suitable for nuclear application are described (auth)

- 329** STANDARD SPECIFICATION FOR ZIRCONIUM AND ZIRCONIUM ALLOY FORGINGS AND EXTRUSIONS FOR NUCLEAR APPLICATION. ASTM B 356-67. Philadelphia; American Society for Testing and Materials (1968). 6p. Available from American Society for Testing and Materials, Philadelphia.

This specification covers zirconium and zirconium alloy forgings and extrusions for nuclear application. The forgings shall include all shapes which were formed with a hammer or a press while extrusions shall include all shapes formed by forcing material through a die, excluding tubing which is covered by the specification for zirconium and zirconium alloy seamless and welded tubing for nuclear applications (ASTM Designation B353). Three grades designated as reactor grade zirconium R-1 and zirconium-tin alloys RA-1 and RA-2, suitable for nuclear application are described (auth)

- 330** STANDARD SPECIFICATION FOR HOT-ROLLED AND COLD-FINISHED ZIRCONIUM AND ZIRCONIUM ALLOY BARS, ROD, AND WIRE FOR NUCLEAR APPLICATION. ASTM B 351-67. Philadelphia; American Society for Testing and Materials (1968). 9p. Available from American Society for Testing and Materials, Philadelphia

This specification covers hot- and cold-finished zirconium and zirconium alloy bars, rod and wire other than those required for reworking including rounds, squares and shapes. Three grades designated as reactor grade zirconium and Zr-Sn alloys RA-1 and RA-2 for use in nuclear application are described (auth)

- 331** STANDARD METHODS OF TEST FOR COMPRESSION SET INDUCED IN VULCANIZED RUBBER DURING EXPOSURE TO HIGH ENERGY NUCLEAR RADIATION. ASTM D 2309-68. Philadelphia; American Society for Testing and Materials (1968). 11p. Available from American Society for Testing and Materials, Philadelphia

These methods cover the testing of vulcanized rubber parts that are to be assembled in such a manner that the rubber will remain subjected to compressive stresses or shear during continuous exposure to high energy radiation. The types and dose rate of nuclear radiation included within the scope of these methods are described. Provisions were made for handling a time lapse of variable extent between application of the compressive load and the start of irradiation, and for the use of either macro- or microspecimens, alternative compression devices compatible with such specimens, and different modes of load application. Three methods are covered as follows: Method A—compression set under constant load with measurements performed at or near the site of irradiation, Method B—compression set under constant deflection with measurements performed at or near the site of irradiation, Method C—compression set under constant deflection with measurements performed at a site remote from irradiation facility (auth)

- 332** RECOMMENDED PRACTICE FOR EXPOSURE OF POLYMERIC MATERIALS TO HIGH ENERGY RADIATION. ASTM D 1672-66. Philadelphia; American Society for Testing and Materials (1966). 6p. Available from American Society for Testing and Materials, Philadelphia

The purpose of this recommended practice is to define conditions for the exposure of plastics and elastomers to high-energy radiation prior to determination of radiation induced changes in physical or chemical properties. The problems of measuring the properties of materials during irradiation are too varied and complex for consideration in this recommended practice. Only the conditions of irradiation are specified and not the specimens, so that the effect of radiation on any property may be determined

by the use of the appropriate specimens and test methods. The method describes procedures for five types of exposure, as follows: Procedure A—exposure at ambient conditions, Procedure B—exposure at controlled temperature, Procedure C—exposure in a medium other than air, Procedure D—exposure under load, and Procedure E—exposure combining two or more of the variables listed in procedures A through D. The method specifically covers the following kinds of radiation: gamma or x-radiation, electrons or beta radiation, neutrons, and mixtures of these such as reactor radiation. (auth)

333 RECOMMENDED PRACTICE FOR EXPOSURE OF ADHESIVE SPECIMENS TO HIGH-ENERGY RADIATION. ASTM D 1879-70. Philadelphia: American Society for Testing and Materials (1970). 5p. Available from American Society for Testing and Materials, Philadelphia.

The purpose of this recommended practice is to define conditions for the exposure of polymeric adhesives in bonded specimens to high-energy radiation prior to determination of radiation-induced changes in physical or chemical properties. The following kinds of radiation are covered: gamma or x-ray radiation, electron or beta radiation, neutrons, and mixtures of these such as reactor radiation. This practice specifies only the conditions of irradiation but does not cover the preparation of test specimens, testing conditions, or the evaluation of test. These are covered in the various ASTM methods or specifications for specific materials. Procedures are given for the following types of exposure: Procedure A—exposure at ambient conditions, Procedure B—exposure at controlled temperature, Procedure C—exposure in a medium other than air, Procedure D—exposure under load, and Procedure E—exposure combining two or more of the variables listed in Procedures A to D. (auth)

334 (EUR-4517, pp 235-41) FIELD EXPERIENCE WITH ELECTRICAL SUPPLY SYSTEMS IN CANADIAN NUCLEAR POWER STATIONS. Elston, K. (Hydro-Electric Power Commission of Ontario, Toronto)

Safety requirements and reliability standards concerning electrical systems for nuclear power plants in Canada are described. Performances for operating power reactor electrical systems are reviewed. (D C C)

335 (CONF-710315-11) ROLE OF THE NATIONAL LABORATORIES IN THE RDT STANDARDS PROGRAM. Hallett, W. J. (Argonne National Lab., Ill.). [1971]. 13p. Dep. NTIS.

From Conference on fast reactors; Palo Alto, Calif. (7 Mar 1971)

The RDT standards program and the parts played in it by the national laboratories are discussed. The efforts to develop standards for the Liquid Metal Fast Breeder Reactor (LMFBR) are reviewed. The RDT standards program will result in standards that will be the record of the technology developed for the LMFBR, technology based on tests of materials, components and systems designed and built to those standards. (auth)

336 (CONF-710315-9) ADAPTABILITY OF LWR QUALITY ASSURANCE STANDARDS TO THE LMFBR. Fidrych, L. F.; Hinko, K.; Stock, H. J. (General Electric Co., Sunnyvale, Calif. Breeder Reactor Development Operation). 16 Dec 1970. 7p. (71-NE-9). ASME, New York \$2.00.

From Conference on fast reactors; Palo Alto, Calif. (7 Mar 1971).

An appraisal of industry's position on the LMFBR program is presented concerning quality assurance standards. An account of the large body of standards that came to being during the LWR era and their relevance to the LMFBR are analyzed. The adaptability of these standards is dealt with in terms of quality assurance systems, plant design, equipment design and construction, and in-service inspection. The degree of urgency is discussed with which quality assurance standards are required to realize the commercial LMFBR era. (auth)

337 (NBS-SPEC PUBL-329) AN INDEX OF U. S. VOLUNTARY ENGINEERING STANDARDS. Covering those Standards, Specifications, Test Methods, and Recommended Practices Issued by National Standardization Organizations in the United States. Slattery, William J. (ed.) (National Bureau of Standards, Washington, D. C.). Mar 1971. 1000p. GPO \$9.00.

A computer-produced Index is presented that contains the permuted titles of more than 19,000 voluntary engineering and related standards, specifications, test methods, and recommended practices, in effect as of December 31, 1969, published by some 360 U. S. technical societies, professional organizations, and trade associations. The title of each standard can be found under all the significant key words which it contains. These key words are arranged alphabetically down the center of each page together with their surrounding context. The date of publication or last revision, the standard number, and an acronym designating the standards-

issuing organization appear as part of each entry. A list of these acronyms and the names and addresses of the organizations which they represent are found at the beginning of the Index. (auth)

338 (RDT-C-4-1-T) ORIFICE PLATE FOR ORIFICE FLANGE UNION. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jan 1971. 8p. RSO.

A standard prescribing requirements for orifice plate for orifice flange union for use in nuclear and associated applications is presented. (TSS)

339 (RDT-C-4-4-T) VENTURI FLOW TUBE FOR LIQUID SODIUM. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jan 1971. 19p. LMEC.

A standard prescribing requirements for Venturi flow tube for liquid sodium for use in nuclear and associated applications is presented. (auth)

340 (RDT-E-1-18-T) CLASS I VALVES FOR LIQUID METAL SERVICE. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1971. 60p. LMEC.

A standard prescribing requirements for Class I valves for liquid metal service for nuclear and associated applications is presented. (TSS)

341 (RDT-E-1-19-T) SMALL, CLASS II, LIQUID METAL VALVES. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Sep 1970. 35p. LMEC.

A standard prescribing requirements for small, Class II, liquid metal valves for nuclear and associated applications is presented. (TSS)

342 (RDT-E-3-9-T) ELECTROMAGNETIC PUMP FOR LIQUID METAL SERVICE. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Mar 1971. 46p. LMEC.

A standard prescribing requirements for electromagnetic pump for liquid metal service for nuclear and associated applications is presented. (TSS)

343 (RDT-E-4-13-T) FREEZE VENT FOR SODIUM SERVICE. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1971. 32p. LMEC.

A standard prescribing requirements for freeze vent for sodium service for nuclear and associated applications is presented. (TSS)

344 (RDT-E-10-2-T) GUARD VESSEL FOR PRIMARY SODIUM CONTAINING COMPONENTS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Nov 1970. 28p. LMEC.

A standard prescribing requirements for guard vessel for primary sodium containing components for nuclear and associated applications is presented. (TSS)

345 (RDT-F-7-2-T) PREPARATIONS FOR SEALING, PACKAGING, PACKING, AND MARKING OF COMPONENTS FOR SHIPMENT AND STORAGE. (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 29p. RSO.

A standard prescribing requirements for preparations for sealing, packaging, packing, and marking of components for shipment and storage for nuclear and associated applications is presented. (TSS)

346 (RDT-F-8-1-T) PRELOADING THREADED FASTENERS AND CLOSURES. (Division of Reactor Development and Technology (AEC), Washington, D. C.). 9 Feb 1969. 39p. RSO.

A standard prescribing requirements for preloading threaded fasteners and closures for nuclear and associated applications is presented. (TSS)

347 (RDT-M-1-1-T) CORROSION RESISTING CHROMIUM AND CHROMIUM-NICKEL STEEL COVERED WELDING ELECTRODES (MODIFIED ASTM A298). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 8p. RSO.

A standard prescribing requirements for corrosion-resisting chromium and chromium-nickel steel covered welding electrodes (modified ASTM A298) for nuclear and associated applications is presented. (TSS)

348 (RDT-M-6-2-T) MECHANICAL LOCKING DEVICES. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Mar 1969. 21p. RSO.

A standard prescribing requirements for mechanical locking devices for fasteners for use in nuclear and associated applications is presented. (auth)

349 (RDT-M-9-2-T) EXAMINATION REQUIREMENTS AND ACCEPTANCE STANDARDS FOR SEAL MEMBRANES. (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 4p. RSO.

A standard prescribing requirements for examination requirements and acceptance standards for seal membranes for use in nuclear and associated applications is presented (auth)

350 (RDT-M-11-1-T) NONMETALLIC SEAL MATERIALS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 9p. RSO.

A standard prescribing requirements for nonmetallic seal materials for nuclear and associated applications is presented (TSS)

351 (RDT-F-2-4-T) QUALITY VERIFICATION PROGRAM REQUIREMENTS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Oct 1969. 7p. RSO

A standard prescribing requirements for quality verification program requirements for nuclear and associated applications is presented (auth)

352 (RDT-F-3-4-T) ULTRASONIC SHEAR-WAVE EXAMINATION OF PLATES (MODIFIED ASTM A577). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 5p. RSO

A standard prescribing requirements for ultrasonic shear-wave examination of plates (modified ASTM A577) for nuclear and associated applications is presented (auth)

353 (RDT-F-3-5-T) LONGITUDINAL-WAVE ULTRASONIC EXAMINATION OF PLAIN AND CLAD STEEL PLATES (MODIFIED ASTM A578). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 8p. RSO.

A standard prescribing requirements for longitudinal-wave ultrasonic examination of plain and clad steel plates (modified ASTM A578) for nuclear and associated applications is presented (auth)

354 (RDT-F-3-6-T) NONDESTRUCTIVE EXAMINATION. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Mar 1969. 29p. RSO

A standard prescribing requirements for nondestructive examination for nuclear and associated applications is presented (auth)

355 (RDT-F-3-8-T) ULTRASONIC EXAMINATION OF METAL PIPE AND TUBING FOR LONGITUDINAL DISCONTINUITIES (MODIFIED ASTM E213). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 5p. RSO

A standard prescribing requirements for ultrasonic examination of metal pipe and tubing for longitudinal discontinuities (modified ASTM E213) for nuclear and associated applications is presented (auth)

356 (RDT-C-6-1-T) NaK-TRANSMISSION HIGH-TEMPERATURE PRESSURE TRANSMITTER FOR LIQUID METAL SERVICE. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Mar 1971. 31p. LMEC.

A standard prescribing requirements for the design, materials, fabrication, quality assurance, shipping, and performance of pressure transmitters for use in sodium or sodium-potassium alloy liquid metal systems at temperatures up to 1200°F is presented (W H K)

357 (RDT-F-3-3-T) ULTRASONIC EXAMINATION OF HEAVY STEEL FORGINGS (MODIFIED ASTM A388). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 7p. RSO.

A standard prescribing requirements for ultrasonic examination of heavy steel forgings (modified ASTM A388) for nuclear and associated applications is presented (TSS)

358 (RDT-F-7-1-T) CONTINUOUS IDENTIFICATION MARKING OF WROUGHT METAL PRODUCTS (Division of Reactor Development and Technology (AEC), Washington, D. C.). 7 Sep 1967. 6p. RSO.

A standard prescribing requirements for continuous identification marking of wrought metal products for nuclear and associated applications is presented (TSS)

359 (RDT-M-1-2-T) STAINLESS STEEL WELDING RODS AND BARE ELECTRODES (ASME SFA-5.9 WITH ADDITIONAL REQUIREMENTS). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1971. 11p. RSO.

A standard prescribing requirements for stainless steel welding rods and bare electrodes (ASTE SFA-5.9 with additional

requirements) for nuclear and associated applications is presented (TSS)

360 (RDT-M-1-3-T) MILD STEEL COVERED ARC-WELDING ELECTRODES (MODIFIED ASTM A233). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 4p. RSO.

A standard prescribing requirements for mild steel-covered welding electrodes (modified ASTM A233) for use in nuclear and associated applications is presented (TSS)

361 (RDT-M-1-4-T) LOW ALLOY STEEL COVERED ARC-WELDING ELECTRODES (MODIFIED ASTM A316). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 7p. RSO.

A standard prescribing requirements for low alloy steel covered arc welding electrodes (modified ASTM A316) for use in nuclear and associated applications is presented (auth)

362 (RDT-M-1-6-T) MILD STEEL ELECTRODES AND WELDING RODS FOR GAS-METAL-ARC WELDING (MODIFIED ASTM A559). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 5p. RSO.

A standard prescribing requirements for mild steel electrodes and welding rods for gas-metal-arc welding (modified ASTM A559) for use in nuclear and associated applications is presented (auth)

363 (RDT-M-1-7-T) COPPER AND COPPER ALLOY ARC WELDING ELECTRODES (MODIFIED ASTM B225). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 3p. RSO.

A standard prescribing requirements for copper and copper alloy arc-welding electrodes (modified ASTM B225) for nuclear and associated applications is presented (TSS)

364 (RDT-M-1-8-T) COPPER AND COPPER ALLOY WELDING RODS (MODIFIED ASTM B259). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 4p. RSO.

A standard prescribing requirements for copper and copper alloy welding rods (modified ASTM B259) for use in nuclear and associated applications is presented. (TSS)

365 (RDT-M-1-9-T) BRAZING FILLER METAL (MODIFIED ASTM B260). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 2p. RSO.

A standard prescribing requirements for brazing filler metal (modified ASTM B260) for use in nuclear and associated applications is presented (auth)

366 (RDT-M-1-10-T) NICKEL AND NICKEL ALLOY COVERED WELDING ELECTRODES (MODIFIED ASTM B295). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 4p. RSO.

A standard prescribing requirements for nickel and nickel alloy covered welding electrodes (modified ASTM B295) for use in nuclear and associated applications is presented (auth)

367 (RDT-M-1-11-T) NICKEL AND NICKEL-ALLOY BARE WELDING RODS AND ELECTRODES (MODIFIED ASTM B304). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 4p. RSO.

A standard prescribing requirements for nickel and nickel alloy bare welding rods and electrodes (modified ASTM B304) for use in nuclear and associated applications is presented (auth)

368 (RDT-M-1-16-T) ZIRCONIUM AND ZIRCONIUM ALLOY BARE WELDING RODS (ASTM B351 WITH ADDITIONAL REQUIREMENTS). (Division of Reactor Development and Technology (AEC), Washington, D. C.). May 1970. 7p. RSO.

A standard prescribing requirements for zirconium and zirconium alloy bare welding rods (ASTM B351) for nuclear and associated applications is presented. (TSS)

369 (RDT-M-2-1-T) CARBON STEEL FORGINGS (MODIFIED ASTM A105). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 17p. RSO.

A standard prescribing requirements for carbon steel forgings (modified ASTM A105) for nuclear and associated applications is presented. (TSS)

370 (RDT-M-2-3-T) WROUGHT SEAMLESS CARBON STEEL WELDING FITTINGS (MODIFIED ASTM A234). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 11p. RSO.

A standard prescribing requirements for wrought seamless carbon steel welding fittings (modified ASTM A234) for nuclear and associated applications is presented. (TSS)

371 (RDT-M-2-4-T) ALLOY STEEL FORGINGS (MODIFIED ASTM A336). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 13p. RSO.

A standard prescribing requirements for alloy steel forgings (modified ASTM A336) for nuclear and associated applications is presented. (TSS)

372 (RDT-M-2-5-T) FACTORY MADE WROUGHT AUSTENITIC STEEL WELDING FITTINGS (MODIFIED ASTM A403). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 10 Feb 1969. 11p. RSO.

A standard prescribing requirements for factory-made wrought austenitic steel welding fittings (modified ASTM A403) for nuclear and associated applications is presented. (TSS)

373 (RDT-M-2-6-T) LOW CARBON CHROMIUM STEEL FORGINGS (MODIFIED ASTM A473). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 8p. RSO.

A standard prescribing requirements for low carbon chromium steel forgings (modified ASTM A473) for nuclear and associated applications is presented. (TSS)

374 (RDT-M-2-7-T) QUENCHED AND TEMPERED VACUUM TREATED CARBON AND ALLOY STEEL FORGINGS FOR PRESSURE VESSELS (MODIFIED ASTM A508). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 7p. RSO.

A standard prescribing requirements for quenched and tempered vacuum treated carbon and alloy steel forgings for pressure vessels (modified ASTM A508) for nuclear and associated applications is presented (TSS)

375 (RDT-M-3-1-T) SEAMLESS CARBON STEEL PIPE FOR HIGH-TEMPERATURE SERVICE (MODIFIED ASTM A106). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 6p. RSO.

A standard prescribing requirements for seamless carbon steel pipe for high-temperature service (modified ASTM A106) for nuclear and associated applications is presented (TSS)

376 (RDT-M-3-2-T) STAINLESS AND ALLOY STEEL SEAMLESS TUBES (ASME SA-213 WITH ADDITIONAL REQUIREMENTS). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1971. 11p. RSO.

A standard prescribing requirements for stainless and alloy steel seamless tubes (ASME SA-213 with additional requirements) for nuclear and associated applications is presented (TSS)

377 (RDT-M-3-3-T) SEAMLESS AUSTENITIC STAINLESS STEEL PIPE (MODIFIED ASTM A376). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 13 Feb 1969. 12p. RSO.

A standard prescribing requirements for seamless austenitic stainless steel pipe (modified ASTM A376) for use in nuclear and associated applications is presented. (TSS)

378 (RDT-M-3-4-T) SEAMLESS ANNEALED NICKEL-CHROMIUM-IRON AND NICKEL-IRON-CHROMIUM ALLOY CONDENSER AND HEAT EXCHANGER TUBES (MODIFIED ASTM B163). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 6p. RSO.

A standard prescribing requirements for seamless annealed nickel-chromium-iron and nickel-iron-chromium alloy condenser and heat exchanger tubes for nuclear and associated applications is presented (auth)

379 (RDT-M-3-5-T) WELDED AUSTENITIC STAINLESS STEEL TUBING (MODIFIED ASTM A249). (Division of Reactor Development and Technology (AEC), Washington, D. C.). May 1969. 11p. RSO.

A standard prescribing requirements for welded austenitic stainless steel tubing (modified ASTM A249) for nuclear and associated applications is presented. (TSS)

380 (RDT-M-3-6-T) SEAMLESS AND WELDED AUSTENITIC STAINLESS STEEL PIPE (MODIFIED ASTM A312). (Division of Reactor Development and Technology (AEC), Washington, D. C.). May 1969. 11p. RSO.

A standard prescribing requirements for seamless and welded austenitic stainless steel pipe (modified ASTM A312) for nuclear and associated applications is presented. (TSS)

381 (RDT-M-3-7-T) WELDED LARGE DIAMETER STAINLESS STEEL PIPE (MODIFIED ASTM A358). (Division of Reactor Development and Technology (AEC), Washington, D. C.). May 1969. 11p. RSO.

A standard prescribing requirements for welded large diameter stainless steel pipe (modified ASTM A358) for nuclear and associated applications is presented. (TSS)

382 (RDT-M-3-8-T) ZIRCONIUM AND ZIRCONIUM ALLOY TUBES (ASTM B353 WITH ADDITIONAL REQUIREMENTS). (Division of Reactor Development and Technology (AEC), Washington, D. C.). May 1970. 9p. RSO.

A standard prescribing requirements for zirconium and zirconium alloy tubes (ASTM B353 with additional requirements) for nuclear and associated applications is presented. (TSS)

383 (RDT-M-3-12-T) SEAMLESS FERRITIC ALLOY STEEL PIPE (MODIFIED ASTM A335). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 14p. RSO.

A standard prescribing requirements for seamless ferritic alloy steel pipe (modified ASTM A335) for nuclear and associated applications is presented (TSS)

384 (RDT-M-4-1-T) CARBON-STEEL CASTINGS SUITABLE FOR FUSION WELDING FOR HIGH-TEMPERATURE SERVICE (MODIFIED ASTM A216). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 11p. RSO.

A standard prescribing requirements for carbon-steel castings suitable for fusion welding for high-temperature service (modified ASTM A216) for use in nuclear and associated applications is presented (auth)

385 (RDT-M-4-2-T) AUSTENITIC STAINLESS STEEL CASTINGS FOR HIGH-TEMPERATURE SERVICE (MODIFIED ASTM A351). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 10p. RSO.

A standard prescribing requirements for austenitic stainless steel castings for high-temperature service (modified ASTM A351) for use in nuclear and associated applications is presented (auth)

386 (RDT-M-4-3-T) COBALT-CHROMIUM ALLOY CASTINGS, WEAR AND CORROSION RESISTANT. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 7p. RSO.

A standard prescribing requirements for wear and corrosion-resistant cobalt-chromium alloy castings for use in nuclear and associated applications is presented (auth)

387 (RDT-M-5-1-T) CHROMIUM AND CHROMIUM-NICKEL STAINLESS STEEL PLATE, SHEET, AND STRIP (MODIFIED ASTM A240). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 14p. RSO.

A standard prescribing requirements for chromium and chromium-nickel stainless steel plate, sheet, and strip (modified ASTM A240) for use in nuclear and associated applications is presented (TSS)

388 (RDT-M-5-2-T) CARBON STEEL PLATES FOR PRESSURE VESSELS FOR MODERATE AND LOWER-TEMPERATURE SERVICE (MODIFIED ASTM A516). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 10 Jan 1968. 8p. RSO.

A standard prescribing requirements for carbon steel plates for pressure vessels for moderate and lower-temperature service (modified ASTM A516) for use in nuclear and associated applications is presented (auth)

389 (RDT-M-5-3-T) MANGANESE-MOLYBDENUM AND MANGANESE-MOLYBDENUM-NICKEL ALLOY STEEL PLATES, QUENCHED AND TEMPERED, FOR PRESSURE VESSELS (MODIFIED ASTM A533). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 7p. RSO.

A standard prescribing requirements for manganese-molybdenum and manganese-molybdenum-nickel alloy steel plates for pressure vessels (modified ASTM A533) for use in nuclear and associated applications is presented. (TSS)

390 (RDT-M-5-4-T) NICKEL-CHROMIUM-IRON ALLOY PLATE, SHEET, AND STRIP (MODIFIED ASTM B168). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 11p. RSO.

A standard prescribing requirements for nickel-chromium-iron alloy plates, sheets, and strips (modified ASTM B168) for nuclear and associated applications is presented. (TSS)

391 (RDT-M-5-5-T) CHROMIUM-MOLYBDENUM ALLOY STEEL PLATES (MODIFIED ASTM A387). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 14p. RSO.

A standard prescribing requirements for chromium-molybdenum alloy steel plates (modified ASTM A387) for nuclear and associated applications is presented. (TSS)

392 (RDT-M-5-6-T) ZIRCONIUM AND ZIRCONIUM ALLOY PLATE, SHEET, AND STRIP (ASTM B352 WITH ADDITIONAL REQUIREMENTS). (Division of Reactor Development and Technology (AEC), Washington, D. C.). May 1970. 8p. RSO.

A standard prescribing requirements for zirconium and zirconium alloy plate, sheet, and strip (ASTM B352 with additional requirements) for use in nuclear and associated applications is presented (auth)

393 (RDT-M-6-1-T) ALLOY STEEL BOLTING MATERIALS FOR LOW-TEMPERATURE SERVICE (MODIFIED ASTM A320). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 10p. RSO.

A standard prescribing requirements for alloy steel bolting materials for low-temperature service (modified ASTM A320) for use in nuclear and associated applications is presented (auth)

394 (RDT-M-6-3-T) ALLOY STEEL BOLTING MATERIALS FOR HIGH-TEMPERATURE SERVICE (MODIFIED ASTM A193). (Division of Reactor Development and Technology (AEC), Washington, D. C.). 14 Feb 1969. 14p. RSO.

A standard prescribing requirements for alloy steel bolting material for high-temperature service (modified ASTM A193) for use in nuclear and associated applications is presented (auth)

395 (RDT-M-7-1-T) LOW CARBON CHROMIUM STEEL BARS (MODIFIED ASTM A276). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 8p. RSO.

A standard prescribing requirements for low carbon chromium steel bars (modified ASTM A276) for nuclear and associated applications is presented (TSS)

396 (RDT-M-10-1-T) ZIRCONIUM AND ZIRCONIUM ALLOY INGOTS (ASTM B350 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington, D. C.). May 1970. 7p. RSO.

A standard prescribing requirements for zirconium and zirconium alloy ingots (ASTM B350 with additional requirements) for nuclear and associated applications is presented (TSS)

397 (RDT-M-13-1-T) REACTOR GRADE SODIUM-PURCHASE SPECIFICATIONS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jun 1970. 7p. LM&C.

A standard prescribing requirements for reactor grade sodium-purchase specifications for use in nuclear and associated applications is presented (TSS)

398 (RDT-F-3-37-T) SPECIAL REQUIREMENTS FOR METAL PRODUCTS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1971. 44p. RSO.

This standard provides requirements for the manufacture, examination or test of metal products which, when specified by a referencing standard, this standard, or other ordering document, must be satisfied in addition to all other requirements for the material. Some of these must be performed due to requirements of the ASME Boiler and Pressure Vessel Code, Section III, Nuclear Power Plant Components (hereafter called the Code) or other RDT standard requirements. Others are stated for the convenience of the designer or user who may specify them for reasons not related to the Code. Information is included on ductile-brittle transition and other mechanical test requirements, specimen and temperature condition standards for Charpy V-notch impact transition testing, nondestructive examination requirements, high neutron field applications, steel manufacturing process, P and S limitations, Co content limitations, grain size, extra low carbon grades, austenitic stainless steel, and welding materials qualification requirements. 13 referenced documents are listed. (L C L.)

399 (RDT-F-6-1-1) WELDING. (Division of Reactor Development and Technology (AEC), Washington, D. C.). 10 Feb 1969. 127p. RSO.

A standard prescribing requirements for welding, examining, and testing of watercooled reactor coolant systems and liquid metal heat transfer systems for nuclear and associated applications is presented (TSS)

400 (RDT-I-6-5-T) WELDING QUALIFICATIONS (SUPPLEMENT TO ASME BOILER AND PRESSURE VESSEL CODE SECTION IX). (Division of Reactor Development and Technology (AEC), Washington D. C.). Jul 1971. 41p. RSO.

A standard prescribing requirements for welding qualifications (supplement to ASME boiler and pressure vessel code Section IX) for nuclear and associated applications is presented (TSS)

401 (RDT-M-11-2-T) IMPREGNATED ASBESTOS PACKING MATERIAL. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 7p. RSO.

A standard prescribing requirements for impregnated asbestos packing material for nuclear associated applications is presented (auth)

402 (RDT-M-12-1-T) TEST REQUIREMENTS FOR THERMAL INSULATING MATERIALS FOR USE ON AUSTENITIC STAINLESS STEELS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1969. 19p. RSO.

A standard prescribing requirement for test requirements for thermal insulating materials for use on austenitic stainless steels for nuclear and associated applications is presented (auth)

403 (RDT-M-12-2-T) CALCIUM SILICATE BLOCK AND PIPE THERMAL INSULATION (ASTM C533 WITH ADDITIONAL REQUIREMENTS). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jun 1971. 6p. RSO.

A standard prescribing requirements for calcium silicate block and pipe thermal insulation (ASTM C533 with additional requirements) for nuclear and associated applications is presented (auth)

404 (RDT-E-15-2-T) REQUIREMENTS FOR NUCLEAR COMPONENTS. (SUPPLEMENT TO ASME BOILER AND PRESSURE VESSEL CODE, SECTION III). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1971. 25p. RSO.

Supplemental requirements for the construction of pressure-containing components of water cooled power reactors are presented. (H D R)

405 FUEL ASSEMBLY IDENTIFICATION. ANS 13.8 1971. Hinsdale, Ill. American Nuclear Society (1971). 6p. Available from American Nuclear Society, Hinsdale, Ill.

Requirements for the identification of fuel assemblies used in nuclear power plants are described. The characters and sequence to be used in assigning a facility identification prefix and a serial number are defined. (H D R)

406 BEGEBHARE SCHLEUSEN IN KERNKRAFTWERKEN ANFORDERUNGEN. (Access Locks in Nuclear Power Plants Requirements) DIN 25 406 1971. Berlin, Normblätter durch Beuth-Vertrieb GmbH (1971) 4p. Available from Normblätter durch Beuth-Vertrieb GmbH, Berlin.

In accordance with the present status of operational experience, standards are summarized for access locks in nuclear power plants. Under normal operations, the locks should permit easy recognition and accident free utilization. In emergencies, they should permit safe exit for personnel. For these standards, the case is considered in which a person using the lock is disabled during an emergency. Self-evident design aspects, such as tightness and pressure resistance of the lock are treated only cursorily. Compiled are definitions, general requirements, special requirements, manual activation, motor activation, control panels, energy supply, and additional equipment. (H B G)

407 (RDT-E-4-1-T) STEAM GENERATOR FOR PRESSURIZED WATER REACTORS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Oct 1969. 45p. RSO.

Requirements for the design, fabrication, testing, and inspection of steam generators for pressurized water power reactors are presented. (H D R)

408 (RDT-F-2-2-T) QUALITY ASSURANCE PROGRAM REQUIREMENTS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jun 1969. 44p. RSO.

General requirements are presented for planning, managing, conducting, and evaluating quality assurance programs for reactor development and test facility projects and associated processes, structures, components, and systems. These quality assurance requirements are based on proven practices and provide the means of control and verification whereby those responsible for project management can assure that the quality required for safe, reliable, and economical operation will be achieved. The objective of the programs covered by the standard is to assure that structures, components, systems, and facilities

are designed, developed, manufactured, constructed, operated, and maintained in compliance with established engineering criteria. To achieve this objective, controls are to be established and implemented at predetermined points, and necessary action taken to prevent, detect, and correct any deficiencies. (auth)

409 (RDT-F-5-1-T) CLEANING AND CLEANLINESS REQUIREMENTS FOR NUCLEAR REACTOR COMPONENTS. (Division of Reactor Development and Technology (AF-C) Washington D C.) Mar 1969 26p. RSO.

Minimum requirements for cleaning and cleanliness of vessels, heat exchangers, pumps, piping, valves and other fabricated components for nuclear service are presented. (auth)

410 (RDT-E-6-5-T) COLLAPSIBLE-ROTOR, ROLLER-NUT CONTROL ROD DRIVE MECHANISM FOR SODIUM SERVICE. (Division of Reactor Development and Technology (AEC), Washington, D C.). Mar 1971 55p. LMEC.

Requirements for the design, fabrication, assembly, and quality assurance for the procurement of the electro-mechanical devices intended to move and position control elements within the core of a liquid sodium cooled nuclear reactor are presented. Only those drive mechanisms based upon a collapsible-rotor roller-nut mechanical motor, energized by a magnetic field generated by an electrical coil are included. These control rod drive mechanisms may be connected to control rods having specific functions such as power regulation, power shimming, or safety shutdown, or any sequence or combination of these functions. (auth)

411 (CONF-700224-, Paper 5) INFLUENCE OF ENGINEERING INSPECTION STANDARDS ON THE MANUFACTURE OF NUCLEAR REACTOR PRESSURE VESSELS. van Veen, M. C. (Rotterdamsche Droogdok Maatschappij N. V. (Netherlands)). 12p.

From International symposium on non-destructive testing of nuclear power reactor components, Rotterdam, The Netherlands (26 Feb 1970).

In Proceedings of the international symposium on non-destructive testing of nuclear power reactor components (1970).

The effects of inspection standards on the cost and construction time of nuclear pressure vessels are examined. Both destructive and nondestructive tests necessary to comply with the required inspection standards represent 7 to 10% of the vessel cost and account for 15% of the total construction time. (H D R)

412 (RDT-C-16-1-T) SUPPLEMENTARY CRITERIA AND REQUIREMENTS FOR RDT REACTOR PLANT PROTECTION SYSTEMS. (Division of Reactor Development and Technology (AEC) Washington D. C.) Dec 1969 39p. RSO.

General criteria and requirements are presented for the design, fabrication and assembly, quality assurance, installation, testing, monitoring, calibration, surveillance, and modification of reactor and critical assembly plant protection systems. These include the system functional requirements for the instruments logic, and actuators. (auth)

413 (RDT-F-3-7-T) INSPECTION REQUIREMENTS FOR MATERIALS USED IN REACTOR COOLANT SYSTEM WEAR APPLICATIONS. (Division of Reactor Development and Technology (AEC), Washington, D C.). 6 Oct 1967. 6p. RSO.

Nondestructive examination requirements (visual, liquid penetrant, radiographic and hardness determinations) and acceptance standards for wear applications within reactor coolant systems such as anti-friction bearings, valve seats, thrust and journal sleeve bearings, and similar applications are presented. These requirements apply to finished and semi-finished hard surfaces and surfaces of wrought, cold worked, and cast materials used in wear applications in components such as pumps, valves and control rod drive mechanisms. (auth)

414 (RDT-F-6-10-T) REPAIR OF MATERIALS BY WELDING. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1971. 4p. RSO.

This standard sets forth requirements to be met in the repair of materials by welding. It is intended to be applied with referencing standards for basic material product forms. The requirements contained herein are intended to comply with the rules of ASME Boiler and Pressure Vessel Code, Section III, "Nuclear Power Plant Components", by being identical with or more stringent than its requirements. (auth)

415 SCHWEISSEN VON DRUCKBEHAELTERN FUER KERNKRAFTANLAGEN. (Welding of Pressure Vessels for Nuclear Power Plants). DVS 3002 1967. Krefeld, Ger., Deutscher Verband fuer Schweisstechnik e.V. (1967). 4p. Available from Deutscher Verband fuer Schweisstechnik e.V. Krefeld, Ger.

The standard concerns reactor pressure vessels of metallic structure for nuclear power installations. Strict technical safety requirements and aspects of economical performance are considered. In accordance with this standard, all other pressure vessels for nuclear power plants can also be welded. Standards are given for the preparation phase, the welding process, and test procedures. (H B G)

416 SCHWEISSEN VON SICHERHEITSBEHÄLTERN FUER KERNKRAFTANLAGEN. (Welding of Safety Vessels for Nuclear Power Plants). DVS 3001 1967. Krefeld, Ger. Deutscher Verband fuer Schweisstechnik e.V. (1967) 4p. Available from Deutscher Verband fuer Schweisstechnik e.V., Krefeld, Ger.

The standard concerns steel safety vessels for nuclear power plants. In case of a reactor incident, the vessels must withstand pressure elevations and must prevent escape of radioactive material, or must keep radioactive emission within permissible levels. The instruction is also applicable to locks and similar installations. Standards are given for the preparation phase, the welding process, and test procedures. (H B G)

417 SCHWEISSEN VON ROHRLEITUNGEN FUER KERNKRAFTANLAGEN. (Welding of Piping for Nuclear Power Plants). DVS 3003 1969. Krefeld, Ger., Deutscher Verband fuer Schweisstechnik e.V. (1969) 3p. Available from Deutscher Verband fuer Schweisstechnik e.V., Krefeld, Ger.

The standard concerns the welding of metal piping in nuclear power plants. Certain systems of nuclear power plants require special instructions for the quality of welding connections which deviate from those already in existence for the welding of pipes subjected to internal pressure. Standards are given for the preparation phase, the welding process, and test procedures. (H B G)

418 RULES FOR INSERVICE INSPECTION OF NUCLEAR REACTOR COOLANT SYSTEMS. ASME Boiler and Pressure Vessel Code, Section XI 1971. New York, American Society of Mechanical Engineers (1971). 22p. Available from American Society of Mechanical Engineers, New York.

Rules for inservice inspection of cooling system components and supports in light water cooled power reactors are presented. Included in the rules are classification of the areas subject to inspection, responsibilities, provisions for accessibility, definitions of examination methods, examination techniques and procedures, personnel qualifications, frequency of inspection, records, mapping, evaluation of inspection results, and disposition and repair requirements. (H D R)

419 RULES FOR CONSTRUCTION OF NUCLEAR POWER PLANT COMPONENTS. ASME Boiler and Pressure Vessel Code, Section III 1971. New York, American Society of Mechanical Engineers (1971). 614p. Available from American Society of Mechanical Engineers, New York.

Rules of safety governing the design, fabrication, installation, and inspection during construction of nuclear power plant components such as pressure vessels, piping, pumps, and valves are presented. The components for which the rules are specified include those components which are designed to provide a pressure-containing barrier, to act as a pressure-retaining member in the nuclear power system, or to support the reactor core. (H D R)

420 (CONF-710315-23) STANDARDS REQUIRED FOR LMFBR DESIGN AND CONSTRUCTION. Hobson, R. G. (Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.). [1970]. Contract AT(30-1)-4200. 36p. Dep. NTIS.

From Conference on fast reactors; Palo Alto, Calif. (7 Mar 1971).

Existing standards that might be applicable to a LMFBR are reviewed. The standards are examined in relation to a 300 MW(e) loop-type plant utilizing hot cell refueling. Actions needed for further standards development are suggested. (H D R)

421 (RDT-E-1-13-T) VALVE, ISOLATION, BUTTERFLY TYPE, RUBBER SEATED CONTAINMENT HEATING AND VENTILATING SYSTEMS FOR LIGHT WATER NUCLEAR POWER PLANTS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Dec 1970. 12p. RSO.

Requirements for wafer and flanged butterfly valves used as isolation valves in light water reactor containment vessel air recirculation systems are presented. (H D R)

422 (CONF-710315-12) DEVELOPMENT AND USE OF STANDARDS FOR THE LMFBR. Henrie, J. O.; Durand, R. E. (Atoms International, Canoga Park, Calif.). 9 Mar 1971. 15p.

From Conference on fast reactors; Palo Alto, Calif. (7 Mar 1971).

The development of LMFBR standards at Atomics International

is reviewed. Plans for developing fast breeder reactor standards are described. Some of the practices used in assuring a balanced implementation of standards are discussed. (D C C)

- 423** (RDT-F-6-11-T) FABRICATION OF PIPING SUB-ASSEMBLIES FOR LIQUID METAL SERVICE. (Division of Reactor Development and Technology (AEC), Washington D C) 23 Aug 1971 10p LMEC

A standard prescribing requirements for fabrication of piping subassemblies for liquid metal service for nuclear and associated applications is presented.

- 424** TOUGHNESS OF STEEL PLATES FOR REACTOR PRESSURE VESSELS. Susukida, H. (Mitsubishi Heavy Industries, Ltd., Kobe, Japan) Kinzoku Zairyo, 10 No 11, 17-23 (Nov 1970). (In Japanese)

With the increase in power output of light water power reactors the thickness of steel plates used for pressure vessels is increasing. Standards for the steel plates associated with nuclear applications are reviewed. Tests of the toughness using wedge opening loading and dynamic tear techniques are discussed. Plate thickness effects are discussed showing that the increase of plate thickness with increasing power of reactors adversely affects the toughness. The relations of plate thickness and NDT temperature are shown. Alloying elements and heat treatment are connected with hardenability. PV manufacturers are responsible for the heat treatment. Neutron irradiation increases strength however ductility and toughness are lowered. (Japan)

- 425** (KAPL-P-3937) IMPROVING POWER SYSTEM RELIABILITY THROUGH STANDARDIZATION WITH SPECIFIC REFERENCE TO NUCLEAR POWER REACTORS. Fleischmann, Walter L., Ringlee, Robert J. (Knolls Atomic Power Lab, Schenectady N Y) [15 Mar 1971] 65p Dep NTIS

The management practices to be applied to ensure reliable performance from nuclear power plants designed during rapidly evolving states of development are described. The practices include those established for data collection of outages of power plant equipment and those needed to ensure that experiences from operating plants and tests are fed into new designs of increased size. 47 references. (D C C)

- 426** IEEE STANDARD FOR ELECTRICAL PENETRATION ASSEMBLIES IN CONTAINMENT STRUCTURES FOR NUCLEAR FUELED POWER GENERATING STATIONS. IEEE No 317 1971 New York: Institute of Electrical and Electronics Engineers Inc. (1971) 11p. Available from Institute of Electrical and Electronics Engineers New York.

The mechanical, electrical, and test requirements for the design, construction, and installation of electrical penetration assemblies in containment structures for stationary nuclear fueled power generating stations are described. The electrical conductor and insulation characteristics of external circuits which connect to penetration assemblies are beyond the scope of these criteria. (auth)

- 427** IEEE CRITERIA FOR CLASS I ELECTRIC SYSTEMS FOR NUCLEAR POWER GENERATING STATIONS. IEEE No 308 1970 New York: Institute of Electrical and Electronics Engineers Inc. (1970) 8p. Available from Institute of Electrical and Electronics Engineers New York.

Those parts of the electric systems in stationary land based nuclear power generating stations that provide electric power to the Class I electric equipment are described. The electric systems included are comprised of the following interrelated systems: alternating-current power systems, direct current power systems, and vital instrumentation and control power systems. These systems consist of power supplies (e.g., connections to the station switchyard, generating units, batteries), distribution equipment, and components (e.g., transformers, switchgear, bus cable, battery chargers, inverters) and instrumentation and controls (e.g., relays, meters, switches, control devices). This standard does not apply to the station generator, generator buses, step-up and auxiliary transformers, switchyard, the transmission lines, and the transmission network. (auth)

- 428** IEEE TRIAL-USE STANDARD. GENERAL GUIDE FOR QUALIFYING CLASS I ELECTRIC EQUIPMENT FOR NUCLEAR POWER GENERATING STATIONS. IEEE No 323 1971 New York: Institute of Electrical and Electronics Engineers Inc. (1971) 7p. Available from Institute of Electrical and Electronics Engineers New York.

The basic requirements for the qualification of Class I electric equipment are described. This is equipment which is essential to the safe shutdown and isolation of the reactor or whose failure or

damage could result in significant release of radioactive material. (auth)

- 429** PROPOSED IEEE CRITERIA FOR NUCLEAR POWER PLANT PROTECTION SYSTEMS. IEEE No 279 1968 New York: Institute of Electrical and Electronics Engineers Inc. (1968) 10p. Available from Institute of Electrical and Electronics Engineers New York.

Minimum requirements for the safety related functional performance and reliability of protection systems for stationary land based nuclear reactors producing steam for electric power generation is described. Fulfillment of these requirements does not necessarily fully establish the adequacy of protective system functional performance and reliability. On the other hand, omission of any of these requirements will in most instances be an indication of system inadequacy. The nuclear power plant protection system encompasses all electric and mechanical devices and circuitry (from sensors to actuation device input terminals) involved in generating those signals associated with the protective function. These signals include those that actuate reactor trip and that in the event of a serious reactor accident, actuate engineered safeguards such as containment isolation, core spray, safety injection, pressure reduction, and air cleaning. (auth)

- 430** DEVELOPMENT AND IMPLEMENTATION OF EQUIPMENT MAINTENANCE STANDARDS FOR NUCLEAR REACTORS. Clement, T M. (Douglas United Nuclear, Inc., Richland, Wash.) Trans. Amer. Nucl. Soc., 14 Suppl. 2, 45-6 (1971).

From Conference on reactor operating experience, Denver, Colo. (8 Aug 1971). See CONF-710808.

- 431** STANDARD SPECIFICATION FOR TANTALUM AND TANTALUM ALLOY TUBING. ASTM B521-70 Philadelphia: American Society for Testing and Materials (1970) 5p. Available from American Society for Testing and Materials Philadelphia.

This specification covers tantalum and tantalum alloy tubing of the following types: Alloy 400—unalloyed tantalum, and Alloy 401—tantalum-10 percent tungsten. (auth)

- 432** STANDARD SPECIFICATION FOR QUENCHED AND TEMPERED CARBON AND ALLOY STEEL FORGINGS FOR PRESSURE VESSEL COMPONENTS. ASTM A541-69 Philadelphia: American Society for Testing and Materials (1969) 8p. Available from American Society for Testing and Materials Philadelphia.

This specification covers requirements for quenched and tempered carbon and alloy steel forgings for pressure vessel components. Eight classes of steel are covered. The maximum section thickness for forgings of the various classes is limited by the ability of the selected composition to respond to the heat treatment and meet the specified mechanical tests. The maximum section thickness to which the various classes can normally be furnished is listed. All classes are considered weldable under proper conditions. Welding technique is of fundamental importance, and it is presupposed that welding procedure and inspection will be in accordance with approved methods for the class of material used. (auth)

- 433** STANDARD SPECIFICATION FOR HIGH-STRENGTH ALLOY STEEL PLATES, QUENCHED AND TEMPERED, FOR PRESSURE VESSELS. ASTM A517-70 Philadelphia: American Society for Testing and Materials (1970) 7p. Available from American Society for Testing and Materials Philadelphia.

This specification covers high-strength quenched and tempered alloy steel plates intended for use in fusion-welded boilers and other pressure vessels. The maximum thickness of plates to be specified under this specification shall be 1/4 in. for Grades A, B, C, D, and J, 2 in. for Grades G, H, K, L, and M, and 2 1/2 in. for Grades E, F, and P. Welding technique is of fundamental importance and must be such as to not adversely affect the properties of the plate, especially in the heat affected zone. It is presupposed that welding procedures will be suitable for the materials being welded. (auth)

- 434** STANDARD SPECIFICATION FOR EIGHT AND NINE PER CENT NICKEL ALLOY STEEL PLATE, QUENCHED AND TEMPERED, FOR PRESSURE VESSELS. ASTM A553-71 Philadelphia: American Society for Testing and Materials (1971) 6p. Available from American Society for Testing and Materials Philadelphia.

This specification covers water quenched and tempered 8 and 9 percent nickel alloy steel plate for use in pressure vessels. This specification includes two types of steel, Type A and Type B. The maximum thickness of plates is limited only by the capacity of the composition to meet the specified mechanical property requirements, however, current practice normally limits the thickness of

plates furnished under this specification to 2 in. maximum. This material is intended primarily for fusion welding. (auth)

435 STANDARD SPECIFICATION FOR NICKEL-COBALT-MOLYBDENUM-CHROMIUM ALLOY STEEL PLATES QUENCHED AND TEMPERED FOR PRESSURE VESSELS ASTM A605-70 Philadelphia American Society for Testing and Materials (1970) 3p Available from American Society for Testing and Materials Philadelphia

This specification covers a class of 9 percent nickel, 4 percent cobalt, molybdenum-chromium alloy steel plates at an ultimate tensile strength level of 190 to 220 ksi for use in the quenched and tempered condition, and intended for the construction of pressure vessels and other pressure equipment. Construction involving fusion welding is intended and welding technique is of fundamental importance. The minimum thickness of plates to be furnished to this specification is $\frac{3}{16}$ in. and the maximum thickness is 6 in. Supplementary requirements are provided for use when additional testing or inspection is desired. These shall apply only when specified individually by the purchaser in the order. (auth)

436 STANDARD SPECIFICATION FOR CHROMIUM-MOLYBDENUM ALLOY STEEL PLATES QUENCHED AND TEMPERED FOR PRESSURE VESSELS ASTM A542-70 Philadelphia American Society for Testing and Materials (1970) 5p Available from American Society for Testing and Materials Philadelphia

This specification covers three classes of chromium-molybdenum steel plates for use in the quenched and tempered condition, intended for the fabrication of pressure vessels and other pressure equipment. Fabrication involving fusion welding is intended and welding technique is of fundamental importance. It is presupposed that welding procedures will be qualified in accordance with the applicable fabrication code requirements. The minimum thickness of plates to be furnished to this specification is $\frac{3}{16}$ in. The maximum thickness is limited only by the capacity of the specified composition to respond to heat treatment and meet specified mechanical tests. Supplementary requirements are provided for use when additional testing or inspection is desired. These shall apply only when specified individually by the purchaser in the order. (auth)

437 STANDARD SPECIFICATION FOR SUPPLEMENTARY REQUIREMENTS FOR NICKEL ALLOY PLATE FOR NUCLEAR APPLICATIONS ASTM B509-70 Philadelphia American Society for Testing and Materials (1970) 2p Available from American Society for Testing and Materials Philadelphia

This specification provides supplementary requirements for nickel-copper alloy, nickel-chromium-iron alloy, and nickel-iron-chromium alloy plate for nuclear applications. It is intended to be used in conjunction with a basic production specification. This specification applies to plate $\frac{3}{4}$ in. and over in thickness. (auth)

438 STANDARD SPECIFICATION FOR STAINLESS AND HEAT-RESISTING STEEL BARS AND SHAPES FOR USE IN BOILERS AND OTHER PRESSURE VESSELS ASTM A479-63 Philadelphia American Society for Testing and Materials (1963) 9p Available from American Society for Testing and Materials Philadelphia

This specification covers hot finished bars and cold finished bars of stainless and heat-resisting steel including rounds, squares, and hexagons and hot rolled or extruded shapes such as angles, tees, and channels for use in boiler and pressure vessel construction. (auth)

439 STANDARD SPECIFICATION FOR QUENCHED AND TEMPERED VACUUM TREATED CARBON AND ALLOY STEEL FORGINGS FOR PRESSURE VESSELS ASTM A508-69 Philadelphia American Society for Testing and Materials (1969) 9p Available from American Society for Testing and Materials Philadelphia

This specification covers quenched and tempered vacuum treated carbon and alloy steel forgings for pressure vessels such as those used in reactor systems. Specifically, it covers forgings for vessel closures, shells, flanges, tube sheets, rings, heads, and similar parts. All classes are considered weldable under proper conditions. Welding technique is of fundamental importance and it is presupposed that welding procedure and inspection will be in accordance with approved methods for the class of material used. (auth)

440 STANDARD SPECIFICATION FOR TITANIUM AND TITANIUM-ALLOY CASTINGS ASTM B367-69 Philadelphia American Society for Testing and Materials (1969) 4p Available from American Society for Testing and Materials Philadelphia

This specification covers ten grades of unalloyed titanium and titanium alloy castings as follows: Grades C-1 to C-4—unalloyed titanium, Grade C-5—Ti-6Al-4V, Grade C-6—Ti-5Al-2.5Sn, and Grades C-7A, C-7B, C-8A, C-8B are Ti-Pd. (auth)

441 STANDARD SPECIFICATION FOR PIPING FITTINGS OF WROUGHT CARBON STEEL AND ALLOY STEEL FOR MODERATE AND ELEVATED TEMPERATURES ASTM A234-71 Philadelphia American Society for Testing and Materials (1971) 6p Available from American Society for Testing and Materials Philadelphia

This specification covers wrought carbon steel and alloy steel fittings of seamless and welded construction for use in pressure piping and in pressure vessel fabrication for service at moderate and elevated temperatures. The term fitting applies to butt-welding, socket-end and threaded-end parts such as 45 and 90 elbows, 180 return bends, caps, tee reducers, lap-joint stub ends, and other types as covered by the latest revision of ANSI B16.9 MSS SP48, and ANSI B16.11. Optional supplementary requirements are provided for fittings where a greater degree of examination is desired. When desired, one or more of these supplementary requirements may be specified in the order. This specification does not cover cast welding fittings. (auth)

442 STANDARD SPECIFICATION FOR STAINLESS AND HEAT-RESISTING STEEL BARS AND SHAPES ASTM A276-70 Philadelphia American Society for Testing and Materials (1970) 7p Available from American Society for Testing and Materials Philadelphia

This specification covers hot finished or cold-finished bars except bars for rebar, including rounds, squares, and hexagons and hot rolled or extruded shapes such as angles, tees, and channels in the more commonly used types of stainless steels excluding the free-machining types for general corrosion resistance and high temperature service. (auth)

443 STANDARD SPECIFICATION FOR SEAMLESS FERRITIC ALLOY STEEL PIPE FOR HIGH TEMPERATURE SERVICE ASTM A335-70 Philadelphia American Society for Testing and Materials (1970) 9p Available from American Society for Testing and Materials Philadelphia

This specification covers nominal (average) wall seamless alloy-steel pipe intended for high temperature service. Pipe ordered to this specification shall be suitable for bending, flanging (vanstoning), and similar forming operations and for fusion welding. Selection will depend upon design, service conditions, mechanical properties, and high temperature characteristics. Several grades of ferritic steels are covered. Supplementary requirements (S1 to S6) of an optional nature are provided. These supplementary requirements call for additional tests to be made and when desired shall be so stated in the order, together with the number of such tests required. (auth)

444 STANDARD SPECIFICATION FOR CHROMIUM-MOLYBDENUM ALLOY STEEL PLATES FOR PRESSURE VESSELS ASTM A387-70 Philadelphia American Society for Testing and Materials (1970) 7p Available from American Society for Testing and Materials Philadelphia

This specification covers two groups of chromium-molybdenum steel plates of five compositions intended for use in boilers and other pressure vessels designed for elevated temperature service. Group I is composed of three grades containing not more than 1.5 per cent chromium and designated A, B, and C. Group II consists of two grades containing between 2 per cent and $3\frac{1}{2}$ per cent chromium and designated D and E, intended for mildly corrosive service as well as for elevated temperature service. The maximum thickness of plates of Group I and Group II is limited only by the ability of the selected composition to meet the mechanical tests. Welding technique is of fundamental importance and it is presupposed that welding procedures will be in accordance with an approved method for these grades of materials. Supplementary requirements are provided for use when additional testing or inspection is desired. These shall apply only when specified individually by the purchaser in the order. (auth)

445 STANDARD SPECIFICATION FOR STAINLESS AND HEAT-RESISTING STEEL FORGINGS ASTM A473-70 Philadelphia American Society for Testing and Materials (1970) 7p Available from American Society for Testing and Materials Philadelphia

This specification covers austenitic, ferritic, and martensitic stainless and heat-resisting steel forgings for general use and for low or high temperature service. (auth)

446 STANDARD SPECIFICATION FOR MANGANESE-MOLYBDENUM AND MANGANESE-MOLYBDENUM-NICKEL ALLOY STEEL PLATES QUENCHED AND TEMPERED FOR PRESSURE VESSELS ASTM A533-70 Philadelphia American Society for Testing and Materials (1970) 6p Available from American Society for Testing and Materials Philadelphia

This specification covers four grades of manganese-molybdenum and manganese-molybdenum-nickel alloy steel plates for use in the quenched and tempered condition and intended for the construction of pressure vessels and other pressure equipment. Construction involving fusion welding is intended and welding technique is of fundamental importance. It is presupposed that welding procedures will be qualified in accordance with the applicable fabrication code requirements. The minimum thickness of plates to be furnished to this specification is $\frac{1}{4}$ in. The maximum thickness of Classes 1 and 2 is limited only by the capacity of the selected composition to respond to the heat treatment and meet the specified mechanical tests. The maximum thickness of Class 3 is limited to 2 in. (auth)

447 STANDARD SPECIFICATION FOR CARBON-STEEL CASTINGS SUITABLE FOR FUSION WELDING FOR HIGH-TEMPERATURE SERVICE ASTM A216-70a Philadelphia American Society for Testing and Materials (1970) 6p Available from American Society for Testing and Materials Philadelphia

This specification covers carbon steel castings for valves, flanges, fittings, or other pressure containing parts for high temperature service and of quality suitable for assembly with other castings or wrought-steel parts by fusion welding. Three grades WCA, WCB, and WCC are covered in this specification. Selection will depend upon design and service conditions, mechanical properties, and the high-temperature characteristics. (auth)

448 STANDARD SPECIFICATION FOR ALLOY STEEL BOLTING MATERIALS FOR LOW-TEMPERATURE SERVICE ASTM A320-70 Philadelphia American Society for Testing and Materials (1970) 9p Available from American Society for Testing and Materials Philadelphia

This specification covers alloy steel bolting materials for pressure vessels, valves, flanges, and fittings for low-temperature service. Bolting material covers rolled, forged, or strain hardened bars, bolts, screws, studs, and stud bolts. Ten grades are covered, including both ferritic and austenitic steels designated L7, B8. Selection will depend on design, service conditions, mechanical properties, and low temperature characteristics. Nuts and washers for use with this bolting material are discussed. Supplementary Requirement S1 of an optional nature is provided. It shall apply only when specified in the inquiry, contract, and order. (auth)

449 STANDARD SPECIFICATION FOR SUPPLEMENTARY REQUIREMENTS FOR NICKEL ALLOY SEAMLESS PIPE AND TUBE FOR NUCLEAR APPLICATIONS ASTM B513-70 Philadelphia American Society for Testing and Materials (1970) 3p Available from American Society for Testing and Materials Philadelphia

This specification provides supplementary requirements for nickel-copper alloy, nickel-chromium-iron alloy, and nickel-iron-chromium alloy seamless pipe and tube for nuclear applications. It is intended to be used in conjunction with a basic production specification. This specification applies to cold drawn pipe and tube in sizes of $\frac{6}{16}$ in. and under in outside diameter and hot finished tube in sizes of $\frac{9}{16}$ in. and under in outside diameter. Three types of nondestructive testing requirements are covered and the purchase order should state which is to apply. (auth)

450 STANDARD SPECIFICATION FOR SUPPLEMENTARY REQUIREMENTS FOR NICKEL ALLOY ROD AND BAR FOR NUCLEAR APPLICATIONS ASTM B510-70 Philadelphia American Society for Testing and Materials (1970) 2p Available from American Society for Testing and Materials Philadelphia

This specification provides supplementary requirements for nickel-copper alloy, nickel-chromium-iron alloy, and nickel-iron-chromium alloy rod and bar for nuclear applications. It is intended to be used in conjunction with a basic production specification. Two nondestructive testing options are covered and the purchase order should state which is to apply. (auth)

451 AMERICAN NATIONAL STANDARD CLASSIFICATION OF UNIRRADIATED URANIUM SCRAP ANSI N15.1-1970 New York American National Standards Institute Inc (1970) 15p Available from American National Standards Institute New York

This standard of classifications applies to the area of cold uranium scrap. The purpose of this standard is to provide a

classification system with inherent flexibility which will provide a means for facilitating activities in the nuclear industry relevant to the classifications set forth in this standard. (auth)

452 (WCAP-4167-1 pp E 1-6) PLUTONIUM DIOXIDE-URANIUM DIOXIDE PELLETS (Westinghouse Electric Corp Pittsburgh Pa Nuclear Fuel Div)

In EEI-Westinghouse plutonium recycle demonstration program

This specification applies to solid cylindrical plutonium dioxide fuel pellets in the sintered and ground condition and fabricated via the mechanical blend route for use in thermal nuclear power reactors. The manufacturer shall maintain a uniform standard of quality to meet all the requirements of this specification. Disposition of all deviations shall require written approval prior to use. (auth)

453 TENTATIVE METHOD OF TEST FOR DELTA-IN-HOURS (DIH) PURITY OF NUCLEAR GRAPHITE ASTM C624-68T Philadelphia American Society for Testing and Materials (1968) 2p Available from American Society for Testing and Materials Philadelphia

This method covers the determination of delta in hours (DIH) purity of nuclear graphite. This method applies to graphites to be used for moderator or reflector components of nuclear reactors and subcritical test reactors and for thermal columns. Excluded from this method are graphites containing fissionable materials for use as fuel or driver elements and graphites containing materials having high neutron absorption cross sections for use as reactor control or safety devices. The size, number of samples, and authorization required for determining DIH purity are given. (auth)

454 TENTATIVE RECOMMENDED PRACTICE FOR REPORTING IRRADIATION RESULTS ON GRAPHITE ASTM C625-68T Philadelphia American Society for Testing and Materials (1968) 2p Available from American Society for Testing and Materials Philadelphia

This recommended practice covers information recommended for inclusion in reports giving graphite irradiation results. The purpose of this recommendation is to identify sample and test parameters that may influence graphite irradiation test results. This practice should not be construed as a requirement or recommendation that proprietary information be disclosed. (auth)

455 TENTATIVE DESCRIPTIVE NOMENCLATURE OF CONSTITUENTS OF AGGREGATES FOR RADIATION-SHIELDING CONCRETE ASTM C638-69T Philadelphia American Society for Testing and Materials (1969) 5p Available from American Society for Testing and Materials Philadelphia

This nomenclature is intended to give accurate descriptions of some common or important naturally occurring and synthetic constituents of aggregates for radiation-shielding concrete that at the same time are not common or important constituents of concrete aggregates in general use. While most of the minerals and rocks discussed below may occur in small quantities in aggregates in general use, they are not major constituents of such aggregates. Common constituents of aggregates in general use are described in ASTM Descriptive Nomenclature C 294. Constituents of Natural Mineral Aggregates. Radiation shielding concrete often contains such aggregates, but other special aggregates are used in some circumstances. The synthetic aggregates included are ferrophosphorus and boron frits. The descriptions are not adequate to permit the identification of materials since accurate identification of natural and synthetic aggregate constituents in many cases can only be made by a qualified geologist, mineralogist, or petrographer using the apparatus and procedures of these sciences. (auth)

456 TENTATIVE SPECIFICATION FOR AGGREGATES FOR RADIATION-SHIELDING CONCRETE ASTM C637-69T Philadelphia American Society for Testing and Materials (1969) 4p Available from American Society for Testing and Materials Philadelphia

This specification covers special aggregates for use in radiation-shielding concretes in which composition or high specific gravity or both are of prime consideration. (auth)

457 (A/CONF 49/P-285) STANDARD MODELS OF NUCLEAR PLANTS OF 200 MWE AND 400 MWE FOR DEVELOPING COUNTRIES Klees, P. Mommen, E. Pierard, A. May 1971 20p (CONF-710901-105) Dep. NTIS (U.S. Sales Only).

Prepared for 4th international conference on the peaceful uses of atomic energy, Geneva, Switzerland (6 Sep 1971).

The selection of the technical parameters can be guided by an optimization calculation. From its participation to the first PWR s

of medium power built in Europe and the progresses realized in the core technology, ACEC developed the parameters of a 200 MW(e) power plant. The core description, the selection of primary equipments and the auxiliary systems are described. The worldwide inventory of small power grids, their growth and interconnection prospects show that a 200 MW(e) unit size meets the requirements of numerous countries and can be integrated in the investment decisions to be taken henceforth 1975. Considering that the general tendency of doubling in 10 years the 200 MW(e) unit enables them to take advantage of the nuclear 10 years earlier than the present classical size of 400 MW(e) other things being equal. A 200 MW(e) station in eastern Pakistan is an example. 9 references (auth)

458 (A/CONF.49/P-671) DISCUSSION OF NUCLEAR PLANT SAFETY WITH REFERENCE TO OTHER HAZARDS EXPERIENCED BY THE COMMUNITY. Tattersall, J. O., Simpson, D. M., Reynolds, R. A. (Atomic Energy Board, Pretoria (South Africa)). May 1971. 14p. (CONF-710901-317). Dep. NTIS (U. S. Sales Only).

Prepared for 4th international conference on the peaceful uses of atomic energy, Geneva, Switzerland (6 Sep 1971).

Nuclear installation safety assessment and the comparison of risk due to the pressure of the installation with the existing hazards facing society are discussed. Reference is made to the continuous trend, particularly noticeable in the evolving technologies such as the aerospace and nuclear industries, of more positive and quantitative evaluation at the design stage. Noting that a probability approach to reactor safety is being actively studied by other workers in the field, the need to define a relationship between the magnitude of an activity release and the probability of the event is examined. Methods for achieving this by consideration of the reactor hazard and the frequency of other hazards normally tolerated by the community are discussed. The problem of detailed evaluation of the reactor design to ensure that it conforms to the limits so established is also mentioned. Recognizing that public acceptance of hazards is continuously changing, the limitations of applying standards accepted in the past to the risks that may arise in the future are already evident. Some mention is made of attempts to overcome this difficulty by consideration of the factors involved in the process whereby society establishes a tolerance level. (auth)

459 (CONF-701002-- pp 12-24) APPLICATION OF NUCLEAR STANDARDS IN THE DESIGN AND EVALUATION OF NUCLEAR REACTORS. Schmidt, Josef Johannes (International Atomic Energy Agency, Vienna (Austria)).

From Symposium on neutron standards and flux normalization; Argonne, Ill. (21 Oct 1970).

In Neutron standards and flux normalization.

The way standard neutron cross sections and data enter into reactor-design calculations is discussed and the dependence of fast reactor design parameters, such as effective multiplication factor, breeding ratio, Doppler coefficient, and others on standard data is investigated. From this, $\nu_{sp}(^{252}\text{Cf})$ and the fast ^{235}U fission cross sections are identified as particularly important standards. Furthermore, the need for reliable primary standards and for using mutually consistent standard data in reactor calculations is underlined. (45 references) (auth)

460 STANDARD SPECIFICATIONS FOR DEUTERIUM OXIDE. ASTM D2032-68. Philadelphia: American Society for Testing and Materials (1968). 2p. Available from American Society for Testing and Materials (1968).

Specifications are given for minimum requirements for D_2O to be used as a moderator in heavy water moderated reactors. These include: isotopic content of deuterium to equal or exceed 99.75 at %; electric conductivity not to exceed $15 \mu \text{ Ohms/cm}$; consumption of KMnO_4 not to exceed $1 \times 10^{-5} \text{ g/ml}$; turbidity not to exceed 5 nephelous units; total solids not to exceed 12 mg/l; and chlorides not to exceed 0.1 mg/l. Methods of testing are listed. (M. C. G.)

461 (RDT-E-3-3-T) VERTICAL, SHAFT-SEALED, MOTOR DRIVE, SINGLE-STAGE CENTRIFUGAL PUMP. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Oct 1970. 27p. RSO.

A standard prescribing requirements for a vertically mounted, single-stage, shaft-sealed, electric motor-driven, centrifugal pump classified as a Class 1 pump as required by paragraph 130 of the draft ASME Code for Pumps and Valves for Nuclear Power for service in water-cooled reactor systems is presented. (auth)

462 (RDT-E-4-17-T) HEAT EXCHANGER, CLASS 2, WATER-TO-WATER, STRAIGHT, OR U-TUBE. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1971. 28p. RSO.

A standard prescribing requirements for construction and

acceptance of water-to-water, shell and tube heat exchangers meeting the Class 2 requirements of the ASME Boiler and Pressure Vessel Code, Section III, Nuclear Power Plant Components is presented. It includes U-tube, straight tube, and special configuration types of heat exchangers. (auth)

463 (RDT-E-4-18-T) AIR-COOLED HEAT EXCHANGER FOR NUCLEAR STEAM-SUPPLIED SYSTEMS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Mar 1971. 30p. RSO.

A standard prescribing requirements for the mechanical design, thermal and hydraulic analyses, materials, fabrication, inspection, and testing of air-cooled heat exchanger assemblies for nuclear power plant applications is presented. (auth)

464 (RDT-E-5-1-T) PRESSURIZER FOR PRESSURIZED WATER REACTORS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Dec 1970. 45p. RSO.

The requirements for design, fabrication, testing and inspection of an electrically heated pressurizer for pressurized water nuclear reactors using either direct immersion or non-immersion type heaters are presented. (auth)

465 (RDT-F-5-2-T) ELECTRIC HEATER AND CONNECTOR ASSEMBLY FOR PRESSURIZER FOR PRESSURIZED WATER REACTOR. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Dec 1970. 25p. RSO.

The requirements for design, fabrication, testing and inspection of a single electric heater and connector assembly for pressurizers for pressurized water nuclear reactors are presented. (auth)

466 (RDT-E-13-15-T) FUEL ASSEMBLIES FOR PRESSURIZED WATER REACTORS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1971. 47p. RSO.

The requirements for fuel assemblies for pressurized water reactors typical of those (including associated clustered control rod assemblies or burnable poison rod assemblies) in commercial electric power utility service are presented. Specifically these requirements cover design, materials, process and personnel qualification, fabrication, assembly, quality assurance, test, inspection and examination, cleaning, packaging and shipping. A fuel assembly is defined as a fabricated assembly of fuel rod support structures (skeletons). Only Zircaloy clad fuel rods containing sintered uranium dioxide pellets are covered. (auth)

467 STANDARD REFERENCE RADIOGRAPHS FOR STEEL WELDS. ASTM E99-63. Philadelphia: American Society for Testing and Materials (1963). 2p. Available from American Society for Testing and Materials. Philadelphia.

A collection of reference radiographs is presented which covers types and degrees of discontinuities occurring in steel welds that are detectable by radiographic methods. The reference radiographs are in the form of mounted transparencies and are intended to serve as a guide for radiographic interpretation. No attempt was made to establish limits of acceptability for any discontinuity. However, where applicable and upon agreement of all interested parties, they may be used in production inspection to evaluate weld soundness as provided for in product specifications. (auth)

468 STANDARD REFERENCE RADIOGRAPHS FOR HEAVY-WALLED ($4\frac{1}{2}$ TO 12-IN) STEEL CASTINGS. ASTM E280-68. Philadelphia: American Society for Testing and Materials (1968). 3p. Available from American Society for Testing and Materials. Philadelphia.

Reference radiographs are presented which are reproductions of original radiographs and are supplied as a means of establishing the categories and severity levels of discontinuities in steel castings that may be revealed by radiographic examination. They may be used in accordance with contractual specifications. Radiographs for evaluation are to be compared with these reference radiographs for classification on the basis of the category and severity level of the discontinuity. These reference radiographs are applicable to nominal section thicknesses of $4\frac{1}{2}$ to 12 in (114 to 305 mm). (auth)

469 STANDARD METHOD FOR ULTRASONIC CONTACT INSPECTION OF WELDMENTS. ASTM E164-65. Philadelphia: American Society for Testing and Materials (1965). 6p. Available from American Society for Testing and Materials. Philadelphia.

A procedure for ultrasonically testing and inspecting welds by the reflection method using pulsed waves introduced by direct contact of the searching unit with the weldment is specified. The procedure is basically a manual method for thicknesses over $\frac{3}{16}$ in (5 mm). Specific variations for thin materials, automatic searching, and through transmission methods are not covered in detail.

but where adaptable, the procedure may be used with these variations. The test is conducted using angle projection of the ultrasonic beam by surface contact, except where indicated otherwise in the method. In special cases, pulsed longitudinal waves can be used as described in the Recommended Practice for Ultrasonic Testing by the Reflection Method, Using Pulsed Longitudinal Waves Induced by Direct Contact (ASTM Designation E 114) (auth).

470 STANDARD METHOD FOR ULTRASONIC INSPECTION OF METAL PIPE AND TUBING FOR LONGITUDINAL DISCONTINUITIES. ASTM E213-68. Philadelphia: American Society for Testing and Materials (1968). 4p. Available from American Society for Testing and Materials. Philadelphia.

A method is described for detecting longitudinal discontinuities in metal pipe and tubing using pulse-reflection ultrasonic contact or immersion techniques. It is intended to be used for tubular products having outside diameters from approximately $\frac{1}{2}$ to 6 in. These techniques have been used for smaller and larger sizes, however, and may be specified upon contractual agreement by the purchaser and the producer. The characteristic oblique entry of sound into the tube wall and the circumferential direction of the sound path are illustrated. (auth)

471 STANDARD REFERENCE RADIOGRAPHS FOR STEEL FUSION WELDS. ASTM E390-69. Philadelphia: American Society for Testing and Materials (1969). 4p. Available from American Society for Testing and Materials. Philadelphia.

Reference radiographs are presented which may be used to establish the types and severity levels of discontinuities that are revealed by radiographic examination. They may be used with contractual specifications. The three volumes of reference radiographs are based on seven nominal weld thicknesses and are applicable to seven thickness ranges up to 8 in. Each volume contains illustrations of representative graded and ungraded discontinuities. The discontinuity types and severities illustrated for each thickness of base material are listed. Each of the graded discontinuity types has five severity levels, 1 through 5 in order of increasing severity. The ungraded discontinuities are included for informational purposes. (auth)

472 STANDARD REFERENCE RADIOGRAPHS FOR STEEL CASTINGS UP TO 2 IN. (51MM) IN THICKNESS. ASTM E71-71. Philadelphia: American Society for Testing and Materials (1971). 2p. Available from American Society for Testing and Materials. Philadelphia.

Reference radiographs are presented which illustrate various types and degrees of discontinuities occurring in steel castings which have section thicknesses of up to 2 in. They are intended to provide the following: a guide enabling recognition of discontinuities and their differentiation both as to type and severity level, example radiographic illustrations of discontinuities and a nomenclature for reference in acceptance standards, specifications and drawings, and a source of reference radiographs from which purchasers and suppliers may, by mutual agreement, select particular radiographs to serve as standards representing minimum acceptability. At the same time, the standards so established may be unambiguously identified by alphabetic defect type designation and severity level. Two sets of reference radiographs are provided herein. One set made with 220 kV x rays is intended for the evaluation of radiographs made with relatively low energy radiation, (x rays up to 400 kV and iridium-192). The second set made with a radium source, is applicable to radiographs made with high energy radiation (1 and 2 MeV x rays, betatron x rays and cobalt-60 gamma rays). In each of these two sets, there are 31 radiographs which illustrate 7 different types of discontinuities of various severity grades or classes as in Table 1. (auth)

473 STANDARD SPECIFICATION FOR STRAIGHT-BEAM ULTRASONIC EXAMINATION OF PLAIN AND CLAD STEEL PLATES FOR SPECIAL APPLICATIONS. ASTM A578-71. Philadelphia: American Society for Testing and Materials (1971). 5p. Available from American Society for Testing and Materials. Philadelphia.

The procedure and acceptance standards are specified for straight-beam, pulse-echo ultrasonic examination of rolled carbon and alloy plain and clad steel plates $\frac{3}{4}$ in. thick and over for special applications. The method will detect discontinuities parallel to the rolled surfaces. Two levels of acceptance standards are provided. Supplementary requirements are provided for examination of clad plate and for alternative procedures. (auth)

474 PHYSICAL INVENTORIES OF NUCLEAR MATERIALS. ANSI N15.3-1971. New York: American National Standards Institute (1971). 7p. Available from American National Standards Institute. New York.

This standard specifies the minimum frequency for physical inventories and the fundamental steps which nuclear facility management shall take to ensure adequate physical inventories of nuclear materials. (auth)

475 RECORD AND REPORTING UNITS FOR NUCLEAR MATERIALS CONTROL. ANSI N15.2-1971. New York: American National Standards Institute (1971). 4p. Available from American National Standards Institute. New York.

The nuclear materials to which this standard shall apply include special nuclear materials such as uranium enriched in the isotope U-235 (subsequently referred to as "enriched uranium"), uranium enriched in the isotope U-233 (subsequently referred to as "uranium-233"), plutonium, and plutonium-238. This category shall be used if the contained isotope ^{238}Pu is greater than 10% of the total Pu element weight. Source materials are defined as uranium depleted in the isotope ^{235}U below 0.711 weight percent (subsequently referred to as "depleted uranium"), normal uranium, thorium, and tritium. This standard applies to records and reports of a facility which may reasonably be expected to be contributing to internal and external accountability. (auth)

476 GUIDE TO PRACTICE NUCLEAR MATERIAL CONTROL SYSTEMS FOR CONVERSION FACILITIES. ANSI N15.4-1970. New York: American National Standards Institute (1970). 12p. Available from American National Standards Institute. New York.

This standard establishes requirements for control of nuclear material in conversion facilities. The basic materials to be converted include yellow cake or similar crude uranium compounds, uranium or plutonium oxides or nitrate or uranium hexafluoride. The products of a conversion process include uranium hexafluoride, uranium or plutonium metal, uranium or plutonium oxides (chiefly UO_2 or PuO_2 or mixtures of these) or uranium or plutonium carbides, nitrides, etc. (auth)

477 TARGET FOR THE AEC'S REACTOR STANDARDS PROGRAM IN THE INSTRUMENTATION AND CONTROL AREA. Hagenstein, Paul L. (Division of Reactor Development and Tech., Washington, D.C.). IFFI (Inst. Elec. Electron. Eng.) Trans. Nucl. Sci., NS-18, No. 1, 332-6 (Feb. 1971). From IFFI nuclear science symposium. New York, N.Y. (4 Nov. 1970).

The development of standards for the IFFI instrumentation and control systems is described. (D.C.)

478 HOW NUCLEAR PIPING CODE RULES WILL INFLUENCE PIPING DESIGN TODAY AND TOMORROW. pp. 145-59 of Piping Systems. Chicago: Reinhold Publishing Corp. (1970).

From HPAC conference on piping systems; Chicago, Ill. (3 Nov. 1969). See CONF-691134.

A panel discussion of the development of the Nuclear Piping Code ANSI B31.7 and of the significance of this code to the design of, materials selection for, and operation of nuclear plant piping systems is presented. (L.C.L.)

479 QUALITY ASSURANCE AND IN-SERVICE INSPECTION OF NUCLEAR PIPING. Wylie, Robert. (Southwest Research Inst., San Antonio). pp. 139-42 of Piping Systems. Chicago: Reinhold Publishing Corp. (1970).

From HPAC conference on piping systems; Chicago, Ill. (3 Nov. 1969). See CONF-691134.

Quality assurance during construction and in-service inspection during operation are necessary to assure the reliability and safety of nuclear power plant piping systems. Both the ASME and ANSI have developed quality assurance standards for the materials, design, and construction of components in such piping systems. Methods are discussed for verifying that these standards are met. In-service inspection requirements for nuclear piping systems have been defined by ANSI. Acoustic emission and ultrasonic methods for performing these inspections are described. (L.C.L.)

480 POWER SUPPLY FOR AIR AND LAND VEHICLE-MOUNTED PROSPECTION EQUIPMENT FOR RADIOACTIVE MATERIALS. IEC Publication 253-1967. Geneva: Bureau Central de la Commission Electrotechnique Internationale (1967). 4p. (In French and English). Available from American National Standards Institute, New York.

Specifications are presented for the performance of storage batteries used as power supplies for air or land vehicle-mounted radioactive mineral prospecting equipment. (L.C.L.)

481 GUIDE LINES FOR PIPE SUPPORT CONTRACTUAL RELATIONSHIPS. MSS SP-77-1971. Arlington, Va.; Manu-

facturers Standardization Society of the Valve and Fittings Industry (1971). 3p.

Guide lines published by the Manufacturers Standardization Society of the Valve and Fittings Industry are presented for the use and convenience of engineers, pipe fabricators, pipe erectors, pipe hanger designers, pipe hanger manufacturers, and for their customers. Information is included on the functions of the pipe hanger contractor, the purchaser's engineer, and the pipe fabricator and/or erector. (L C L)

482 SPECIFICATION FOR CARBON AND LOW ALLOY STEEL CONTAINMENT STRUCTURES FOR STATIONARY NUCLEAR POWER REACTORS. BS 4208 1967. London; British Standards Institution (1967). 88p. Available from American National Standards Institute, New York.

The standard is concerned with design, construction, inspection, and testing of steel reactor containment structures for use at temperatures not exceeding 300°C. (J R D)

483 POWER SOURCES FOR PORTABLE PROSPECTING EQUIPMENT FOR RADIOACTIVE MATERIALS. IEC Publication 201 1965. Geneva; Bureau Central de la Commission Electrotechnique Internationale (1965). 4p. (In French and English). Available from American National Standards Institute, New York.

Specifications are presented for the size and voltage rating of Type R 20 primary cells for use as power supplies in self-contained portable equipment for radioactive ore prospecting. (L C L)

484 RECOMMENDATIONS FOR CRITICALITY SAFETY IN HANDLING AND PROCESSING FISSIONABLE MATERIALS. PART 1. PRINCIPLES OF CRITICALITY SAFETY. BS 3598 Pt. 1 1963. London; British Standards Institution (1963). 5p. Available from American National Standards Institute, New York.

Standards are presented to provide a guide in the prevention of criticality accidents in all operations with fissionable materials outside the cores of nuclear reactors, but within the boundaries of nuclear establishments. These operations include the handling, processing, storage, transport, and treatment of fissionable materials. (L C L)

485 STANDARD FOR ADMINISTRATIVE CONTROLS FOR NUCLEAR POWER PLANTS. Draft No. 6. ANS-3.2 1971. Hinsdale, Ill.; American Nuclear Society (1971). 41p.

Criteria for administrative controls necessary for the safe and efficient operation of nuclear power plants are presented. Test, mobile, and experimental reactors, as well as reactors not subject to AEC licensing, are excluded because of differences in operational practices and contractual requirements. (auth)

486 INSTALLATION, INSPECTION, AND TESTING REQUIREMENTS FOR INSTRUMENTATION AND ELECTRIC EQUIPMENT DURING THE CONSTRUCTION OF NUCLEAR POWER GENERATING STATIONS. IEEE Std 336 1971. New York; Institute of Electrical and Electronics Engineers, Inc (1971). 16p.

The requirements for installation, inspection, and testing of Class I and Class IE electric power, instrumentation, and control equipment and systems during the construction phase of a nuclear power generating station are described. These requirements are intended to assure that only materials and equipment of acceptable quality are incorporated into the plant, that quality is maintained and quality workmanship prevails throughout the construction process, and that completed installations conform to specified requirements, so as to promote public safety, prevent accidents and mitigate the consequences of accidents if they occur, and provide a high degree of plant reliability. (auth)

487 IEEE TRIAL-USE CRITERIA FOR THE PERIODIC TESTING OF NUCLEAR POWER GENERATING STATION PROTECTION SYSTEMS. IEEE Std 338 1971. New York; Institute of Electrical and Electronics Engineers, Inc (1971). 11p.

Minimum requirements for the safety-related functional performance and reliability of the protection system for stationary, land-based nuclear reactors producing steam for electric power generation are presented. These requirements include, but are not limited to, the capability for testing the protection system. (auth)

488 IEEE TRIAL-USE GUIDE FOR TYPE TESTS OF CONTINUOUS-DUTY CLASS I MOTORS INSTALLED INSIDE THE CONTAINMENT OF NUCLEAR POWER GENERATING STATIONS. IEEE Std 334 1971. New York; Institute of Electrical and Electronics Engineers, Inc (1971). 12p.

Tests are described that will yield data which verify that Class I continuous-duty electric motors installed within the containment

of nuclear power generating stations are capable of operating under design basis event conditions. (auth)

489 IEEE GUIDE FOR SEISMIC QUALIFICATION OF CLASS I ELECTRIC EQUIPMENT FOR NUCLEAR POWER GENERATING STATIONS. IEEE Std 344 1971. New York; Institute of Electrical and Electronics Engineers, Inc (1971). 11p.

Procedures are described that will yield data which verify that the Class I electric equipment can meet its performance requirements during and following a design basis earthquake. This guide may be used by equipment manufacturers to establish procedures that will yield data to substantiate performance claims or by equipment users to evaluate and verify performance of representative devices and assemblies as part of an overall qualification effort. (auth)

490 WASTE HEAT DISPOSAL FROM POWER GENERATING STATIONS. Brown, F. Stewart. (Federal Power Commission, Washington, D. C.). J. Power Div., Amer. Soc. Civil Eng., 96 No. PO3, 277-86 (Jun 1970).

Methods for disposing of waste heat from nuclear power plants are described. The effects of nuclear power plant operations on the environment are analyzed. Standards for regulating thermal discharges from power reactors are discussed. (D C C)

491 QUALITY-ASSURANCE STANDARDS AND PRACTICES. Langston, Merritt E. (Atomic Energy Commission, Washington, D. C.). Nucl. Safety; 12 No. 6, 549-52 (Nov-Dec 1971).

The U S Atomic Energy Commission has been taking many positive strengthening actions to establish and enforce a systematic, disciplined approach to the assurance of quality in advanced reactors and test facilities to provide for safe, reliable and economic operation in a timely and predictable manner. Some of these strengthening actions directed toward the development and application of quality-assurance standards and practices for advanced reactor development and technology programs are described. The assistance rendered to the ANSI Subcommittee N45-3 in the preparation of industry standards is reviewed. 10 references. (auth)

492 OPERATION OF FAST BURST REACTORS. ANS 14.1 1971. Hinsdale, Ill.; American Nuclear Society (1971). 7p.

A proposed standard for the design and operation of fast burst reactors is presented. The standard is applicable to all current fast burst reactors. The standard does not apply to repetitively pulsed reactors or booster assemblies. (auth)

493 OPERATIONAL GUIDES FOR NUCLEAR SHIPS AND CRITERIA FOR THEIR APPLICATION. Genshuryoku Inkaai Geppou 16 No. 1, 26-8 (Jan 1971). (In Japanese)

Operational guides and criteria for their application were formulated by the Atomic Energy Commission, based on a report by a nuclear energy safety standards group. The purpose is to ensure safety while in port and harbor with regard to the population. Fundamental conditions as to ship position, concerning the public safety, are given. As the guides of nuclear ship operation in port and harbor, the following are described: anchorage in harbors, mooring outside harbors, anchorages at a distance, navigation within harbors, and navigation along the coast. Finally, doses of radiation, as the criteria for application of the guides, are given briefly. (Japan)

494 SPECIFICATION FOR CARBON AND LOW ALLOY STEEL PRESSURE VESSELS FOR PRIMARY CIRCUITS OF NUCLEAR REACTORS. BS 3915 1965. London; British Standards Institution (1965). 81p. Available from American National Standards Institute, New York.

The standard covers the design, construction, inspection and testing of all primary pressure containing parts of nuclear reactors made of carbon or low alloy steel which fall within either of the following categories: Category A Pressure vessels and components which are intended to contain radioactive materials and are subject to neutron irradiation such that the physical properties of the materials of construction may be affected during the projected life of the nuclear installation or those which, from biological considerations of radioactivity, will be inaccessible for comprehensive periodic examination and maintenance. Category B Pressure vessels and components which are intended to contain radioactive materials in service but which on reactor shut-down, will be accessible for comprehensive examination and maintenance at any time during the projected life of the nuclear installation. (auth)

495 GENERAL PRINCIPLES OF NUCLEAR REACTOR INSTRUMENTATION. IEC Publication 231 1967. Geneva; Bureau Central de la Commission Electrotechnique Internationale

(1967). 34p (In French and English) Available from American National Standards Institute, New York.

The recommendation gives guidance on the provision of reactor instrumentation and recommends standards of good practice. The main body of the recommendation is of general application. Items of instrumentation are included only where they have a direct bearing on the over-all safety and effective control of the reactor (auth)

496 GENERAL PRINCIPLES OF NUCLEAR REACTOR INSTRUMENTATION IEC Publication 231A 1969 Geneva; Bureau Central de la Commission Electrotechnique Internationale (1969) 30p. (In French and English). Available from American National Standards Institute, New York.

Recommendations on standards for nuclear reactor instrumentation are presented. Guidelines for protection systems and general alarms are included (H D R)

497 GENERAL CHARACTERISTICS OF NUCLEAR REACTOR INSTRUMENTATION IEC Publication 232 1966 Geneva, Bureau Central de la Commission Electrotechnique Internationale (1966) 50p. (In French and English). Available from American National Standards Institute, New York.

Recommendations concerning the construction, quality and performance of electrical measuring assemblies used in the control and safety of nuclear reactors are presented. The variable measured may be nuclear (e.g., neutron flux or gamma radiation) or nonnuclear (e.g., temperature or pressure). In the latter case, the assembly or sub-assembly is considered only when it is part of a reactor control, instrumentation or safety equipment (auth)

498 PROPOSED IEEE CRITERIA FOR CLASS I ELECTRICAL SYSTEMS FOR NUCLEAR POWER GENERATING STATIONS. IEEE (Inst. Elec. Electron. Eng.), Trans. Nucl. Sci., NS-16 No. 4, 31-40 (Aug 1969).

Criteria and requirements for the electrical systems of nuclear generating stations specifically related to providing protection to the health and safety of the public are presented. These are based on the following: redundant systems that require electric power are provided to cope with design basis events, the conditions and the availability of the various portions of the systems following a design basis event cannot be predicted exactly, and the access to certain equipment following a design basis event may be limited for several months (auth)

499 RADIATION PENETRATION TEST AND ITS STANDARDS Sena Tomio (Osaka Univ. Suita Japan) Keikinokoku Yosetsu No. 99 105-9 (Mar 1971) (In Japanese)

For radiation penetration test, JIS Z 2341 (radiation penetration test method for metals) was established in 1955. Several JISs and NDISs (Japan Non-Destructive Testing Institute Standard) are established including test of fillet welds, pipe periphery butt welds and x-ray equipment and photosensitive materials. Penetrators and gradation gages are applied to indicate quality of images. In a few standards, correction of penetrometer discrimination is permitted when the absorption coefficient is different from wires of the penetrometer due to irradiated sample materials. There is growing tendency to adopt radiation quality gages for this problem. Since selection of testing method and determination of test conditions are generally important in nondestructive testing, qualification of test engineers is of great concern. Qualifying examinations of engineers have been performed by Japan Nondestructive Testing Institute. License with examination in accordance with JIS is also anticipated. These problems should also be discussed in relation to foreign standards (Japan)

500 INSPECTION AND STANDARDS FOR STEEL MATERIALS FOR NUCLEAR MACHINERY AND EQUIPMENT Sato Kazuki (Mitsubishi Steel Mfg Co Ltd Tokyo) Karyoku Hatsuden 22 No. 2, 216-20 (Feb 1971) (In Japanese)

With recent advances in nuclear power generation, demands are rising for establishment of manufacturing and inspection techniques and for the continuous supply of structural materials with stable properties. However, the standards and legal regulations have not been established. Mitsubishi Steel Mfg Co has engaged in the manufacture of reactor-grade steel for PWRs. Inspection and standards applied include those for materials, welding, quality control, and personnel. Standards are also included for inspection procedures for steel castings, such as nondestructive testing and affirmation of defect removal. Regulations applied for manufactured products include those for water chambers in steam generators, bent stainless steel pipes, stop valves, regulating valves, and turbine casings (Japan)

501 (RDT-A-1-1-T(10-71)) COOLANT COMPOSITION IN PRESSURIZED WATER REACTORS (Division of Reactor De-

velopment and Technology (AEC) Washington D. C.) Oct 1971, 9p RSO

Reactor coolant specifications for pressurized water reactors are presented. Impurity limits for makeup water and reactor coolant during normal operation and special plant conditions are specified. The use of chemical additives for pH control, reactivity control and suppression of radiolytic decomposition of reactor coolant is discussed and system design criteria are presented (auth)

502 (RDT-E-4-1-T(12-71)) STEAM GENERATOR FOR PRESSURIZED WATER REACTORS. (Division of Reactor Development and Technology (AEC), Washington D. C.) Dec 1971, 36p RSO

Construction and acceptance requirements of a pressurized water heated generator for nuclear power plants are presented (auth)

503 (RDT-E-13-1-T(6-71)) FAST FLUX TEST FACILITY CERAMIC GRADE PLUTONIUM DIOXIDE. (Division of Reactor Development and Technology (AEC), Washington, D. C.) Jun 1971, 15p. RSO.

The requirements for PuO_2 , ceramic grade, for use in the fabrication of mixed oxide fuel pellets are presented (auth)

504 (RDT-E-13-2-T(6-71)) FAST FLUX TEST FACILITY CERAMIC GRADE URANIUM DIOXIDE. (Division of Reactor Development and Technology (AEC), Washington, D. C.) Jun 1971, 13p. RSO.

The requirements for UO_2 , ceramic grade, for the fabrication of mixed oxide fuel pellets and insulator pellets are presented (auth)

505 (RDT-E-13-5-T(6-71)) FAST FLUX TEST FACILITY DRIVER FUEL PIN (Division of Reactor Development and Technology (AEC), Washington, D. C.) Jun 1971, 21p. RSO.

The requirements for driver fuel pins for the FFTF are presented. Driver fuel pins consist of PuO_2 - UO_2 pellets clad with Type 316 stainless steel (auth)

506 (RDT-E-13-6-T(6-71)) FAST FLUX TEST FACILITY DRIVER FUEL PIN FUEL PELLETS. (Division of Reactor Development and Technology (AEC), Washington, D. C.) Jun 1971, 28p. RSO.

The requirements for mixed PuO_2 - UO_2 fuel pellets to be used in the FFTF driver fuel pins are presented (auth)

507 (RDT-E-13-7-T(6-71)) FAST FLUX TEST FACILITY DRIVER FUEL PIN INSULATOR PELLETS (Division of Reactor Development and Technology (AEC), Washington, D. C.) Jun 1971, 16p. RSO.

The requirements for UO_2 insulator pellets to be used in the FFTF driver fuel pins are presented (auth)

508 (RDT-E-13-8-T(6-71)) FAST FLUX TEST FACILITY DRIVER FUEL PIN SEAMLESS CLADDING TUBE. (Division of Reactor Development and Technology (AEC), Washington, D. C.) Jun 1971, 34p. RSO

The requirements for 20% cold worked modified Type 316 stainless steel seamless tubes for FFTF driver fuel cladding are presented (auth)

509 (RDT-E-13-9-T(6-71)) FAST FLUX TEST FACILITY DRIVER FUEL PIN END CAPS (Division of Reactor Development and Technology (AEC) Washington D. C.) Jun 1971, 21p RSO

The requirements for driver fuel pin end caps for the FFTF which are to be made from 20% cold worked modified Type 316 stainless steel rod are presented (auth)

510 (RDT-E-13-10-T(6-71)) FAST FLUX TEST FACILITY DRIVER FUEL PIN REFLECTORS (Division of Reactor Development and Technology (AEC) Washington, D. C.) Jun 1971, 15p RSO

The requirements for Inconel 600 reflectors for use in FFTF driver fuel pins are presented (auth)

511 (RDT-E-13-11-T(6-71)) FAST FLUX TEST FACILITY DRIVER FUEL PIN PLENUM SPACER (Division of Reactor Development and Technology (AEC) Washington D. C.) Jun 1971, 16p RSO

The requirements for Type 316 stainless steel plenum spacers for FFTF driver fuel pins are presented (auth)

512 (RDT-E-13-12-T(6-71)) FAST FLUX TEST FACILITY DRIVER FUEL PIN PLENUM SPRING (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jun 1971 15p RSO.

The requirements for Type 302 stainless steel plenum springs to be used in FFTF driver fuel pins are presented (auth)

513 (RDT-E-13-13-T(6-71)) FAST FLUX TEST FACILITY DRIVER FUEL PIN WRAP WIRE (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jun 1971, 18p RSO.

The requirements for 17% cold worked modified Type 316 stainless steel wire for wrapping FFTF driver fuel pins are presented (auth)

514 (RDT-P-3-1-T(12-71)) ELECTRICAL PENETRATION ASSEMBLIES FOR NUCLEAR REACTOR CONTAINMENT STRUCTURES, (Division of Reactor Development and Technology (AEC), Washington, D. C.), Dec 1971, 15p. RSO

The requirements for the electrical penetrations and connectors to be used in transmitting electrical power, control, and instrumentation signals between equipment located inside a nuclear reactor containment vessel and facilities located external to the containment vessel are presented. The electrical penetrations will be attached to containment vessel nozzles (auth)

515 (RDT-E-3-2-T(8-69)) CENTRIFUGAL FREE-SURFACE SODIUM PUMP WITH ELECTRICAL DRIVE, (Division of Reactor Development and Technology (AEC), Washington, D. C.), Aug 1969, 71p. LMEC.

A standard prescribing requirements for centrifugal free surface sodium pump with electrical drive for nuclear and associated applications is presented (J R D)

516 (RDT-M-1-3-T(7-71)) MILD STEEL COVERED WELDING ELECTRODES (ASME SFA-5.1 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jul 1971, 7p. RSO

A standard prescribing requirements for mild steel covered welding electrodes (ASME SFA-5.1 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 1-3T dated February 1969 (J R D)

517 (RDT-M-1-5-T(7-71)) WELDING RODS AND ELECTRODES, SURFACING (AWS A5.13 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jul 1971 5p. RSO.

A standard prescribing requirements for welding rods and electrodes, surfacing (AWS A5.13 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT 1-5T, dated April 1968 (J R D)

518 (RDT-M-1-7-T(7-71)) COPPER AND COPPER ALLOY WELDING ELECTRODES (ASME SFA-5.6 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jul 1971, 7p. RSO.

A standard prescribing requirements for Cu and Cu alloy welding electrodes (ASME SFA-5.6 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT 1-7T dated February 1969 (J R D)

519 (RDT-M-1-8-T(7-71)) COPPER AND COPPER ALLOY WELDING RODS (ASME SFA-5.7 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jul 1971 5p. RSO

A standard prescribing requirements for Cu and Cu alloy welding rods (ASME SFA-5.7 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 1-8T dated February 1969 (J R D)

520 (RDT-M-1-9-T(7-71)) BRAZING FILLER METAL (ASME SFA-5.8 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.) Jul 1971, 4p. RSO

A standard prescribing requirements for brazing filler metal (ASME SFA-5.8 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 1-9T, dated February 1969 (J R D)

521 (RDT-M-1-10-T(7-71)) NICKEL AND NICKEL ALLOY COVERED WELDING ELECTRODES (ASME SFA-5.11 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jul 1971, 6p. RSO.

A standard prescribing requirements for Ni and Ni alloy covered

welding electrodes (ASME SFA-5.11 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 1-10T, dated February 1969 (J R D)

522 (RDT-M-1-11-T(7-71)) NICKEL AND NICKEL-ALLOY BARE WELDING RODS AND ELECTRODES (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jul 1971 6p. RSO.

A standard prescribing requirements for nickel and nickel alloy bare welding rods and electrodes for nuclear and associated applications is presented. This standard supersedes RDT M1-11T, dated February 1969 (J R D)

523 (RDT-M-1-15-T(1-72)) NICKEL-MOLYBDENUM-CHROMIUM ALLOY BARE WELDING RODS AND ELECTRODES (ASME SFA-5.14 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jan 1972 7p. RSO

A standard prescribing requirements for Ni-Mo-Cr alloy bare welding rods and electrodes (ASME SFA-5.14 with additional requirements) for nuclear and associated applications is presented (J R D)

524 (RDT-M-1-16-T(1-72)) ZIRCONIUM AND ZIRCONIUM ALLOY BARE WELDING RODS (ASTM B351 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jan 1972, 5p RSO.

A standard prescribing requirements for Zr and Zr alloy bare welding rods (ASTM B351 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M1-16T dated May 1970 (J R D)

525 (RDT-M-1-17-T(7-71)) MILD STEEL ELECTRODES FOR SUBMERGED ARC WELDING (ASME SFA-5.17 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jul 1971 7p RSO.

A standard prescribing requirements for mild steel electrodes for submerged arc welding (ASME-5.17 with additional requirements) for nuclear and associated applications is presented (J R D)

526 (RDT-M-1-19-T(1-72)) NICKEL-CHROMIUM-MOLYBDENUM-COLUMBIUM BARE WELDING RODS AND ELECTRODES (ASME SFA-5.14 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jan 1972 7p. RSO

A standard prescribing requirements for Ni-Cr-Mo-Nb bare welding rods and electrodes (ASME SFA-5.14 with additional requirements) for nuclear and associated applications is presented (J R D)

527 (RDT-M-2-1-T(7-71)) CARBON STEEL FORGINGS (ASME SA-105 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jul 1971, 9p. RSO.

A standard prescribing requirements for carbon steel forgings (ASME SA-105 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 2-1T dated February 1969 (J R D)

528 (RDT-M-2-2-T(1-72)) STAINLESS AND LOW ALLOY STEEL FORGINGS (ASME SA-182 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jan 1972 10p. RSO

A standard prescribing requirements for stainless steel and low alloy steel forgings (ASME SA-182 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 2-2T dated July 1971 (J R D)

529 (RDT-M-2-4-T(7-71)) ALLOY STEEL FORGINGS (ASME SA-336 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jul 1971, 10p. RSO.

A standard prescribing requirements for alloy steel forgings (ASME SA-336 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 2-4T dated February 1969 (R C K)

530 (RDT-M-2-7-T(7-71)) CARBON AND ALLOY STEEL FORGINGS, VACUUM TREATED (ASME SA-508 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.) Jul 1971, 7p RSO.

A standard prescribing requirements for carbon and alloy steel forgings, vacuum treated (ASME SA-508 with additional require-

ment) for nuclear and associated applications is presented. This standard supersedes RDT M 2-1 dated February 1969 (JRD).

531 (RDT-M-2-8-T(1-71)) ALLOY STEEL FORGINGS (ASME SA 541 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jul 1971 8p RSO

A standard prescribing requirements for alloy steel forgings (ASME SA-541 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 2-81 dated November 1967 (JRD).

532 (RDT-M-2-11-T(1-72)) NICKEL-MOLYBDENUM-CHROMIUM ALLOY FORGINGS (ASME SA-182 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jan 1972 9p RSO

A standard prescribing requirements for Ni-Mo-Cr alloy forgings (ASME SA-182 with additional requirements) for nuclear and associated applications is presented (JRD).

533 (RDT-M-2-12-T(1-72)) NICKEL-MOLYBDENUM-CHROMIUM ALLOY WELDING FITTINGS (ASME SA-403 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jan 1972 9p RSO

A standard prescribing requirements for Ni-Mo-Cr alloy welding fittings (ASME SA-403 with additional requirements) for nuclear and associated applications is presented (JRD).

534 (RDT-M-2-15-T(7-71)) NICKEL-CHROMIUM ALLOY BARS, FORGINGS, AND FORGING STOCK (ASTM A637 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jul 1971 9p RSO

A standard prescribing requirements for Ni-Cr alloy bars, forgings, and forging stock (ASTM A637 with additional requirements) for nuclear and associated applications is presented (JRD).

535 (RDT-M-3-1-T(7-71)) CARBON STEEL SEAMLESS PIPE (ASME SA 106 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC), Washington, D. C.) Jul 1971 8p RSO

A standard prescribing requirements for carbon steel seamless pipe (ASME SA 106 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 3-11 dated February 1969 (JRD).

536 (RDT-M-3-2-T(12-71)) STAINLESS AND ALLOY STEEL SEAMLESS TUBES (ASME SA-213 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Dec 1971, 11p RSO

A standard prescribing requirements for stainless steel and alloy steel seamless tubes (ASME SA 213 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 3-21 dated July 1971 (JRD).

537 (RDT-M-3-3-T(1-72)) AUSTENITIC STAINLESS STEEL SEAMLESS PIPE (ASME SA-376 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jan 1972 10p RSO

A standard prescribing requirements for austenitic stainless steel pipe (ASME SA-376 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 3-31 dated July 1971 (JRD).

538 (RDT-M-3-4-T(7-71)) NICKEL ALLOY SEAMLESS TUBES (ASME SB 163 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC), Washington, D. C.) Jul 1971 9p RSO

A standard prescribing requirement for nickel alloy seamless tubes (ASME SB 163 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 3-4T dated February 1969 (JRD).

539 (RDT-M-3-8-T(1-72)) ZIRCONIUM AND ZIRCONIUM ALLOY TUBES (ASTM B353 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jan 1972 6p RSO

A standard prescribing requirement for Zr and Zr alloy tubes (ASTM B 353 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 3-81 dated February 1969 (JRD).

540 (RDT-M-3-9-T(1-72)) NICKEL-IRON-CHROMIUM ALLOY SEAMLESS PIPE AND TUBING (ASME SB-407 WITH AD-

DITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jan 1972 9p RSO

A standard prescribing requirements for Ni-Fe-Cr alloy seamless pipe and tubing (ASME SB 407 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 3-91 dated July 1971 (JRD).

541 (RDT-M-3-10-T(7-71)) NICKEL-MOLYBDENUM-CHROMIUM ALLOY SEAMLESS PIPE AND TUBES (ASME SB 167 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jul 1971 11p RSO

A standard prescribing requirements for Ni-Mo-Cr alloy seamless pipe and tubes (ASME SB 167 with additional requirements) for nuclear and associated applications is presented (JRD).

542 (RDT-M-3-11-T(7-71)) CARBON AND LOW ALLOY STEEL WELDED PIPE (ASME SA-105 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jul 1971 9p RSO

A standard prescribing requirements for carbon and low alloy steel welded pipe (ASME SA-105 with additional requirements) for nuclear and associated applications is presented (JRD).

543 (RDT-M-3-12-T(7-71)) FERRITIC ALLOY STEEL SEAMLESS PIPE (ASME SA-335 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC), Washington, D. C.) Jul 1971 9p RSO

A standard prescribing requirements for ferritic alloy steel seamless pipe (ASME SA-335 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 3-121 dated February 1969 (JRD).

544 (RDT-M-3-18-T(1-72)) NICKEL-MOLYBDENUM-CHROMIUM ALLOY SEAMLESS TUBES (ASME SB-163 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jan 1972 11p RSO

A standard prescribing requirements for Ni-Mo-Cr alloy seamless tubes (ASME SB-163 with additional requirements) for nuclear and associated applications is presented (JRD).

545 (RDT-M-3-29-T(1-72)) NICKEL-CHROMIUM-MOLYBDENUM-COBIUMBIUM ALLOY SEAMLESS TUBES (AMS 5589 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jan 1972 8p RSO

A standard prescribing requirements for Ni-Cr-Mo-Nb alloy seamless tubes (AMS 5589 with additional requirements) for nuclear and associated applications is presented (JRD).

546 (RDT-M-3-30-T(1-72)) NICKEL-CHROMIUM-MOLYBDENUM-COBIUMBIUM ALLOY SEAMLESS TUBES (AMS 5590 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jan 1972 8p RSO

A standard prescribing requirements for Ni-Cr-Mo-Nb alloy seamless tubes (AMS 5590 with additional requirements) for nuclear and associated applications is presented (JRD).

547 (RDT-M-4-5-T(1-72)) NICKEL-MOLYBDENUM-CHROMIUM ALLOY CASTINGS (ASTM A494 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jan 1972 9p RSO

A standard prescribing requirements for Ni-Mo-Cr alloy castings (ASTM A 494 with additional requirements) for nuclear and associated applications is presented (JRD).

548 (RDT-M-5-1-T(1-72)) STAINLESS STEEL PLATE SHEET AND STRIP (ASME SA-240 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jan 1972 10p RSO

A standard prescribing requirements for stainless steel sheet plate and strip (ASME SA 240 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 5-1T dated July 1971 (JRD).

549 (RDT-M-5-7-T(1-72)) NICKEL-IRON-CHROMIUM ALLOY PLATE SHEET AND STRIP (ASME SB-409 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AFC) Washington, D. C.) Jan 1972 6p RSO

A standard prescribing requirements for Ni-Fe-Cr alloy plate sheet and strip (ASME SB 409 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 5-7T dated July 1971 (JRD).

550 (RDT-M-5-8-T(1-72)) NICKEL-MOLYBDENUM-CHROMIUM ALLOY SHEET AND PLATE (ASME SB-434 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington, D.C.) Jun 1972, 8p. RSO

A standard prescribing requirements for Ni-Mo-Cr alloy sheet and plate (ASME SB-434 with additional requirements) for nuclear and associated applications is presented. (JRD)

551 (RDT-M-5-20-T(1-72)) NICKEL-CHROMIUM-MOLYBDENUM-COLUMBIUM ALLOY PLATE, SHEET AND STRIP (AMS 5597 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington, D.C.) Jan 1972, 7p. RSO

A standard prescribing requirements for Ni-Cr-Mo-Nb alloy plate, sheet and strip (AMS 5597 with additional requirements) for nuclear and associated applications is presented. (JRD)

552 (RDT-M-5-21-T(1-72)) NICKEL-CHROMIUM-MOLYBDENUM-COLUMBIUM ALLOY PLATE, SHEET AND STRIP (AMS 5596 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington, D.C.) Jan 1972, 7p. RSO

A standard prescribing requirements for Ni-Cr-Mo-Nb alloy plate, sheet and strip (AMS 5596 with additional requirements) for nuclear and associated applications is presented. (JRD)

553 (RDT-M-7-6-T(1-72)) PRECIPITATION-HARDENING STAINLESS STEEL BARS, SHAPES AND FORGINGS (ASTM A564 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington, D.C.) Jan 1972, 12p. RSO

A standard prescribing requirements for precipitation-hardening stainless steel bars, shapes, and forgings (ASTM A564 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 7-6T dated July 1971. (JRD)

554 (RDT-M-7-11-T(1-72)) NICKEL-MOLYBDENUM-CHROMIUM ALLOY ROD AND BAR (ASME SB-336 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington, D.C.) Jan 1972, 8p. RSO

A standard prescribing requirements for Ni-Mo-Cr alloy rod and bar (ASME SB-336 with additional requirements) for nuclear and associated applications is presented. (JRD)

555 TEST STANDARDS FOR NUCLEAR PLANT MOTORS, Nailen, R. L. Power Eng.; 75 No. 12, 39-41 (Dec 1971).

The proposed guide for testing Class 1 motors is discussed. Class 1 motors include induction motors inside the reactor containment which drive fans and pumps in the event of a reactor malfunction. The difficulties involved in deriving standards to meet the requirements of motor reliability are described. (HDR)

556 (RDT-F-4-20-T(10-71)) OPERATION AND MAINTENANCE MANUALS, (Division of Reactor Development and Technology (AEC), Washington, D.C.), Oct 1971, 32p. RSO.

557 (WHAN-IR-45) INSTRUCTION FOR THE SELECTION AND USE OF ACCEPTANCE SAMPLING PLANS, Stevenson, W. F. (WADCO Corp., Richland, Wash.), Nov 1970, Contract AT(45-1)-2170, 60p, Dep. NTIS.

The instruction serves as a standard which describes basic principles which must be considered in the selection and use of acceptance sampling plans involved in procurement of FTR fuels and components. (JRD)

558 (RDT-M-1-1-T(7-71)) STAINLESS STEEL COVERED WELDING ELECTRODES (ASME SFA-5.4 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington, D.C.) Jul 1971, 9p. RSO.

A standard prescribing requirements for stainless steel covered welding electrodes (ASME SFA-5.4 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 1-1T dated February 1969. (JRD)

559 (RDT-M-1-6-T(7-71)) MILD STEEL ELECTRODES AND WELDING RODS (ASME SFA-5.18 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington, D.C.) Jul 1971, 8p. RSO.

A standard prescribing requirements for mild steel electrodes and welding rods (ASME SFA-5.18 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 1-6T dated February 1969. (JRD)

560 (RDT-M-1-20-T(1-72)) MILD STEEL ELECTRODES FOR FLOW-CORED ARC WELDING (ASME SFA-5.20 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington, D.C.) Jan 1972, 8p. RSO.

A standard prescribing requirements for mild steel electrodes for flux cored arc welding (ASME SFA-5.20 with additional requirements) for nuclear and associated applications is presented. (JRD)

561 (RDT-M-2-3-T(7-71)) CARBON AND ALLOY STEEL WELDING FITTINGS (ASME SA-234 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington, D.C.) Jul 1971, 10p. RSO.

A standard prescribing requirements for carbon and alloy steel welding fittings (ASME SA-234 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 2-3T dated February 1969. (JRD)

562 (RDT-M-2-6-T(7-71)) MARTENSITIC STAINLESS STEEL (TYPE 403) FORGINGS (ASME SA-182 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington, D.C.) Jul 1971, 10p. RSO.

A standard prescribing requirements for martensitic stainless steel (Type 403) forgings (ASME SA-182 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 2-6T dated February 1969. (JRD)

563 (RDT-M-2-9-T(1-72)) ZIRCONIUM AND ZIRCONIUM ALLOY FORGINGS AND EXTRUSIONS (ASTM B356 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington, D.C.) Jan 1972, 6p. RSO.

A standard prescribing requirements for Zr and Zr alloy forgings and extrusions (ASTM B356 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 2-9T dated May 1970. (JRD)

564 (RDT-M-2-1-T(10-71)) NICKEL-CHROMIUM ALLOY BARS, FORGINGS, AND FORGING STOCK (ASTM A637 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington, D.C.) Oct 1971, 9p. RSO.

A standard prescribing requirements for Ni-Cr-Ni bars, forgings and forging stock (ASTM A637 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 2-1T dated July 1971 and RDT M 7-2T dated January 1968. (JRD)

565 (RDT-M-2-16-T(1-72)) TUNGSTEN FORGINGS (AMS 7897 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington, D.C.) Jan 1972, 7p. RSO.

A standard prescribing requirements for tungsten forgings (AMS 7897 with additional requirements) for nuclear and associated applications is presented. (JRD)

566 (RDT-M-3-5-T(7-71)) AUSTENITIC STAINLESS STEEL WELDED TUBING (ASME SA-249 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington, D.C.) Jul 1971, 9p. RSO.

A standard prescribing requirements for austenitic stainless steel welded tubing (ASME SA-249 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 3-5T dated May 1969. (JRD)

567 (RDT-M-3-6-T(7-71)) AUSTENITIC STAINLESS STEEL PIPE (ASME SA-312 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington, D.C.) Jul 1971, 7p. RSO.

A standard prescribing requirements for austenitic stainless steel pipe (ASME SA-312 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 3-6T dated May 1969. (JRD)

568 (RDT-M-3-7-T(7-71)) AUSTENITIC STAINLESS STEEL WELDED PIPE, LARGE DIAMETER (ASME SA-358 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington, D.C.) Jul 1971, 9p. RSO.

A standard prescribing requirements for austenitic stainless steel welded pipe, large diameter (ASME SA-358 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 3-7T dated May 1969. (JRD)

569 (RDT-M-3-9-T(7-71)) NICKEL-IRON-CHROMIUM ALLOY SEAMLESS PIPE AND TUBING (ASME SB-407 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington D C) Jul 1971 9p RSO

A standard prescribing requirements for Ni-Fe-Cr alloy seamless pipe and tubing (ASME SB-407 with additional requirements) for nuclear and associated applications is presented (J R D)

570 (RDT-M-3-16-T(1-72)) CARBON AND ALLOY STEEL PIPE (ASME SA-333 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington D C) Jan 1972 9p RSO

A standard prescribing requirements for carbon and alloy steel pipe (ASME SA-333 with additional requirements) for nuclear and associated applications is presented (J R D)

571 (RDT-M-5-2-T(7-71)) CARBON STEEL PLATES (ASME SA-516 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington D C) Jul 1971 8p RSO

A standard prescribing requirements for carbon steel plates (ASME SA-516 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M-5-2-T dated January 1968 (J R D)

572 (RDT-M-5-4-T(7-71)) NICKEL-CHROMIUM-IRON ALLOY PLATE SHEET AND STRIP (ASME SB-168 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington D C) Jul 1971 6p RSO

A standard prescribing requirements for Ni-Cr-Fe alloy plate sheet and strip (ASME SB-168 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT 5-4-T dated February 1969 (J R D)

573 (RDT-M-5-5-T(7-71)) LOW ALLOY STEEL PLATES (ASME SA-387 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington D C) Jul 1971 7p RSO

A standard prescribing requirements for low alloy steel plates (ASME SA-387 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT 5-5-T dated February 1969 (J R D)

574 (RDT-M-5-6-T(1-72)) ZIRCONIUM AND ZIRCONIUM ALLOY PLATE SHEET AND STRIP (ASTM B352 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington D C) Jan 1972 6p RSO

A standard prescribing requirements for Zr and Zr alloy plate sheet and strip (ASTM B352 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M-5-6-T dated May 1970 (J R D)

575 (RDT-M-5-7-T(7-71)) NICKEL-IRON-CHROMIUM ALLOY PLATE SHEET AND STRIP (ASME SB-409 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington D C) Jul 1971 6p RSO

A standard prescribing requirements for Ni-Fe-Cr alloy plate sheet and strip (ASME SB-409 with additional requirements) for nuclear and associated applications is presented (J R D)

576 (RDT-M-12-3-T(10-71)) MINERAL FIBER HYDRAULIC-SETTING THERMAL INSULATING AND FINISHING CEMENT (ASTM C449 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington D C) Oct 1971 4p RSO

A standard prescribing requirements for mineral fiber hydraulic setting thermal insulating and finishing cement (ASTM C 449 with additional requirements) for nuclear and associated applications is presented (J R D)

577 (RDT-E-8-5-T(12-71)) EX-VESSEL HANDLING MACHINE FOR SODIUM COOLED REACTORS (Division of Reactor Development and Technology (AEC), Washington, D. C., Dec 1971, 23p, RSO.

The requirements for the design, material fabrication, assembly, inspection, preoperational and acceptance testing and delivery of ex-vessel handling machines and associated auxiliary equipment for use in refueling liquid sodium cooled nuclear reactor plants when in a shutdown condition are presented (auth)

578 RADIATION PROTECTION AS A PART OF ENVIRONMENTAL PROTECTION IN GENERATION OF ELECTRIC POWER FROM NUCLEAR ENERGY IN THE GERMAN DEMOCRATIC RE-

PUBLIC Albrecht, L. Roehnsch, W. (Staatliche Zentrale fuer Strahlenschutz, Berlin) Kernenergie 14 No 7-8, 227-31 (Jul-Aug 1971).

The radiation protection standards in the Democratic Republic of Germany are described. The release limits for radioactive discharges from nuclear power plants are discussed. 19 references (D C C)

579 (RDT-C-14-1-T(1-72)) CONTAINMENT EXHAUST RADIATION MONITORING SYSTEM (Division of Reactor Development and Technology (AEC), Washington, D C.) Jan 1972, 18p, RSO.

The basic requirements for design, fabrication, cleaning, handling, testing, calibration, marking, packaging, shipping and quality assurance for a containment exhaust radiation monitoring system used in the plant protection system of a nuclear reactor facility are presented (auth)

580 (RDT-E-7-4-T(11-71)) MIXING COMPONENT FOR LIQUID METAL PIPING SYSTEMS (Division of Reactor Development and Technology (AEC), Washington D C) Nov 1971 25p RSO

A standard prescribing requirements for mixing component for liquid metal piping systems for nuclear and associated applications is presented (J R D)

581 (RDT-E-8-18-T(8-71)) THREADED FASTENERS FOR NUCLEAR COMPONENTS (Division of Reactor Development and Technology (AEC), Washington D C) Oct 1971 7p RSO

A standard prescribing requirements for threaded fasteners for nuclear components for nuclear and associated applications is presented (J R D)

582 (RDT-E-10-3-T(9-71)) TANK-LIQUID METAL SERVICE (Division of Reactor Development and Technology (AEC), Washington D C) Sep 1971 22p RSO

A standard prescribing requirements for tank-liquid metal service for nuclear and associated applications is presented. This standard supersedes RDT E-10-3-T, dated September 1971 (J R D)

583 (RDT-F-6-7-T(7-71)) WELDABILITY TESTS FOR MATERIALS (Division of Reactor Development and Technology (AEC), Washington D C) Jul 1971 13p RSO

A standard prescribing requirements for weldability tests for materials for nuclear and associated applications is presented (J R D)

584 (RDT-F-6-14-T(7-71)) BRAZING FABRICATION REQUIREMENTS (Division of Reactor Development and Technology (AEC), Washington D C) Jul 1971 8p RSO

A standard prescribing requirements for brazing fabrication requirements for nuclear and associated applications is presented (J R D)

585 (RDT-M-1-4-T(7-71)) LOW ALLOY STEEL COVERED WELDING ELECTRODES (ASME SFA-5.5 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington D C) Jul 1971 7p RSO

A standard prescribing requirements for low alloy steel covered welding electrodes (ASME SFA-5.5 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M-1-4-T dated February 1969 (J R D)

586 (RDT-M-4-1-T(7-71)) CARBON STEEL CASTING (ASME SA-216 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington D C) Jul 1971 9p RSO

A standard prescribing requirements for carbon steel castings (ASME SA-216 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M-4-1-T dated February 1969 (J R D)

587 (RDT-M-4-2-T(7-71)) AUSTENITIC STAINLESS STEEL CASTINGS (ASME SA-351 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC), Washington D C) Jul 1971 9p RSO

A standard prescribing requirements for austenitic stainless steel castings (ASME SA-351 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M-4-2-T dated February 1969 (J R D)

588 (RDT-M-4-3-T(7-71)) COBALT-CHROMIUM ALLOY STEEL CASTINGS (Division of Reactor Development and Technology (AEC), Washington D C) Jul 1971 9p RSO

A standard prescribing requirements for Co-Cr alloy steel castings for nuclear and associated applications is presented. This standard supersedes RDT M 4 IT dated February 1963 (J R D)

589 (RDT-M-4-4-T(7-71)) ALLOY STEEL CASTINGS (ASME SA-217 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington D C) Jul 1971 9p RSO

A standard prescribing requirements for alloy steel castings (ASME SA 217 with additional requirements) for nuclear and associated applications is presented (J R D)

590 (RDT-M-5-3-T(7-71)) LOW ALLOY STEEL PLATES (ASME SA-533 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington D C) Jul 1971 8p RSO

A standard prescribing requirements for low alloy steel plates (ASME SA 533 with additional requirements for nuclear and associated applications) is presented. This standard supersedes RDT M 5 IT dated February 1963 (J R D)

591 (RDT-M-6-1-T(7-71)) ALLOY STEEL BOLTING MATERIAL FOR LOW TEMPERATURE SERVICE (ASME SA-320 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington D C) Jul 1971 8p RSO

A standard prescribing requirements for alloy steel bolting material for low temperature service (ASME SA 320 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 6 IT dated February 1963 (J R D)

592 (RDT-M-6-3-T(7-71)) ALLOY STEEL BOLTING MATERIAL FOR HIGH TEMPERATURE SERVICE (ASME SA-193 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington D C) Jul 1971 8p RSO

A standard prescribing requirements for alloy steel bolting material for high temperature service (ASME SA 193 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 6 IT dated February 1963 (J R D)

593 (RDT-M-6-4-T(7-71)) ALLOY STEEL NUTS FOR BOLTING FOR HIGH TEMPERATURE SERVICE (ASME SA-194 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington D C) Jul 1971 8p RSO

A standard prescribing requirements for alloy steel nuts for bolting for high temperature service (ASME SA 194 with additional requirements) for nuclear and associated applications is presented (J R D)

594 (RDT-M-6-5-T(10-71)) ALLOY STEEL BOLTING MATERIAL FOR SPECIAL APPLICATIONS (ASME SA 540 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington D C) Oct 1971 7p RSO

A standard prescribing requirements for alloy steel bolting material for special applications (ASME SA 540 with additional requirements) for nuclear and associated applications is presented (J R D)

595 (RDT-M-7-1-T(7-71)) MARTENSITIC STAINLESS STEEL (TYPE 403) BARS (ASTM A276 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington D C) Jul 1971 8p RSO

A standard prescribing requirements for martensitic stainless steel (Type 403) bars (ASTM A276 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 7 IT dated February 1963 (J R D)

596 (RDT-M-7-3-T(7-71)) STAINLESS STEEL BARS AND SHAPES (ASME SA 479 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington D C) Jul 1971 8p RSO

A standard prescribing requirements for stainless steel bars and shapes (ASME SA 479 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 7 IT dated February 1963 (J R D)

597 (RDT-M-7-4-T(7-71)) NICKEL-CHROMIUM IRON ALLOY ROD AND BAR (ASME SB-166 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington D C) Jul 1971 6p RSO

A standard prescribing requirements for Ni-Cr-Fe alloy rod and bar (ASME SB 166 with additional requirements for nuclear and associated applications) is presented (J R D)

598 (RDT-M-7-5-T(7-71)) COBALT-CHROMIUM-TUNGSTEN-NICKEL ALLOY ROUNDS (Division of Reactor Development and Technology (AEC) Washington D C) Jul 1971 9p RSO

A standard prescribing requirements for Co-Cr-W-Ni alloy rounds for nuclear and associated applications is presented. This standard supersedes RDT M 7 5T dated February 1963 (J R D)

599 (RDT-M-7-7-T(7-71)) COBALT-CHROMIUM ALLOY BARS AND SHAPES (Division of Reactor Development and Technology (AEC) Washington D C) Jul 1971 7p RSO

A standard prescribing requirements for Co-Cr alloy bars and shapes for nuclear and associated applications is presented. This standard supersedes RDT M 7 7T dated March 1963 (J R D)

600 (RDT-M-7-8-T(7-71)) NICKEL-CHROMIUM-IRON ALLOY WIRE (AMS 5687 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington D C) Jul 1971 5p RSO

A standard prescribing requirements for Ni-Cr-Fe alloy wire (AMS 5687 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 7 8T dated February 1963 (J R D)

601 (RDT-M-7-9-T(1-72)) ZIRCONIUM AND ZIRCONIUM ALLOY BARS, ROD AND WIRE (ASTM B351 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington D C) Jan 1972 6p RSO

A standard prescribing requirements for Zr and Zr alloy bars, rod and wire (ASTM B 351 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 7 9T dated May 1970 (J R D)

602 (RDT-M-7-10-T(7-71)) NICKEL-IRON-CHROMIUM ALLOY ROD AND BAR (ASME SB 408 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington D C) Jul 1971 6p RSO

A standard prescribing requirements for Ni-Fe-Cr alloy rod and bar (ASME SB-408 with additional requirements) for nuclear and associated applications is presented (J R D)

603 (RDT-M-10-1-T(1-72)) ZIRCONIUM AND ZIRCONIUM ALLOY INGOTS (ASTM B350 WITH ADDITIONAL REQUIREMENTS) (Division of Reactor Development and Technology (AEC) Washington D C) Jan 1972 5p RSO

A standard prescribing requirements for Zr and Zr alloy ingots (ASTM B 350 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 10 1T dated May 1970 (J R D)

604 (RDT-M-12-4-T(1-72)) REFLECTIVE INSULATION (Division of Reactor Development and Technology (AEC) Washington D C) Jan 1972 17p RSO

A standard prescribing requirements for reflective insulation for nuclear and associated applications is presented. This standard supersedes RDT M 12 4 dated March 1971 (J R D)

605 (RDT-E-8-11-T(12-71)) FFTF CLOSED LOOP IN-REACTOR ASSEMBLY FABRICATION (Division of Reactor Development and Technology (AEC) Washington D C) Dec 1971 23p RSO

The Closed Loop In Reactor Assembly (CLIRA) is the in reactor component of the Closed Loop System for irradiation of fuels and materials test assemblies. It provides physical support for distributes coolant supply to and provides process and test section instrumentation leads, tubes and sensors. It isolates the experiments from the reactor sodium pool and prevents test failure propagation to the reactor. The requirements for the fabrication quality assurance packaging and delivery of the CLIRA are presented. All components and services to be provided by the supplier are specified (auth)

606 (RDT-E-6-13-T(1-72)) CORE SUPPORT STRUCTURE FOR SODIUM COOLED REACTORS (FABRICATION ONLY) (Division of Reactor Development and Technology (AEC), Washington, D. C.) Jan 1972 22p RSO

The core support structure provides support, location and flow distribution for the fuel assemblies, reflector and radial shield. It also provides support for interfacing hardware items. The requirements are presented for the fabrication quality assurance packaging and delivery of the core support structure (auth)

607 (RDT-E-6-23-T(12-71)) CORE RADIAL SHIELD FOR SODIUM COOLED REACTORS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Dec 1971. 20p. RSO.

The requirements are presented for the fabrication, quality assurance, packaging and delivery of core radial shieldings. The ordering data establishes the specific requirements for a particular radial shield. The purpose of the radial shield is to limit the total dose of damaging radiation on critical in-vessel components to assure acceptable end-of-life properties. The standard applies to a radial shield for use in a liquid metal cooled reactor vessel. (auth)

608 (RDT-E-6-23-T(11-71)) CONTROL ROD ABSORBER PIN. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Nov 1971. 15p. RSO.

The requirements for absorber pins for nuclear reactor control rod assemblies are presented. (auth)

609 (RDT-E-6-30-T(8-71)) ABSORBER PIN BORON CARBIDE PELLETS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Aug 1971. 12p. RSO.

The requirements for boron carbide pellets to be used in nuclear reactor control rod absorber pins are presented. (auth)

610 GUIDE TO PRACTICE NUCLEAR MATERIAL CONTROL SYSTEM FOR NUCLEAR POWER REACTORS. New York, American National Standards Institute (1970). 11p.

A standard is presented which establishes requirements for the control of special nuclear material in the facilities of nuclear power reactors where such material is used in the production of electrical energy. The materials involved in such a facility are uranium and plutonium of various isotopic content. The nuclear material control system involves the establishing of receipts from the shipper, three internal material balance areas and records of shipments to a reprocessor as the means of maintaining control and accountability of all leased or owned special nuclear materials. (auth)

611 (RDT-F-1-2-T(3-72)) PREPARATION OF SYSTEM DESIGN DESCRIPTIONS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Mar 1972. 19p. RSO.

The purpose, scope, organization and content of reactor system design descriptions are specified in order to promulgate a unified approach to their preparation and use by a project as the principal means to establish, describe and control the individual system designs from conception and throughout the lifetime of the system. (auth)

612 (DOCKET-50250-79) TURKEY POINT PLANT, UNIT 3, Items Still Requiring Resolution. (Division of Compliance (AEC), Atlanta, Ga., Region II). 23 Nov 1971. 3p. Dep. NTIS.

Additional information is presented concerning valves for the chemical and volume control system and safety injection system pipe fittings in the cooling system and standards for the main steam line isolation valves. (D C C)

613 (RDT-E-6-33-T(11-71)) CONTROL ROD ASSEMBLY. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Nov 1971. 11p. RSO.

Technical requirements, quality assurance provisions, and delivery preparation requirements are presented for FFTF control rod assemblies. (H D R)

614 (ANL-7712) ARC SYSTEM STANDARD PATHS AND CATALOGUED PROCEDURES. Woodruff W. L., Daly, T. A., Henryson II H., Kier, P. H., Regis, J. P., Stenberg, C. G., Toppel, B. J. (Argonne National Lab., Ill.). Dec 1971. Contract W-31-109-eng-38. 260p. Dep. NTIS.

A discussion and documentation of the ARC System standard paths and catalogued procedures available for production usage are presented. The intent of the discussion is to serve as an aid to the user in running production problems. The discussion of each of the standard paths and catalogued procedures includes a brief description of the capabilities provided, listings of the path and procedure, a listing of the BCD user input data sets that may be required, and sample problems which demonstrate some of the capabilities and options available. The general discussion provided may serve as a guide to those who might wish to write other paths to provide some special capability. 13 references. (auth)

615 (TID-25959) SAFETY GUIDE 14 REACTOR COOLANT PUMP FLYWHEEL INTEGRITY. (Division of Reactor Standards (AEC), Washington, D. C.). 27 Oct 1971. 6p. UNCL.

Coolant pump flywheel materials, fabrication, testing, and inspection requirements to assure safe operation in water cooled reactors are presented. (H D R)

616 (RDT-E-1-6-T(3-72)) AUTOMATIC SPRING-LOADED SAFETY VALVES. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Mar 1972. 36p. RSO.

Standards are presented for automatic spring-loaded over pressure protection valves for use in water cooled power reactor system. (H D R)

617 GUIDELINES FOR DETERMINING THE OPERATING BASIS EARTHQUAKE AND ASSOCIATED VIBRATORY GROUND MOTION. ANS 2.1-1971. Hinsdale, Ill., American Nuclear Society (1972). 10p.

This standard provides guidance for the seismological and geologic investigations and evaluations needed to determine the Operating Basis Earthquake (OBE) and associated vibratory ground motion at a nuclear power plant site. The OBE, and associated vibratory ground motion, is a condition which might reasonably be expected to occur during the operating life of a nuclear power plant. The nuclear plant is designed so that in the event of an OBE, those features of the plant necessary for continued operation remain functional. The geological and seismological factors that should be taken into account in determining the OBE and associated vibratory ground motion are set forth. Factors affecting the dynamic behavior of the material underlying the nuclear power plant site are stated to aid in evaluating soil response effects. Surface faulting, stability of the foundation or underlying materials, and earthquake-caused water waves, such as tsunami, are not within the scope of this standard. (L C L)

618 (RDT-E-1-9-T(3-72)) STAINLESS STEEL GATE VALVES, MANUAL AND POWER OPERATED. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Mar 1972. 30p. RSO.

A standard prescribing requirements for stainless steel gate valves, manual and power operated for nuclear and associated applications is presented. (J R D)

619 (RDT-E-1-12-T(3-72)) STAINLESS STEEL CHECK VALVES. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Mar 1972. 21p. RSO.

A standard prescribing requirements for stainless steel check valves for nuclear and associated applications is presented. (J R D)

620 (RDT-E-21-T(3-72)) STAINLESS STEEL GLOBE AND ANGLE VALVES, MANUAL AND POWER OPERATED. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Mar 1972. 31p. RSO.

A standard prescribing requirements for stainless steel globe and angle valves, manual and power operated for nuclear and associated applications is presented. (J R D)

621 QUALITY ASSURANCE FOR PROTECTIVE COATINGS APPLIED TO NUCLEAR FACILITIES. ANSI N101.5-1972, Rev. 9. New York, American National Standards Institute, Inc. (1972). 38p.

This standard provides a common basis for the quality assurance of protective coatings applied to nuclear facilities. Quality assurance as covered by this standard comprises all those planned and systematic actions necessary to provide specified documentation and adequate confidence that shop and field coating work for nuclear facilities will perform in accordance with the specified requirements. The subjects covered include the application and use of this standard, general requirements, coating materials, surface preparation of substrates, application of coating systems, coating inspection, and quality assurance documentation. (L C I)

622 (RDT-INDEX-3-72) INDEX OF RDT STANDARDS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Mar 1972. 24p. RSO.

623 (RDT-Status-3-72) RDT STANDARDS TRANSMITTAL. Bimonthly Status Report of RDT Standards for Period Ending March 31, 1972. (Oak Ridge National Lab., Tenn.). 40p. RSO.

624 CRITERIA FOR REINFORCED CONCRETE NUCLEAR POWER CONTAINMENT STRUCTURES. Title No. 69-2. Detroit, American Concrete Institute (1971). 26p.

These design criteria are to serve as a guide in the design of reinforced concrete nuclear power containment structures. The philosophy of these structures in general is presented. The various factors to be considered in the design are outlined. Specific information on design and analysis methods, on load factors, and on allowable stresses and strains is included. The special material requirements pertaining to the construction of nuclear structures

such as ductility, splices, prestressing, corrosion protection, and others are described. The special requirements of documentation and testing, such as preservation of records, performance of leak tests, and weld inspections, etc., are listed. (auth)

- 625** PERIODIC TESTING OF PROTECTION SYSTEM ACTUATION FUNCTIONS. Safety Guide 22-1972. Washington, D. C., Atomic Energy Commission (1972). 7p.

Acceptable methods of including the actuation devices in the periodic tests of the protection system during reactor operation are described. The frequency of such testing is not specified. (auth)

- 626** EARTHQUAKE INSTRUMENTATION CRITERIA FOR NUCLEAR POWER PLANTS. ANS 2.2-1971. Hinsdale, Ill.; American Nuclear Society (1972). 10p.

The minimum requirements for earthquake instrumentation to provide information on the input vibratory ground motion and resultant vibratory responses of representative seismic Class I structures and equipment are presented. Should an earthquake occur the instrumentation output provides information to determine whether or not the plant can continue to operate safely. (auth)

- 627** (RDT-E-3-6-T(2-72)) HORIZONTAL, ELECTRIC MOTOR-DRIVEN, SINGLE-STAGE CENTRIFUGAL PUMP. (Division of Reactor Development and Technology (ALC), Washington, D. C.). Feb 1972. 20p. RSO.

A standard prescribing requirements for horizontal, electric motor-driven, single stage centrifugal pump for nuclear and associated applications is presented. (J R D)

- 628** (RDT-P-4-3-T(4-72)) METAL-SHEATHED, MINERAL INSULATED ELECTRICAL RESISTANCE HEATER. (Division of Reactor Development and Technology (AFC), Washington, D. C.). Apr 1972. 14p. RSO.

A standard prescribing requirements for metal-sheathed mineral-insulated electrical resistance heater for nuclear and associated applications is presented. (J R D)

- 629** (RDT-M-2-5-T(4-72)) AUSTENITIC STAINLESS STEEL WELDING FITTINGS (ASME SA-403 WITH ADDITIONAL REQUIREMENTS). (Division of Reactor Development and Technology (AFC) Washington, D. C.) Apr 1972. 12p. RSO.

A standard prescribing requirements for austenitic stainless steel welding fittings (ASME SA-403 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M-2-5 T, dated July 1971. (J R D)

- 630** (ANL/ES-12) TREATMENT OF COOLING WATERS WITH CHLORINE. Draley, Joseph E. (Argonne National Lab., Ill.), Feb 1972. Contract W-31-109-eng-38. 11p. Dep. NTIS.

The use of chlorine as a defouling agent in power plants requires assurance that aquatic biota will not be harmed. Three requirements are identified: (1) establishment of standards, (2) development of means of predicting the levels of active chlorine species at points of discharge, and (3) monitoring power plant effluents at points of discharge. Various aspects of the problem are considered. (10 references) (auth)

- 631** (WaBoLu-5/70) CRITERIA AND RECOMMENDATIONS FOR THE DESIGN OF VENTILATING DEVICES FOR CONTAMINATED EXHAUST AIR IN BUILDINGS. Fett, W. (Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Boden- und Luftthygiene). Sep 1970. 24p. (In German). INIS.

A review is presented of the state of knowledge which should be considered for the design of exhaust hoods for air pollutants (among others radioactive gases) from buildings or building complexes (e.g. reactor hall), namely from labs, and for the design and construction of the buildings. Criteria for the cavity zone obtained by means of wind tunnel tests, formation of cavity zone, flow in cavity zone, contamination of cavity zone. First recommendations are derived from these criteria. Recommendations concerning the building position, type, proportions and structures of the building. Recommendations concerning the exhaust hood and the ventilation position of exhaust hood and ventilation, size of exhaust hood, operational procedure, emission limits. (INIS)

- 632** (RDT-E-8-6-T(3-72)) TRANSPORTER, FUEL HANDLING. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Mar 1972. 31p. RSO.

A standard prescribing requirements for fuel transporter for nuclear and associated applications is presented. (J R D)

- 633** (RDT-E-4-6-T(1-72)) INTERMEDIATE HEAT EXCHANGER FOR LIQUID METAL SYSTEMS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jan 1972. 48p. RSO.

The requirements are presented for liquid metal-to-liquid metal heat exchangers designed and constructed to Code Class 1 requirements of the ASME Boiler and Pressure Vessel Code Section III, Nuclear Power Plant Components, and special requirements that are additive or more restrictive. Shell-and-tube "intermediate" heat exchangers used to transfer heat between the primary and secondary liquid metal coolants of reactor heat transport systems are included. (auth)

- 634** (RDT-I-4-1-T(3-72)) ELECTRIC HEATERS-SIMULATED IMBROUILLI PINS. (Division of Reactor Development and Technology (AEC) Washington, D. C.) Mar 1972. 19p. RSO.

The performance, materials, fabrication method, inspection and test, and quality assurance requirements for electric heaters simulating IMBROUILLI pins, configurations which are used for heat transfer and other studies related to liquid metal cooled nuclear fuel are presented. (auth)

- 635** (DUN-4190) COMPARISONS OF N REACTOR OPERATING SAFETY LIMITS AND PROCESS STANDARDS LIMITS. Engler, A. E., Jape, F. (Douglas United Nuclear, Inc., Richland, Wash.). 23 Apr 1968. 13p. Dep. NTIS. Declassified 27 Oct 1971.

- 636** (RDT-E-3-7-T(3-72)) RECIPROCATING POSITIVE DISPLACEMENT PUMP. (Division of Reactor Development and Technology (AFC) Washington, D. C.) Mar 1972. 16p. RSO.

Requirements are presented for a horizontally or vertically mounted reciprocating power pump for service in a pressurized water-cooled nuclear reactor system. The criteria include the strength and pressure integrity of the pump structure and the operability and reliability over the required lifetimes of single, duplex, triplex, and multiplex type pumps and their components. (auth)

- 637** (RDT-E-10-5-T(3-72)) EXPANSION JOINT-CONTAINMENT VESSEL AIRLOCK. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Mar 1972. 18p. RSO.

The design, materials, fabrication, field assembly, inspection, test, and quality assurance requirements for bellows-type expansion joints in nuclear reactor containment vessel airlocks are presented. Expansion joints constructed in accordance with this standard will meet the requirements for Class MC components given in Section III of the ASME Boiler and Pressure Vessel Code. (auth)

- 638** (CON-11031-pp 141-55) WATER QUALITY STANDARDS IMPLICATIONS FOR WASTE HEAT. Nalesnik, Richard P. (Environmental Protection Agency, Washington, D. C. (USA) Div of Water Quality Standards). May 1972. From National conference on waste heat utilization. Gatlinburg, TN. (27 Oct 1971).

The Federal water quality standards program is based on the Federal Water Quality Standards Act, part of the fundamental environmental law, the Federal Water Pollution Control Act. The program comprises a beneficial interstate water use category, scientifically determined water quality criteria to protect beneficial uses, and implementation and enforcement plans. A non-degradation provision protects existing high quality waters. The Environmental Protection Agency's Water Quality Standards Division uses as its basic guide the National Technical Advisory Committee report, Water Quality Criteria, now being updated by the National Academy of Sciences. NAC reported scientific investigations of adverse environmental effects from waste heat discharges. Various effective thermal pollution control techniques exist for the electric power producers and research development and demonstration programs are being carried out to expand environmental control knowledge. Thermal programs include biological and engineering studies. The Refuse Act Permit Program is wholly Federal and controls industrial effluent discharges to navigable and tributary waters. (M C G)

- 639** (RDT-M-1-2-T(4-72)) STAINLESS STEEL WELDING RODS AND BARE ELECTRODES (ASME SA-5.9 WITH ADDITIONAL REQUIREMENTS). (Division of Reactor Development and Technology (AEC) Washington, D. C.) Apr 1972. 12p. RSO.

A standard prescribing requirements for stainless steel welding rods and bare electrodes (ASME SA-5.9) with additional require-

ments for nuclear and associated applications is presented (J R D)

640 (RDT-M-4-1(4-72)) ALLOY STEEL FORGINGS (ASME SA-308 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.) Apr 1972, 9p, RSO.

A standard prescribing requirements for alloy steel forgings (ASME SA-308 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT-M-4-1 dated July 1971 (J R D)

641 (RDT-M-3-31-T(4-72)) STAINLESS STEEL CASTING (ASTM A451 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.) Apr 1972, 11p, RSO.

A standard prescribing requirements for stainless steel casting (ASTM A451 with additional requirements) for nuclear and associated applications is presented (J R D)

642 (RDT-M-6-1-T(4-72)) ALLOY STEEL BOLTING MATERIAL FOR LOW TEMPERATURE SERVICE (ASME SA-320 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.) Apr 1972, 9p, RSO.

A standard prescribing requirements for alloy steel bolting materials for low temperature service (ASME SA-320 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT-M-6-1 dated July 1971 (J R D)

643 (RDT-M-6-1(4-72)) HIGH-STRENGTH, HIGH-TEMPERATURE BOLTING MATERIALS (ASME SA-453 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.) Apr 1972, 9p, RSO.

A standard prescribing requirements for high strength high temperature bolting materials (ASME SA-453 with additional requirements) for nuclear and associated applications is presented (J R D)

644 (RDT-E-10-7-T(5-72)) BLOWDOWN SUPPRESSION TANK, (Division of Reactor Development and Technology (AEC), Washington, D. C.) May 1972, 17p, RSO.

The requirements for materials design fabrication testing inspection, shipping and certification of a blowdown suppression tank conforming to ASME Boiler and Pressure Vessel Code (ASME Code) Section III Class 2 are presented (auth)

645 (RDT-E-4-14-T(4-72)) VAPOR TRAP ASSEMBLIES FOR SODIUM SERVICE, (Division of Reactor Development and Technology (AEC), Washington, D. C.) Apr 1972, 45p, RSO.

The requirements are presented for the design, fabrication quality assurance and shipment of vapor trap assemblies for use where removal of sodium vapor, fog and other aerosols from an inert gas cover stream is required to prevent plugging of downstream lines by solid sodium and to protect downstream equipment from its effects (auth)

646 (RDT-E-1-30-T(5-72)) INERT GAS VALVES, (Division of Reactor Development and Technology (AEC), Washington, D. C.) May 1972, 29p, RSO.

A standard prescribing requirements for inert gas valves for nuclear and associated applications is presented (J R D)

647 (RDT-M-3-6-T(6-72)) AUSTENITIC STAINLESS STEEL PIPE (ASME SA-312 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.) Jun 1972, 11p, RSO.

A standard prescribing requirements for austenitic stainless steel pipe (ASME SA-312 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT-M-3-6-T dated July 1971 (J R D)

648 (RDT-M-3-26-T(2-72)) SEAMLESS AUSTENITIC STAINLESS STEEL TUBES WITH INTEGRAL FINS, (ASTM A498 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.) Feb 1972, 9p, RSO.

A standard prescribing requirements for seamless austenitic stainless steel tubes with integral fins is discussed (ASTM A498 with additional requirements) for nuclear and associated applications is presented (J R D)

649 (RDT-M-4-2-T(6-72)) AUSTENITIC STAINLESS STEEL CASTINGS (ASME SA-351 WITH ADDITIONAL REQUIRE-

MENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.) Jun 1972, 11p, RSO.

A standard prescribing requirements for austenitic stainless steel castings (ASME SA-351 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT-M-4-2-T dated July 1971 (J R D)

650 (RDT-M-5-2-T(6-72)) CARBON STEEL PLATES (ASME SA-516 WITH ADDITIONAL REQUIREMENTS), (Division of Reactor Development and Technology (AEC), Washington, D. C.) Jun 1972, 9p, RSO.

A standard prescribing requirements for carbon steel plates (ASME SA-516 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT-M-5-2-T dated July 1971 (J R D)

651 (RDT-C-16-2-T(4-72)) PROTECTION SYSTEM LOGIC, (Division of Reactor Development and Technology (AEC), Washington, D. C.) Apr 1972, 23p, RSO.

The requirements covering mechanical and electrical design material procurement fabrication testing inspection cleaning, packaging and shipping for a Plant Protection System (PPS) and required documents are established. The Protective Logic supplied consists of all equipment necessary for processing the Comparator output signals to initiate a reactor scram or other protective action based on a specific combination of the input signals provided to the Protective Logic by the Comparators. The equipment includes PPS Logic associated power supplies mechanical mounting hardware and interconnecting wiring hardware (auth)

652 (RDT-C-16-4-T(4-72)) PROTECTION SYSTEM COMPARATOR, (Division of Reactor Development and Technology (AEC), Washington, D. C.) Apr 1972, 31p, RSO.

The technical functional and administrative requirements covering mechanical and electrical design material procurement fabrication testing inspection cleaning, packaging and shipping for Plant Protection System (PPS) Comparator and required documents are established. The Comparator consists of all equipment necessary for processing the analog instrumentation output signals to provide trip signals and reset signals to the Protective Logic based on the relationship between the analog instrumentation signal and a setpoint. The equipment includes PPS Comparators associated power supplies mechanical mounting hardware and interconnecting wiring hardware (auth)

653 (RDT-E-11-1-T(5-72)) ION EXCHANGER, NON-REGENERATIVE TYPE, (Division of Reactor Development and Technology (AEC), Washington, D. C.) May 1972, 22p, RSO.

The standard contains requirements covering the construction and acceptance of radioactive waste system ion exchangers non-regenerative type and all required accessories and appurtenances. Ion exchangers covered are to be used in radioactive auxiliary systems of a pressurized water nuclear plant. Included are ion exchangers used in the following services: (a) Clean up units which will process reactor coolant for removal of corrosion and fission products as required for safe disposal of the coolant. (b) Polishing units which will be used for final clean up of radioactive water prior to discharge from the plant (auth)

654 (RDT-E-6-9-T(4-72)) CORE SUPPORT STRUCTURE FOR PRESSURIZED WATER REACTORS (FABRICATION ONLY), (Division of Reactor Development and Technology (AEC), Washington, D. C.) Apr 1972, 13p, RSO.

The requirements for fabrication quality assurance and preparation for delivery of core support structure components for pressurized water reactors are presented (auth)

655 (HEDL-TME-71-19) RDT STANDARDS SEMINAR, RICHLAND, WASHINGTON, NOVEMBER 17-18, 1970, (Hanford Engineering Development Lab., Richland, Wash.), 1970, Contract AT(45-1)-2170, 65p, Dep. NTIS.

The nuclear codes and standards employed in U. S. power plant development are described and discussed. Standards with applications in Liquid Metal Fast Breeder Reactor programs are emphasized (H D R)

656 MEETING TODAY'S NUCLEAR SAFETY REQUIREMENTS, Rhode, G. K. Instrum Power Ind., 14 50-3(1971). From fourteenth power instrumentation symposium. New York, N. Y. (17 May 1971).

The evolution of U. S. nuclear safety standards originated by the AEC, technical societies, or industry organizations is described. The need for standards in instrumentation and control is stressed (H D R)

657 (HEDL-TME-71-21) FAST FLUX TEST FACILITY WELDING STANDARDS FOR THE DRIVER FUEL ASSEMBLY. Crawford, R. M.; Brown, W. F. (Hanford Engineering Development Lab., Richland, Wash.). Feb 1971. Contract AT(45-1)-2170. 27p. Dep. NTIS.

The requirements for welding, examining, and testing welds for the FFTF Driver Fuel Assembly and irradiation test pins are described. The driver fuel assembly consists of an array of fuel pins fabricated into a fuel duct with other related fittings and hardware. The fuel pin array is structurally supported to provide proper spacing for sodium coolant flow in the fuel duct during irradiation. The individual fuel pins consist of nuclear fuel pellets encapsulated in stainless steel tubes with closure welds at each end of the tube. The driver fuel duct is a stainless steel hexagonal tube with welded end fittings which positions and supports the fuel pin subassembly in the FTR core. (auth)

658 (RDT-E-7-8-T(4-72)) PENETRATIONS FOR PIPING. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Apr 1972. 31p. RSO.

The basic requirements are established for design, fabrication, cleaning, handling, marking, packaging, shipping and quality assurance of pipe penetration assemblies. The standard is applicable to pipe penetration assemblies used as a continuation of a process pipe through a wall or bulkhead which is required to be internally or externally sealed such as a nuclear containment vessel or a gas tight lined cell. (auth)

659 (RDT-M-12-5-T(5-72)) THERMAL INSULATION, FLEXIBLE OR MOLDED, HIGH TEMPERATURE, LOW CONDUCTIVITY. (Division of Reactor Development and Technology (AEC), Washington, D. C.). May 1972. 6p. RSO.

A standard prescribing requirements for thermal insulation flexible or molded, high temperature, low conductivity, for nuclear and associated applications is presented. (J R D)

660 (RDT-C-7-6-T(4-72)) THERMOCOUPLE MATERIAL AND THERMOCOUPLE ASSEMBLY, CHROMEL-P vs. ALUMEL, STAINLESS STEEL SHEATHED, MAGNESIUM OXIDE INSULATED. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Apr 1972. 21p. RSO.

A standard prescribing requirements for thermocouple material and thermocouple assembly Chromel-P vs Alumel, stainless steel sheathed, magnesium oxide insulated for nuclear and associated applications is presented. This standard supersedes RDT C 7-6T, dated July 1970. (J R D)

661 (RDT-M-4-3-T(6-72)) COBALT-CHROMIUM ALLOY STEEL CASTINGS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jun 1972. 11p. RSO.

A standard prescribing requirements for cobalt-chromium alloy steel castings for nuclear and associated applications is presented. This standard supersedes RDT M-4-3T dated July 1971. (J R D)

662 SETTING STANDARDS FOR STEAM GENERATOR FEED CONDITIONS IN NUCLEAR STATIONS WITH WATER-MODERATED WATER-COOLED POWER REACTORS. Margulova, T. Kh.; Zorin, V. M.; Kyun, G. Yu. (Moscow Power Inst.). Therm. Eng. (USSR) (Engl. Transl.); 18: No. 4, 34-40(1971). Translated from Teploenergetika; 18: No. 4, 23-8(1971).

The operating conditions of double-loop nuclear power plant steam generators are described. Formation and removal of chloride-ion and SiO₂ impurities in the steam generator water are discussed, and recommended values for water standards in PWR-type reactors are presented. (H D R)

663 (RDT-E-15-3-T(4-72)) INSULATION/HEATER MODULE-PIPING. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Apr 1972. 48p. RSO.

A standard prescribing requirements for insulation/heater module-piping for nuclear and associated applications is presented. (J R D)

664 (RDT-C-2-3-T(6-72)) TIME RESPONSE TEST FOR SHEATHED, MINERAL INSULATED THERMOCOUPLE ASSEMBLY. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jun 1972. 9p. RSO.

A standard is presented that describes a test providing controlled conditions for a reliable and repeatable production check of the response time of sheathed, mineral insulated thermocouple assemblies. (W H K)

665 STANDARDS DEVELOPMENT PROCESS. RESOLUTION AND CONSENSUS. Johnson, Loering M.; Staff, P. E. (Combustion Engineering, Inc., Windsor, Conn.). IEEE (Inst.

Elec. Electron. Eng.), Trans. Nucl. Sci., NS-19 No. 1, 888-93 (Feb 1972).

From Nuclear science symposium, San Francisco, Calif. (3 Nov 1971). See CONF-711111.

The process of standards development is reviewed using the "Criteria for the Periodic Testing of Nuclear Power Generation Station Protection Systems" as an example. Areas considered include the need for a standard, the requirements of a standards document, draft preparation, and the obtaining of consensus and approval. Some of the problems of the consensus process are described. Responsibilities of the engineering community are reviewed. 18 references. (auth)

666 DEVELOPMENT OF ANS PROPOSED STANDARD. EARTHQUAKE INSTRUMENTATION CRITERIA FOR NUCLEAR POWER PLANTS. Frankel, M. (Los Angeles Dept of Water and Power). Trans. Amer. Nucl. Soc.; 15. No. 1, 318(Jun 1972).

From eighteenth annual American Nuclear Society conference; Las Vegas, Nev. (18 Jun 1972). See CONF-720607.

667 FUEL ASSEMBLY IDENTIFICATION. ANSI N18 3-1972. Hinsdale, Ill.; American Nuclear Society (1972). 2p. A standard prescribing requirements for fuel assembly identification (ANSI N 18 3-1972) for nuclear and associated applications is presented. (J R D)

668 (RDT-E-14-6-T(6-72)) GASKETS-CONTAINMENT VESSEL AIRLOCK. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jun 1972. 10p. RSO.

The requirements for design, manufacture, installation, and test requirements for gasket installations for sealing doors in nuclear power system containment vessel airlocks, are presented. (auth)

669 (RDT-M-3-28-T(5-72)) AUSTENITIC STAINLESS STEEL TUBING FOR LMFBR CORE COMPONENTS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). May 1972. 25p. RSO.

A standard prescribing requirements for austenitic stainless steel tubing for LMFBR core components and associated applications is presented. (J R D)

670 (RDT-M-7-3-T(8-72)) STAINLESS STEEL BARS AND SHAPES (ASME SA-479 WITH ADDITIONAL REQUIREMENTS). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Aug 1972. 9p.

A standard prescribing requirements for stainless bars and shapes (ASME SA-479 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT M 7-3T, dated July 1971. (J R D)

671 (RDT-C-7-7-T(8-72)) THERMOCOUPLE MATERIALS, PLATINUM, AND PLATINUM 10 PERCENT RHODIUM WIRES, NONINSULATED REFERENCE AND STANDARD GRADES. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Aug 1972. 9p. RSO.

A standard prescribing requirements for thermocouple materials, platinum and platinum wires, noninsulated reference and standard grades for nuclear and associated applications is presented. (J R D)

672 (RDT-E-14-5-T(6-72)) INFLATABLE SEAL-CONTAINMENT VESSEL AIRLOCK. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jun 1972. 11p. RSO.

The requirements for the design, manufacture, installation, and test of inflatable seal installations for sealing large doors in power reactor containment structure airlocks are presented. (D.C.C)

673 (RDT-C-14-2-T(5-72)) AREA RADIATION MONITORING SYSTEM. (Division of Reactor Development and Technology (AEC), Washington, D. C.). May 1972. 30p. RSO.

The standard establishes the basic requirements for design, fabrication, cleaning, handling, testing, calibration, marking, packaging, shipping and quality assurance for the area radiation monitoring system used in the Plant Protection System (PPS) of a nuclear reactor facility. The area radiation monitoring system described is limited to those systems which utilize pulse type counting methods in their operation and logarithmic meter scales for readout. (auth)

674 (RDT-F-1-1(7-72)) PREPARATION OF RDT STANDARDS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1972. 45p. RSO.

Requirements and guidance for the preparation, review, approval, amendment, modification, revision and application of RDT stan-

dards are presented. The purpose of this standard is to ensure that the organization, format and processing of standards, amendments and revisions are uniform and consistent. Requests for deviation from the requirements of this standard shall be justified by the requestor and approved by the Division of Reactor Development and Technology (RDT), U. S. Atomic Energy Commission. (auth)

675 (RDT-STATUS-6-72) **BIMONTHLY STATUS REPORT OF RDT STANDARDS FOR THE PERIOD ENDING MAY 31, 1972.** (Division of Reactor Development and Technology (AEC), Washington, D. C.), 13 Jun 1972. 46p. RSO.

Information is presented concerning additions and revisions to USAEC RDT standards during April and May 1972. New standards approved during the reporting period are listed. (D C C)

676 (RDT-E-4-16-T(5-72)) **SODIUM-HEATED STEAM GENERATOR.** (Division of Reactor Development and Technology (AEC), Washington, D. C.), May 1972. 45p. RSO.

The requirements for the design, material selection, fabrication, testing, inspection, and installation of sodium-heated steam generators for LMFBR plant applications are defined. Steam generators designed, built, tested, and inspected in accordance with this standard will meet the requirements of Section III of the ASME Boiler and Pressure Vessel Code. Accessories, including boiler drums, piping, and separators, are not within the province of this standard. (auth)

677 (RDT-F-4-20-T(5-72)) **HOT EXCHANGER FOR GAS COOLERS.** (Division of Reactor Development and Technology (AEC), Washington, D. C.), May 1972. 34p. RSO.

The standard delineates the requirements for the design, fabrication and quality assurance for hot exchangers that cool inert gases or air. The standard applies to stationary heat exchangers to be used for cooling circulating inert gases or air which has been heated by hot reactor plant components or reactor fuel decay. (auth)

678 (RDT-M-3-5-T(8-72)) **AUSTENITIC STAINLESS STEEL WELDED TUBING (ASME SA-249 WITH ADDITIONAL REQUIREMENTS).** (Division of Reactor Development and Technology (AEC), Washington, D. C.), Aug 1972. 11p.

A standard prescribing requirements for austenitic stainless steel welded tubing (ASME SA-249 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT 3-5-T dated July 1971. (H D R)

679 (RDT-M-3-32-T(8-72)) **STAINLESS METAL CARBON STEEL BOILER AND SUPERHEATER TUBES (ASME SA-210 WITH ADDITIONAL REQUIREMENTS).** (Division of Reactor Development and Technology (AEC), Washington, D. C.), Aug 1972. 8p. RSO.

A standard prescribing requirements for seamless medium carbon steel boiler and superheater tubes (ASME SA-210) with additional requirements for nuclear and associated applications is presented. (H D R)

680 (RDT-INDEX-7-72) **INDEX OF RDT STANDARDS.** (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jul 1972. 25p. RSO.

An index is presented for 237 RDT Standards issued through July 31, 1972. (H D R)

681 (RDT-STATUS-7-72) **BIMONTHLY STATUS REPORT OF RDT STANDARDS.** Summary as of July 31, 1972. (Division of Reactor Development and Technology (AEC), Washington, D. C.), 9 Aug 1972. 45p. RSO.

The bimonthly status report delineates additions and deletions to RDT standards. (H D R)

682 (RDT-E-6-36-T(7-72)) **LOW LEVEL FLUX MONITOR MECHANICAL SYSTEM FOR LIQUID METAL SERVICE (FABRICATION ONLY).** (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jul 1972. 17p.

The requirements for the fabrication, quality assurance, pickling, cleaning, and delivery of the mechanical system for a Low Level Flux Monitor (LLFM) for Liquid Metal Service are presented. The LLFM mechanical system provides access for the instrumentation required to measure the reactivity of the reactor during startup, maintenance and refueling operations. It also provides access to the core mid-plane in the proximity of the core centerline. The final location of the LLFM will depend on obtaining an adequate signal to noise ratio. The LLFM assembly consists of a neutron sensor and its associated support hardware housed and shielded from the reactor coolant by a composite thimble. It is designed to provide an adequate thermal environ-

ment for the neutron sensor and to minimize the radiation streaming to the ex-vessel environment. (auth)

683 (RDT-F-3-2-T(5-72)) **ELECTRIC HEATER AND CONNECTOR ASSEMBLY FOR PRESSURIZER FOR PRESSURIZED WATER REACTORS.** (Division of Reactor Development and Technology (AEC), Washington, D. C.), May 1972. 26p. RSO.

The requirements are specified for design, fabrication, testing and inspection of a single electric heater and connector assembly for pressurizers for pressurized water nuclear reactors. (auth)

684 (RDT-M-14-1-T(7-72)) **SODIUM COVER GAS PURCHASE SPECIFICATIONS.** (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jul 1972. 7p.

Purity requirements are presented for the procurement of inert gases (argon, helium, and nitrogen) used to cover sodium in liquid metal fast breeder reactors and supporting test systems. The allowable impurities in the gases are given. In addition, procedures for sampling and analysis and for shipment of the gases are delineated. (auth)

685 (RDT-F-1-36-T(6-72)) **FLOOR VALVE, REACTOR REFUELING AND MAINTENANCE FOR LMFBR.** (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jun 1972. 17p. RSO.

The requirements for the construction of a sealed radiation shielded floor valve for use in a LMFBR refueling system or maintenance system are presented. (H D R)

686 (RDT-E-9-3-T(6-72)) **HIGH-EFFICIENCY PLEATED-BED GAS-PHASE ADSORBENT CELLS.** (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jun 1972. 11p. RSO.

The standard covers a single design (pleated bed) of unit cell adsorber for use in air and gas cleaning applications where very high contaminant removal efficiency is required. Performance materials, design and construction and marking requirements are listed and quality assurance requirements are given. (M C G)

687 (RDT-M-16-1-T(6-72)) **GAS-PHASE ADSORBENTS FOR TRAPPING RADIOACTIVE IODINE AND IODINE COMPOUNDS.** (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jun 1972. 16p. RSO.

This standard covers granulated adsorbents for use in nuclear air and gas treatment systems for trapping radioactive iodine. The standard is limited to 8-16 mesh adsorbents suitable for use in high efficiency thin bed adsorber cells and to adsorbents that have been chemically impregnated to enhance the trapping of radioiodine in the form of organic iodine compounds. Technical requirements, quality assurance requirements and preparations for delivery are given. (M C G)

688 (RDT-F-7-6-T(5-72)) **PIPE HANGERS, SUPPORTS, AND SNUBBERS FOR LIQUID METAL SERVICE.** (Division of Reactor Development and Technology (AEC), Washington, D. C.), May 1972. 22p. RSO.

The requirements are presented for the design, fabrication, quality assurance, inspection, testing, certification and delivery of pipe hangers, supports, and snubbers for liquid metal service. The standard applies to the broad term "supporting elements" which encompass the entire range of the various methods used to carry the weight of pipe lines, insulation and the fluid in transport as well as any snubbers and braces required to resist imposed vibrations. (auth)

689 (RDT-I-1-13-T(8-72)) **AMMEX, ISOLATION, BUTHERLY TYPE.** (Division of Reactor Development and Technology (AEC), Washington, D. C.), Aug 1972. 11p. RSO.

A standard prescribing requirements for Butherly type isolation vessels for use in fast reactor applications is presented. This standard is part of the I-1-13-T(8-72) series. (H D R)

690 (RDT-I-8-1-T(8-72)) **HOISTING AND RIGGING OF CRITICAL COMPONENTS AND REMOVED EQUIPMENT.** (Division of Reactor Development and Technology (AEC), Washington, D. C.), Aug 1972. 30p. RSO.

A standard prescribing requirements for hoisting, moving, and positioning of critical components and removed equipment for nuclear and associated applications is presented. (H D R)

691 (RDT-M-2-2-T(8-72)) **STAINLESS AND LOW ALLOY STEEL FORGINGS (ASME SA-182 WITH ADDITIONAL REQUIREMENTS).** (Division of Reactor Development and Technology (AEC), Washington, D. C.), Aug 1972. 11p. RSO.

A standard prescribing requirements for stainless and low-alloy forgings (ASME SA-182 with additional requirements) for nuclear and associated applications is presented. This standard supersedes RDT-M 2-21 dated January 1972. (J R D)

692 (DUN-SA-168) DEVELOPMENT AND IMPLEMENTATION OF EQUIPMENT MAINTENANCE STANDARDS FOR NUCLEAR REACTORS. (Clement, T. M. (Douglas United Nuclear, Inc., Richland, Wash.). 13 May 1971. 8p. Dep. NTIS.

A formal system of maintenance standards is necessary to provide the nuclear power industry with factual, quantitative risk evaluations that will guide us in developing simpler and more reliable energy systems. These facts will also help dispel many of the allegations concerning the safety and environmental effects of nuclear power plants. (auth)

693 (RDT-F-9-1-T(8-72)) REQUIREMENTS FOR NUCLEAR COMPONENTS AT ELEVATED TEMPERATURES (SUPPLEMENT TO ASME ELEVATED TEMPERATURE CODE CASE 1331). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Aug 1972. 36p. RSO.

Supplementary information is presented concerning standards for high temperature requirements of Class 1 components for nuclear reactors. (D C C)

694 (RDI C 7-15-T(8-72)) THERMOWELL SYSTEMS FOR LIQUID METAL SERVICE. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Aug 1972. 22p. RSO.

This standard covers design and fabrication requirements for thermowell systems for installation in piping or vessels in liquid metal systems. These thermowell systems include a thermo couple or a resistance temperature detector (RTD), a thermowell, tip extension tube, and connection head. (auth)

695 (BNL-16965) REACTOR EFFLUENTS: AS LOW AS PRACTICABLE OR AS LOW AS REASONABLE. Hull, Andrew P. (Brookhaven National Lab., Upton, N. Y.). 1972. 25p. (CONF-720614-1). Dep. NTIS.

From 17th annual meeting of the Health Physics Society, Las Vegas, NV. (12 Jun 1972.)

Recent amendments proposed by the U. S. Atomic Energy Commission to 10 CFR 80 set forth numerical guides to keep radioactivity in light water cooled nuclear power reactors as low as practicable. These are intended to restrict the exposures of nearby persons to 1% or less of the current limits to individuals in the general public. For the most part the amendments contain across the board concentration limits primarily based on their technical practicability. These are radiologically questionable insofar as they are not related to a projected dose to an individual with reference to specific nuclides and they are not detectable by straightforward environmental sampling and analysis techniques. The proposed limits in radiation exposures from power reactor effluents are lacking in scientific warrant insofar as the calculated risk related to current reactor effluents is insignificant relative to other sources of exposure and other kinds of environmental hazards. If adopted, they would occasion a projected expenditure of from \$ 10 to \$1 x 10 per man-rem saved, which is shown to be excessive on several cost benefit comparisons. Design guides for reactor effluent releases based on 10% of current standards would appear adequate to achieve the AEC's intent. To remove public misunderstanding of the possible total population exposure from the operation of nuclear reactors a population dose limit of 0.017 rem/year to be specifically apportioned to such operation and related activities is also proposed. (auth)

696 (RDI-M 2-17-T(9-72)) PRECIPITATION HARDENING ALLOY BARS, FORGINGS, AND FORGING STOCK (ASTM A461 WITH ADDITIONAL REQUIREMENTS). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Sep 1972. 9p. RSO.

A standard prescribing requirements for precipitation hardening alloy bars, forgings, and forging stock (ASTM A461 with additional requirements) for nuclear and associated applications is presented. (J R D)

697 (RDT-M 7-14-T(9-72)) NICKEL-MOLYBDENUM CHROMIUM ALLOY ROD (ASME SB-336 WITH ADDITIONAL REQUIREMENTS). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Sep 1972. 8p. RSO.

A standard prescribing requirements for Ni-Mo-Cr rod (ASME SB-336 with additional requirements) for nuclear and associated applications is presented. (J R D)

698 CRITERIA FOR REINFORCED CONCRETE NUCLEAR POWER CONTAINMENT STRUCTURES. ACI STANDARD TITLE NO. 69-2. J. Amer. Concr. Inst., 69. No. 1, 2-28 (Jan 1972).

Design criteria are presented to serve as a guide in the design of reinforced concrete nuclear power containment structures. The philosophy of these structures in general is described and various factors to be considered in the design are outlined. Specific information on design and analysis methods, on load factors, and on allowable stresses and strains are included. Special material requirements pertaining to the construction of nuclear structures such as ductility, splices, prestressing, corrosion protection, and others are considered. Special requirements of documentation and testing, such as preservation of records, performance of leak tests, and weld inspections, etc., are listed. These criteria were prepared by Committee 349 over a period of 6 years, and are based on the experience gained in the design and construction of nuclear power plants. They are released to the profession as a recommended practice. It is intended to eventually make these recommendations a part of the ASME Boiler and Pressure Vessel Code. (auth)

699 LEAKAGE-RATE TESTING OF CONTAINMENT STRUCTURES FOR NUCLEAR REACTORS. ANSI N45.4-1972 Hinsdale, Ill., American Nuclear Society (1972). 6p.

The provisions of this standard specify the practices and test requirements for the quantitative determination of leakage rates of containment structures for the housing of operating nuclear reactors. The provisions apply to containment structures for nuclear power, test, research, and training reactors wherever a gastight containment structure is specified as a condition for operation. (auth)

700 (RDT-E-3-1-T(6-72)) VERTICAL, CANNED OR WET MOTOR-DRIVEN, SINGLE-STAGE CENTRIFUGAL PUMP. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jun 1972. 24p. RSO.

This standard covers the requirements of a vertically mounted, single-stage, canned-motor or wet-motor, hermetically sealed centrifugal pump classified as a Class 1 pump as defined in NA-2131 of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III for service in light water cooled reactor systems. (auth)

701 (RDT-E-3-3-T(7-72)) VERTICAL, SHAFT-SEALED, MOTOR-DRIVEN, SINGLE-STAGE CENTRIFUGAL PUMP. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1972. 27p. RSO.

This standard covers the requirements for a vertically mounted, single-stage, shaft-sealed, electric-motor-driven, centrifugal pump classified as a Class 1 pump as defined in NA-2131 of Section III of the ASME Boiler and Pressure Vessel Code (ASME Code) for service in water-cooled reactor systems. (auth)

702 (RDI-E 5-1-T(6-72)) PRESSURIZER FOR PRESSURIZED WATER REACTORS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jun 1972. 34p. RSO.

This standard delineates the requirements for design, fabrication, testing, and inspection of an electrically heated pressurizer for pressurized water nuclear reactors using either direct immersion or non-immersion type heaters. (auth)

703 USE OF IEEE STD 308-1971, CRITERIA FOR CLASS 1E ELECTRIC SYSTEMS FOR NUCLEAR POWER GENERATING STATIONS. Safety Guide 32 1972. Washington, D. C.; Directorate of Regulatory Standards, AEC (1972). 6p.

General Design Criterion 17, "Electric Power Systems" of Appendix A to 10 CFR Part 50 "General Design Criteria for Nuclear Power Plants" requires that an onsite electric power system and an offsite electric power system be provided to permit functioning of structures, systems, and components important to safety. In addition, Criterion 17 contains requirements concerning system capacity, capability, independence, redundancy, availability, testability, and reliability of such systems. IEEE Std 308-1971 supplements the requirements of Criterion 17 by elaborating on implementation methods, however, some of the implementation details delineated in IEEE Std 308-1971 are potentially in conflict with Criterion 17. This guide identifies these conflicts and describes acceptable resolutions. (auth)

704 MODEL T STEAM GENERATOR PRODUCTION. Nucl. Eng. Int.; 17. No. 194, 541-3 (Jul 1972).

Manufacturing procedures for the production of standard steam generators for Westinghouse PWR's are described. The 300,000-kW generators 68 ft long and 14 ft dia, weighing 330 tons, con-

sist of the larger evaporator section containing the bank of U-tubes for the primary coolant, and the upper section with two-stage steam separators. The two sections are welded together in the final assembly stages. Facilities are available for direct transfer to ocean-going ships. (UK)

705 STANDARD FOR THE DEVELOPMENT OF TECHNICAL SPECIFICATIONS FOR RESEARCH REACTORS. ANSI-15.1 1972. Hinsdale, Ill.; American Nuclear Society (1972). 25p.

706 RADIOGRAPHIC TESTING METHOD. Supplement A. SNT-TC-1A 1971. Evanston, Ill.; American Society for Non-destructive Testing (1971). 44p.

Recommended practices are described for training, qualification, and certification of radiographic testing personnel whose jobs require appropriate knowledge of the technical principles underlying radiographic tests. (auth)

707 ULTRASONIC TESTING METHOD. Supplement C. SNT-TC-1A 1971. Evanston, Ill.; American Society for Non-destructive Testing (1971). 39p.

Recommended practices are described for training, qualification, and certification of ultrasonic testing personnel whose jobs require appropriate knowledge of the technical principles underlying ultrasonic tests. (auth)

708 LIQUID PENETRANT TESTING METHOD. Supplement D. SNT-TC-1A 1968. Evanston, Ill.; American Society for Nondestructive Testing (1968). 69p.

Recommended practices are described for training, qualification

and certification of liquid penetrant testing personnel whose jobs require appropriate knowledge of the technical principles underlying liquid penetrant tests. (auth)

709 MAGNETIC PARTICLE METHOD. Supplement B. SNT-TC-1A 1971. Evanston, Ill.; American Society for Non-destructive Testing (1971). 75p.

Recommended practices are described for training, qualification, and certification of magnetic particle testing personnel whose jobs require appropriate knowledge of the technical principles underlying magnetic particle tests. (auth)

710 EDDY CURRENT TESTING METHOD. Supplement E. SNT-TC-1A 1968. Evanston, Ill.; American Society for Non-destructive Testing (1968). 52p.

Recommended practices are described for training, qualification, and certification of eddy current testing personnel whose jobs require appropriate knowledge of the technical principles underlying the eddy current tests. (auth)

711 (RDT-M-7-22-1 (9-72)) TANTALUM-TUNGSTEN ALLOY BARS AND RODS (AMS 7848 WITH ADDITIONAL REQUIREMENTS). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Sep 1972. 8p. RSO.

A standard prescribing requirements for tantalum-tungsten alloy bars and rods (AMS 7848 with additional requirements) for nuclear and associated applications is presented. (JRD)

712 (RDT-INDEX 9-72) INDEX OF RDT STANDARDS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Sep 1972. 28p. RSO.

INSTRUMENTATION AND CALIBRATION

713 THE IONIZATION CHAMBER AS A MEASURING STANDARD FOR THE ACTIVITY OF BETA EMITTERS. K. K. Aglintsev. *Izmeritel'naya Tekh.*, No. 9, 39-42 (Sept. 1961). (In Russian)

The 4π counter measures beta activities from 10^{-11} to 10^{-7} curies, the organic scintillation counter measures activities up to 10^{-5} curies; a calorimeter can be used to measure activities of 0.01 curies and higher. An extrapolation ionization chamber can be used to fill the gap between 10^{-5} and 10^{-2} curies. The electrodes are shifted to cause a change in ionization volume of $V_1 - V_2$, and a change in ionization current of $I_1 - I_2$. With a specific activity of the source of $q = 1$ curie/g, a density of $\rho = 1$ g/cm³ and a source thickness of 0.1 mg/cm², calculations for S^{35} (167 kev), W^{185} (430 kev), Tl^{204} (765 kev), Y^{91} (1560 kev), and P^{22} (1690 kev) show that the dose strengths P in a volume $V_1 - V_2$ at a solid angle of 0.024 are 12, 7, 4, 3.3, and 3×10^{-3} rads/sec. The ionization current $I_1 - I_2$ and the energy resolution can be increased by increasing the area to $S = 10$ cm². The average dose strengths are then calculated to be 0.12, 0.10, 0.09, 0.07, and 0.07 rads/sec. If the thickness of the source is increased to 100 mg/cm², the average dose strengths are calculated as 2.8, 9.5, 17, 27, and 28 rads/sec. Calculated values of $I_1 - I_2$, show that the ionization current is increased by a factor of 1000 to 2000 on increasing the area of the source from 0.1 cm² to 10 cm². On increasing the source thickness from 0.1 to 100 mg/cm², the ionization current $I_1 - I_2$ increases by factors of 23, 92, 190, 380, and 395 for these isotopes. A thick source of 100 mg/cm² and an area of 10 cm² are recommended in order to obtain suitable ionization currents. (TTT)

714 (ORNL-3193(p.191-7)) USE OF 4π HIGH-PRESSURE IONIZATION CHAMBERS AS SECONDARY STANDARDS FOR CALIBRATION OF GAMMA-RAY SOURCES. R. W. Peelle (Oak Ridge National Lab., Tenn.).

The efficiencies of Compton and pair spectrometers used in measurements of the spectrum of prompt gamma rays from U^{235} fission are to be determined by the use of known-strength radioactive sources. The strengths of these sources are determined by measurement of two 4π high-pressure ionization chambers. Calibration of the absolute efficiencies of these chambers is performed in a manner that permits detailed estimates of precision to be assigned. (auth)

715 (CEA-BIB-11) SOURCES ETALONS DE NEUTRONS. Bibliographie No. 11. (Standard Neutron Sources. Bibliography No. 11). J. Desdèvises (France. Commissariat à l'Energie Atomique. Centre d'Etudes Nucleaires, Saclay). 1961. 22p.

Seventy-nine abstracts are presented on the methods and processes of neutron source calibration and the preparation and properties of standard sources. The abstracts are ar-

ranged chronologically and cover a period from 1936 to 1961. (D.L.C.)

716 (AFCRL-659) ON THE PRESSURE DEPENDENCE OF THE COSMIC RAY INTENSITY RECORDED BY THE STANDARD NEUTRON MONITOR. Technical Note No. 7. Stig Lindgren (Uppsala Univ. Inst. of Physics). Apr. 7, 1961. Contract AF61(514)-1312. 12p.

The pressure coefficients were determined for some standard neutron monitors at high latitudes for the years 1957-1959 with due regard to variations of primary origin. The following coefficients were obtained: 1) for Murchison Bay and Uppsala $\bar{\alpha} = -0.710 \pm 0.006\%/mb$; 2) for Resolute, Churchill and Ottawa $\bar{\alpha} = -0.725 \pm 0.005\%/mb$; 3) for Mawson and Mt. Wellington $\bar{\alpha} = -0.736 \pm 0.004\%/mb$. The differences in α between the three groups of stations are certainly real to some extent. They probably reflect dissimilarities in the neutron monitors and the pressure recording devices. As a by-product it has proved that for two stations above the latitude knee, the quotient between the pressure corrected daily neutron intensities is remarkably constant in time. It can thus be used as a sensitive indicator of changes in counting rate. (auth)

717 (CF-60-10-62(Rev.1)) INSTRUMENTATION AND CONTROLS DIVISION ELECTRICAL DESIGN STANDARDS AND GRAPHICAL SYMBOLS. (Oak Ridge National Lab., Tenn.). Nov. 1961. Contract [W-7405-Eng-26]. 86p.

Copies are presented of the American Standards Association graphical symbols for electrical and electronic equipment and systems. Recommendations are given for electrical elementary design layout, device codings, etc., for permanent type installations. Electrical diagrams copied from American Drafting Standards Manual are presented. (M.C.G.)

718 ADVANCES IN ELECTRONICS AND ELECTRON PHYSICS. VOLUME 15. L. Marton, ed. New York, Academic Press, 1961. 419p. \$13.00.

A review is presented of the use of Cs atomic beams and other devices as time and frequency standards. The properties of two- and three-level masers of the atomic-beam, solid-state, and traveling-wave types are reviewed, as well as other quantum mechanical amplifiers. Experimental and theoretical studies of relaxation in low-temperature paramagnetic diluted salts are discussed, including investigations of the effects of temperature, paramagnetic energy levels, magnetic field strength, and salt concentration on the relaxation rate. An investigation is made of the techniques for generation, detection, transmission, total reflection, and measurement of millimeter (0.1 to 3 mm wavelength) waves. The electron distribution in the ionosphere is studied as regards its steady state properties, its mechanics, and techniques for its determination. The uses of autodyne circuits in the measurement of electron spin, nu-

clear spin, and nuclear quadrupole resonance spectra in paramagnetic materials are described (T F H)

719 NEUTRON ENERGY MEASUREMENTS

William N McElroy (Armour Research Foundation, Chicago) *Frontier*, 23 No 3, 20-4(1962)

A modified standard foil technique is described for making accurate fast neutron energy spectrum (flux-spectra) measurements in both the low and high energy levels of a reactor. The method depends upon a better intercomparison between several irradiated foils and their proper conversion factors to plot the unknown flux-spectrum, with special attention being paid to the low Mev region. The method calculates more accurately how many neutrons lie within the different energy levels for the entire spectrum by a process of recalculation (N W R)

720 STANDARDIZED LUMINOPHORE Roland W Carlson (to Harshaw Chemical Co) U S Patent 3,030 509 Apr 17, 1962

An improved luminophore is described for use as a calibrating standard for photomultiplier tubes in scintillation detectors. The luminophore comprises a reference luminophore having alpha-emitting material dispersed therein and coupled with a primary luminophore. The assembly is an absolute standard with respect to frequency and a determinable standard with respect to amplitude and resolution, and its resolution spread is small (D L C)

721 DEVELOPMENT OF THE PHOTOMULTIPLIER FM 50 FOR STANDARD SCINTILLATION COUNTERS

E Kinsky p 223-8 of "Nuclear Electronics Vol I" Vienna, International Atomic Energy Agency, 1962 (In English)

The FM-50 is a tube with a plane, transparent Sb-Cs photocathode, 40 mm in diameter, and an eleven-stage Ag-Mg multiplying system designed for standard scintillation counting. The special form of the first and second dynode allows electrons to be collected from large photocathodes in a Reichmann system. The optimal secondary emission coefficient of Ag-Mg alloy is attained when MgO layers, produced in the selective oxidation process, are very thin, therefore, the dynode activation process can be simplified. The activation and sensibilization of the photocathode is discussed; a possibility of sensibilization with O_2 originating from a source incorporated in the tube is described. Some ways of stabilizing dark currents are discussed. The tube characteristics are given (auth)

722 NOTE ON CALIBRATION OF THE NBS STANDARD THERMAL NEUTRON DENSITY J A DeJuren (Atomic International, Canoga Park, Calif) *J Nuclear Energy, Pts. A & B Reactor Sci and Technol*, 16 235 (Apr. 1962).

Accepting the value of the thermal neutron activation cross section of Mn as 13.16 ± 0.11 barn, a recalibration of the neutron flux of the NBS standard apparatus is carried out (T.F.H.)

723 METHODS AND STANDARDS IN RADIOANALYSIS OF WATER S A Reynolds (Oak Ridge National Lab Tenn) *Health Phys*, 8 391-6(Aug 1962)

Methods and standards for chemical methods and the measurement of radionuclides in the radiochemical analysis of water are discussed. An attempt is made to set up logical criteria for the methods and standards (P C H)

724 STANDARD LEAKS AND THEIR CALIBRATION BY CONSTANT PRESSURE CHANGE IN VOLUME TECHNIQUES Maurice K Laufer (Sandia Corp Albuquerque N Mex) p 1086-90 of "1961 Transactions of the Eighth National Vacuum Symposium Combined with the Second International Congress on Vacuum Science and Technology Vol 2" Oxford Pergamon Press 1962 (In English)

Standard leaks are calibrated using $p(\Delta V/\Delta t)$. For leak-

age rates $> 10^{-6}$ Torr-l/sec a valved off evacuated volume is used for ΔV . For rates in range 10^{-10} to 10^{-6} Torr-l/sec ΔV is obtained by the mechanical expansion of metal bellows. The pressure is the same at the beginning and end of the time interval Δt for both cases. Because of its non-pumping characteristic a Knudsen vacuum gage is used to determine p in the calibration of the slower leaks. Standard leaks having rates of 10^{-8} to faster than 10^{-3} Torr-l/sec and normal calibration periods of 12 months are described (auth)

725 MANUFACTURE OF SOLID ORGANIC STANDARD LIGHT SOURCES OF LOW INTENSITY T J Pepin and E P Ney (Univ of Minnesota, Minneapolis) *Rev Sci Instr* 33 724-5(July 1962)

A manufacturing technique is described by which low-intensity ($\sim 5 \times 10^{-6}$ ergs/cm² sec sr in units of astronomical photographic intensities at $\lambda = 4300 \text{ \AA}$ and $\Delta\lambda = 1290 \text{ \AA}$) standard light sources can be produced by the polymerization of an organic plastic scintillator containing a low-energy β emitter (auth)

726 A METHOD OF PRODUCING STANDARD RADIOACTIVE SOURCES FOR CALIBRATING DOSIMETERS Andrzej Kostyrko, Stanisław Pszona, and Kizysztol /arnowiecki (Inst of Nuclear Research Division of Dosimetry, PAN, Warsaw) *Nukleonika*, 7 428-9(1962) (In Polish)

A thin source of $Si^{90} + Y^{90}$ was purchased and measured for uniformity. The nonuniformity was about $\pm 20\%$. It was then decided to improve the uniformity of such sources. Source thicknesses of 0.2 to 2 mg/cm² were deposited on a thick plate of plexiglas (methyl methacrylate) by sedimentation. After drying, the plexiglas was exposed to a vapor of chloroform that softened the plexiglas and resulted in a bonding of the radioactive material to the plexiglas. The sources made in this way were Co^{60} , $Si^{90} + Y^{90}$, Ir^{204} , and C^{14} . Subsequently, sources of Cs^{137} , U^{238} , and Pu^{239} were also made. The first series was deposited with a uniformity of 3 to 10%, depending on the isotope used. The source dimensions were 100×150 mm (I F T)

727 IMPROVEMENTS IN OR RELATING TO STANDARD LEAKS Richard John Bayley Hadden and Albert Walter Kirk (to United Kingdom Atomic Energy Authority) British Patent 913 051 Dec 19 1962 Filed July 25 1960

A standard leak comprises a synthetic resin plug adapted to be secured in a vacuum-tight manner to an opening in an evacuable system. A length of fiber-glass yarn containing a number of hollow filaments is molded into and extends through the plug (R J S)

728 AN IONIZATION CHAMBER AS A CURRENT REFERENCE STANDARD L A W Kemp (London Hospital Research Labs) *Phys Med Biol* 7 359-64 (Dec 1962)

An ionization chamber incorporating a Pm^{14} β -ray source was developed which provides adjustable reference currents of the order of 10^{-7} amp. A special feature of the chamber is that despite the relatively high value of the reference current the magnitude of the latter is independent of the collector voltage over a considerable range thus making it possible to use the chamber in conjunction with electrometer systems which do not maintain a constant potential at their inputs. The current is closely proportional to the mass of gas between the chamber electrodes thus providing automatic correction for pressure and temperature changes when the chamber is used as a monitoring reference standard for a second (unsealed) experimental chamber (auth)

729 INTERCOMPARISONS OF THE STANDARD THERMAL NEUTRON FLUX DENSITY OF THE NATIONAL BUREAU OF STANDARDS W M Murphey and J Chin (National Bureau of Standards Washington, D C) IAEA Preprint SM-36/78 14p (In English)

To be published in Proceedings of the IAEA Symposium on Neutron Detection Dosimetry and Standardization Harwell, United Kingdom December 10-14, 1962

The standard thermal neutron flux maintained at the National Bureau of Standards in Washington since 1951 consists of two radium-beryllium (α, n) sources in a thermalizing geometry of lead and paraffin. The flux has been absolutely measured twice, once in terms of the absorption cross section of boron and once in terms of the absorption cross section of gold. A neutron flux with a cadmium ratio of 7 (for 40 mg/cm² gold foils and 0.040 inch cadmium covers) and a thermal neutron flux density of $4231 \pm 1.5\%$ (Apr. 62) neutrons per cm²-sec is obtained. A slot in an eight inch thick carbon region perpendicular to the line joining the two sources and midway between them affords access to the flux. Over an area 7×6 cm in size in the center of the slot the thermal neutron flux density has been measured to be spatially constant to within 0.5%. The effect of any anisotropy of the flux on the measurement of the thermal neutron flux density by gold foils has been determined to be less than 0.04% (auth).

730 Cf^{252} , A PRIMARY STANDARD FOR NEUTRONS P. R. Fields and H. Diamond (Argonne National Lab. III) IAEA Preprint SM-36/68 20p (TID-17527)

To be published in IAEA Proceedings of the Symposium on Neutron Detection Dosimetry and Standardization Harwell, United Kingdom, December 10-14, 1962

Californium-252 is examined as a primary standard for neutrons. Similarity of the energy spectrum of neutrons from spontaneous fission of Cf^{252} to spectra from fission of U^{235} , U^{238} , and Pu^{239} as well as ease of determining the absolute neutron emission rate makes Cf^{252} a good standard for research on virgin fission neutron spectra in reactors. Cf^{252} sources are easily prepared and require little shielding. Correction for effects of Cf^{252} decay in sources and particle output of single fissions is discussed. (D. C. W.)

731 A SIMPLE OPTICAL SYSTEM FOR USING STANDARD MAGNETS WITH SPARK CHAMBERS K. Lande, A. K. Mann, and D. H. White (Univ. of Pennsylvania, Philadelphia) Nucl. Instr. Methods 20 193-4 (Jan. 1963) (In English)

A method is described for making use of a generally available standard bending magnet with a spark chamber without wasting much of the useful magnetic volume in the effort to provide stereoscopic viewing of the chamber. An optical system was designed which consists essentially of replacing a plane mirror that would occupy a very large volume with a pair of effective echelon mirrors that occupy appreciably less volume. A diagram of the arrangement is shown. Tests to date were satisfactory. The cost was little more than the initial magnet cost. (A. G. W.)

732 APPARATUS FOR CONTACT-FREE QUALITY CONTROL USING THE METHOD OF COMPARISON WITH A STANDARD UNDER IONIZING RADIATION Jiří Oppelt and Jaroslav Hladík Czechoslovak Patent 96,354 Aug. 15, 1960

A new method is proposed for generating the alternating input signal for an ionization chamber. The equipment consists of a rotating ionization chamber, a radiation source, and a standard object. The ionization chamber has at its center a stationary collector, which is the axis of rotation of a cylindrical screen to which the radiation source is attached. The radiation going directly into the chamber is screened. The radiation directed outside the chamber is alternatively reflected either from the object tested, or from the standard and falls on the collector electrode. The ionization current arising has a half-wave form, the amplitude of which depends on the properties of the tested or the standard object. The indicator connected to the output of an a-c amplifier is calibrated directly in units of the controlled variable and indicates the derivation between the

properties of the object and the standard (Referativnyy zhurnal, Avtomatika i radioelektronika No. 4, 1962)

733 (ISS-63/21) SERVIZIO ELETTRONICO—CATALOGO DELLE APPARECCHIATURE ELETTRONICHE STANDARDIZZATE DE E 111 A E 120 (Electronic Service—Circuit Diagrams and Characteristics of Standard Electronic Equipments E 111 to E 120) (Italy Istituto Superiore di Santa, Rome) Jan. 31, 1963 48p

A catalog of circuit diagrams and characteristics of electronic equipment built by the electronic service of the Laboratory of Physics is presented. The main purpose of this catalog is to give to the experimenter a short account of on-the-shelf equipment available. The catalog will be printed in many issues each containing the data on ten pieces of equipment, an index of all issues will be periodically printed. Owing to the essentially practical purpose of this catalog, every specific technical and scientific news was omitted, bibliographic news will be added only in the case of new circuits. (auth)

734 THE USE OF STANDARD SLIDES IN SEMI-QUANTITATIVE RADIOAUTOGRAPHY WITH TRITIATED COMPOUNDS Renato Baserga and Ken Nemeroff (Northwestern Univ. Chicago) Stain Technol. 38 111-16 (Mar. 1963)

By use of the "standard-slide" method it is possible to determine if different batches of radioautographs or even different radioautographs in the same batch, have been processed in an identical manner, and if not, what corrections are necessary to obtain a valid comparison between different radioautographs. With the technique described, essentially identical smears can be prepared from a pooled suspension of Ehrlich ascites tumor cells labeled with tritiated thymidine. In these smears, the percentage of labeled cells and the mean grain count per labeled cell vary within narrow limits, in a given slide, within 2 to 5% of the mean of the slide. In smears processed together in the same manner, the percentage of labeled cells (calculated on 1000 cells) varies within 2%, and the mean grain count per labeled cell (calculated on 50 cells) between 15 and 20% of the mean of all smears. Once the limits of variability are known, smears from the same cell population can be used to ensure the accuracy of procedures performed on separate batches of radioautographs that have been processed separately but in a presumably identical manner. A comparison of the mean grain counts of standard smears from separate batches indicates if variations have occurred during the radioautographic procedure. Any tritiated compound may be used to prepare standard slides. (H. H. D.)

735 (UCRL-7325-T) COMPARISON STANDARDS FOR SOLUTION CALORIMETRY Stuart R. Gunn (California Univ., Livermore, Lawrence Radiation Lab.) [1963] Contract [W-7405-eng-48] 11p

Criteria for processes useful for the intercomparison of solution calorimeters are discussed. Measurements were made of the heats of four processes: dissolution of potassium chloride in water, dissolution of succinic acid in dilute hydrochloric acid, dissolution of magnesium metal in dilute hydrochloric acid, and neutralization of strong sulfuric acid in excess dilute sodium hydroxide. Effects of variations in treatment of the standard substance and in temperature and reagent concentrations were studied in some cases. It is concluded that the sulfuric acid-sodium hydroxide system is the most reproducible and should have the broadest utility. (auth)

736 DEVELOPMENT OF THE SWEDISH ROENTGEN STANDARD LABORATORY EQUIPMENT R. Thoraeus (King Gustav V Jubilee Clinic, Stockholm) Acta Radiol. (N. S.), 1 205-16 (June 1963). (In English)

Improvements of the Swedish roentgen standard laboratory equipment, introduced in connection with an increase of its calibration capacity from 200 to 300 kv, are de-

scribed. The employment of a sub-divided collector electrode, as well as the characteristics of the new 300 kv tube and the new diaphragm system, and precision measurements of diaphragms are discussed (auth)

737 USE OF INTERNAL SCINTILLATION STANDARDS IN HETEROGENEOUS COUNTING SYSTEMS Ben Bloom (National Inst of Arthritis and Metabolic Diseases Bethesda Md) Anal Biochem 6 359 61(Oct 1963)

To compare the results obtained from the assay of potassium gluconate in a thixotropic gel powder phosphor system (TGP) with those obtained from the hexose degradation procedure the relative H^3 and C^{14} efficiencies of the individual systems were evaluated using toluene H^3 and toluene C^{14} as the internal scintillation standards (ISS). Three samples of radioactive potassium gluconate were prepared from glucose-6- H^3 , glucose-6- C^{14} and glucose- C^{14} by the method of Moore and Link. The salts were ground, suspended in toluene containing TGP, PPO and POPOP, and assayed for radioactivity. Samples of three radioactive potassium gluconates were also converted to gluconic acid and the aqueous solutions reduced to thick syrups which were then taken up in Hyamine. Counting was done in PPO and POPOP. Following counting of the samples 20 μ l of toluene H^3 and 20 μ l of toluene C^{14} were added to the sample to determine the relative efficiencies of the two counting systems. Data based on the activities of the internal scintillation standards indicate that the TGP system is the more efficient of the two systems with respect to both H^3 and C^{14} . However inspection of the data obtained with the radioactive potassium gluconate and gluconic acid samples indicates that the Hyamine system is more efficient for both H^3 and C^{14} (H M G)

738 (EUR-422 e) PREPARATION AND CALIBRATION OF Co^{60} STANDARDS FOR INTEGRATED THERMAL FLUX MEASUREMENTS R Vaninbroux and G Grosse (European Atomic Energy Community, European Atomic Energy Community Nuclear Research Center, Ispra Italy, and European Atomic Energy Community Central Nuclear Measurements Bureau Geel Belgium) 1963 20p

At the request of the "Working group of neutron dosimetry" 3 series of Co^{60} standards for flux monitoring (0.25, 2, and 35 mc) were prepared and standardized with high precision. The maximum error of the absolute activity is $\pm 1\%$. The complete standardization method including the absolute and the relative method is described in detail, together with a discussion of the errors. The activities of the standards are expressed also in thermal flux units and an explanation of this choice of unit is given (auth)

739 CONSTRUCTION AND ABSOLUTE CALIBRATION OF A PHOTONEUTRON STANDARD C P Galotto Acta IMEKO (Intern Messtech Conf) Budapest 1961 5 593-605(1961)

A beryllium neutron standard source was constructed. Its activity was $(3.11 \pm 0.07) \times 10^5$ neutrons per second. The beryllium was formed into two interlocking hemispheres with a cavity which contained the gamma source ($RaBr_2$) that was encapsulated by platinum. The neutron production was by $Be^9 + \gamma \rightarrow n + 2He^4$. The calibration and comparison to NBS are discussed (R E U)

740 (TID 19752) INSTRUMENT STANDARDS (General Electric Co. Hanford Atomic Products Operation, Richland Wash.) 1963 Contract AT(45-1)-1350 250p (HWS 10005)

Hanford Atomic Production Operation specification guides for instruments: radiation detection instruments; instrumentation thermocouples; orifices; process control instruments; and electronic design are presented. Details of this manual are given in TID 4100(Suppl.) (N W R)

741 (EANDC-33U(p 52-63)) STANDARD CROSS-SECTION FOR NEUTRON FLUX MEASUREMENTS BE-

TWEEN 10 kev AND 100 kev R Batchelor and J F Barry (United Kingdom Atomic Energy Authority Weapons Group Atomic Weapons Research Establishment Aldermaston, Berks England)

It is recommended that the $Li^6(n, \alpha)$ reaction be adopted as the primary standard for neutron flux measurement between 10 and 100 kev. The reasoning behind this recommendation is given (T F H)

742 IONIZATION CHAMBERS FOR MEASUREMENT OF THERMAL AND GAMMA RADIATION A N Konovalov A V Frolov and I I Shulginin (State Inst of Radiat. Radiological Research Inst USSR) Med Radiol 8 No 10 72 7(Oct 1963) (In Russian)

The necessity of establishing set standards for ionization chambers intended to measure thermal and gamma radiation is discussed. It is shown that 4 types of ionization chambers will sufficiently serve the medical purposes. The results of research showed optimum correlation between the diameter of the cylindrical chamber and its length to be 0.5-1.0 to effect measurements in the range of effective quantities of the order of 10-120 lrv. Chambers made of ethylene and polyethylene with their walls 0.15-0.25 mm thick should be most suitable (P C H)

743 THE USE OF 90 kv X RAY GENERATORS AS A RADIATION SOURCE B Coleby A J Bailey and D N Rhodes (Low Temperature Research Station Cambridge Eng) Intern J Appl Radiation Isotopes 14 499 502 (Nov 1963)

Standard crystallographic x ray generators were modified for use as laboratory radiation sources. Average dose rates of 8000 rad/min were obtained in a volume of 35 ml and 400 rad/min in 140 ml by employing double sided irradiation. The unfiltered radiation gave a half value depth in tissue of 2.4 mm and was considered unsatisfactory for surface irradiation treatment of fruit (auth)

744 ON THE RANGE OF APPLICATION OF THE STANDARD METHODS FOR BETA DOSIMETRY D Herrmann and C F Weiss (Institut für Angewandte Radioaktivität Deutsche Akademie der Wissenschaften Leipzig) Monatsber Deut Akad Wiss Berlin 5 482-9(1963) (In German)

Discrepancies in standard methods for beta dosimetry are discussed. Theoretical explanations of the causes of errors are considered. Conclusions were made regarding the applications of various standard methods (M C G)

745 (NP 13746) METHODS OF EVALUATING RADIOLOGICAL EQUIPMENT AND MATERIALS Recommendations of the International Commission on Radiological Units and Measurements Report 10f 1962 (National Bureau of Standards Washington D C) Aug 23 1963 40p (NBS Handbook 89)

Changing concepts of methods, materials and systems in medical radiology call for agreement on methods for measurement and evaluation of radiological materials and systems. Recommendations are offered as a basis for standards in this area. These recommendations cover the measurement of focal spots, of the conversion factor of x ray image intensifiers, of the characteristics of grids and of the characteristics of body-section radiographic equipment. An appendix on radiation quantities and units is included (D L C)

746 THE ABSOLUTE MEASUREMENT OF THE R UNIT IN THE ENERGY RANGE OF CONVENTIONAL X RAY THERAPY THE PRIMARY STANDARD X RAY IONIZATION CHAMBER OF THE DAU INSTITUT OF BIOPHYSICS BERLIN BUCH A Rikow and J Richter (Inst of Biophysics German Academy of Sciences Berlin) Radiobiol Radiotherap 4 745 50(1963) (In German)

The primary standard x ray ionization chamber is specially designed in the Institute of Biophysics of the Deutsche

Akademie der Wissenschaften is described. The necessary correction factors and their determination and the partly experimentally partly numerically determined deviations of different standard chambers are reported. The maximum error in the reproduction of the R unit with this assembly is $\pm 1.8\%$, the mean deviation $\pm 1.5\%$ (auth).

747 STANDARDIZATION OF A Ra-Be NEUTRON SOURCE FOR USE IN A STANDARD PILF. A. Capgras. Bull. Inform. Sci. Tech. (Paris) No. 81. 4p-7 (Mir, 1964). (In French).

The calibration of a (Ra-Be) neutron source with respect to a (Ra-Be) standard source is described. The method of the manganese bath and that of the long counter is used. The results obtained by both methods agreed but the first was more accurate. (auth).

748 (SC-4452C(M)) SANDIA CORPORATION STANDARD ENVIRONMENTAL TEST METHODS. (Sandia Corp., Albuquerque, N. Mex. and Sandia Corp., Livermore Lab., Livermore, Calif.) July 1964. Contract [AT(29-1)-789]. 100p.

This publication supersedes SC-4452B(M) dated February 1963.

Minimum requirements in the form of process standards covering the instrumentation equipment and methods to be used in conducting environmental tests on Sandia Corporation components are set forth. General guidance is included to help design, development, and test personnel achieve uniformity of testing. A check list for preparation of the environmental testing portion of product specifications is also included to promote uniformity of specifications. (auth).

749 (HW-81871) IASF-NEUTRON DOSIMETRY INTERCALIBRATION OF COUNTING FACILITIES. H. H. Yoshioka and W. H. Zimmer. (General Electric Co., Hanford Atomic Products Operation, Richland, Wash.) Apr. 1964. Contract AT(45-1)-1350. 24p.

The coordinated program for standardization of neutron flux and exposure determinations among ANL, BMI, BNL, GA, GL, HAPO, GE-NMPO, GF-VAL, ORNL, and Phillips is discussed. Techniques and results are discussed. (R. F. U.).

750 (BNL 848) FABRICATION OF BNL STANDARD COBALT-60 SOURCE. A. Olmunn and O. A. Kuhl. (Brookhaven National Lab., Upton, N. Y.) Feb. 1964. Contract AF 30-2 GLN 16. 26p.

The BNL standard source is a cobalt-60 gamma irradiation source consisting of a strip of cobalt approximately 12 inches long which has been doubly encapsulated in stainless steel once before activation and again after activation. A description is given of the procedures and equipment used in the preparation and fabrication of these sources to meet the specifications of the Savannah River Plant. (auth).

751 PHYSICAL ASPECTS OF IRRADIATION. Recommendations of the International Commission on Radiological Units and Measurements (ICRU). Report 10b. 1962. National Bureau of Standards Handbook 85. (National Bureau of Standards, Washington, D. C.). 1964. 106p. \$0.70(GPO).

Physical properties of radiations are reviewed. Emphasis is placed on information acquired since 1959 on various techniques for the measurement of absorbed radiation dose and radiation exposure. Characteristics of radiation instruments are reviewed in detail, including radiation standards and methods for neutron measurements. Available data for stopping power ratios and the average energy (W) required to produce an ion pair in a gas are reviewed and modifications for these factors are presented. (C. H.).

752 (AFC-tr 6399(p 1-9)) UNIFIED AUTOMATIC CONTROL DEVICE FOR USING A MODULATED RADIO-

ACTIVE RADIATION. N. N. Shumilevskiy, V. A. Yarushevskiy, Yu. V. Gushchin, V. N. Pozdnyakov, V. A. Kiryukhin, and R. A. Lein. Translated from *Radiotzotopnyye Metody Avtomat. Kontrolya*, Akad. Nauk Kirg. SSR, Iz. Rasshiren. Soveshch. Vses. Seminara po Prikladnuyu Radioaktiv. Izotopov v Izmeritel'n. Tekhn. Priborostr., 1961, 2. 3-10 (1962).

The variety of instruments developed for radiometric measurement and control has led to the need for unified automatic control systems built out of standard blocks. A first variant of such a unified system has been produced. The system comprises a transducer and measuring device and the various forms of transducers and measuring devices (bloks) are described together with their application. (D. L. C.).

753 (NASA-17-1-126(p 102-37)) A STANDARD CUBICAL TELESCOPE. Y. I. Blokh. (Translation).

A description of the counter telescope and some representative results for locations in the Soviet Union are presented. (R. F. U.).

754 PRECISION REDETERMINATION OF STANDARD REFERENCE WAVELENGTHS FOR X-RAY SPECTROSCOPY. J. A. Bearden, Albert Henins, John C. Mizusoff, William C. Stauber, and John S. Thomsen. (Johns Hopkins Univ., Baltimore). Phys. Rev. 135. A899-901 (Aug. 17, 1964).

This investigation is designed to determine with high accuracy the wavelength ratios of a standard x-ray reference lines: $\text{Cr K}\alpha$, $\text{Cu K}\alpha_1$, $\text{Mo K}\alpha_1$, $\text{Ag K}\alpha_1$, and $\text{W K}\alpha_1$. Most measurements were obtained with a double-crystal spectrometer in reflection. However, a few were taken with the instrument converted to a high-precision single-crystal spectrometer, and some tungsten determinations were made in transmission. Since estimated errors (± 1 ppm) are the lowest ever claimed for this type of work, the apparatus, including adjustment, calibration, and corrections, are described in considerable detail. Novel features include use of a high-intensity, narrow-focus rotating target tube for most measurements, calibration of the spectrometer circle to 0.1 sec with an angular interferometer, and a careful selection of 5 crystals (1 calcite, 2 quartz, and 2 silicon) from more than 100 samples tested. Bragg angles were determined for 20 different combinations of crystals and wavelengths. With an assumed wavelength value for one selected line, this gave an overdetermined set of 20 equations for 9 unknowns (4 wavelengths and 5 grating constants) which was solved by a least-squares adjustment. If the value for $\text{Mo K}\alpha_1$ is provisionally taken as 707,831 xu, the resulting values for the other wavelengths are: $\text{Cr K}\alpha_2$, 2288,854 $\pm$ 0.003 xu, $\text{Cu K}\alpha_1$, 1537,370 $\pm$ 0.002 xu, $\text{Ag K}\alpha_1$, 558,2486 $\pm$ 0.0006 xu, $\text{W K}\alpha_1$, 208,5770 $\pm$ 0.0003 xu. However, the primary quantities determined are the wavelength ratios, which are invariant with respect to a choice of the primary defining reference line. The question of adopting a definitive standard is left open for the present. (auth).

755 SPECIFICATION FOR FILM BADGES FOR PERSONNEL RADIATION MONITORING. London: British Standards Institution, 1963. 12p.

The British Standard for establishing a size for monitoring film and the essential requirements for design of a suitable holder are presented. Specifications apply to badges consisting of photographic film packets, a combination of external filters, and a film holder in such a form as to provide a lightweight rugged radiation dosimeter for monitoring radiation doses including thermal neutrons received by personnel. (H. M. G.).

756 (TID-20893) STANDARD NUCLEAR INSTRUMENT MODULES. Louis Costrell. (National Bureau of Standards, Washington, D. C.). July 1964. 14p.

General specifications for standard instrument modules, which can be interchanged physically and electrically, are discussed. These form the recommendations of the AEC Committee on Nuclear Instrument Modules (R.E.U.)

757 LABORATORY SUPPORT FOR AN X-RAY INSPECTION PROGRAM. Hanson Blatz (New York City Dept. of Health). Health Phys., 10: 643-9 (Sept. 1964).

An attempt was made to demonstrate that the standards now being used in the United States for x-ray inspections are far from satisfactory in terms of validity, scope and completeness. The tools and instruments available to collect the necessary data are, for the most part, inadequate and inappropriate since they were almost all designed for other purposes. These deficiencies can be resolved only by a vigorous and extensive program of research and experimentation to improve the standards and develop new instruments and inspection techniques. Such a program is beyond the scope of local health agencies without substantial and well coordinated outside support. This situation has existed in spite of the knowledge for many years that excessive exposure of the population to radiation from x-ray equipment far exceeds that from all other man-made sources including fallout, about which so much research effort has been exerted. (auth)

758 (NP-14356) METODY ETALONIROVANIYA RADIOAKTIVNYKH ISTOCHNIKOV I GRADUIROVKI RADIO-METRICESKOGO I DOZIMETRICESKOGO APPARATURY. (Radioactive Source Calibration and Graduation of Radiometric and Dosimetric Instruments). S. N. Baikalov, R. D. Vasil'ev, E. F. Garapov, et al. (U.S.S.R. Sovet Ministrov. Gosudarstvennyi Komitet po Ispo-'zovaniyu Atomnoi Energii). [1963]. 18p. Dep.(mn).

The All-Union D. I. Mendeleev Institute for Metrology is assigned the duty of developing standard measurements for ionizing radiations, including the determination of the activity, dose, energy spectrum, decay scheme, particle yield, and other characteristics of radioactive sources and fields. Prototype and operational radiation sources and spectrometric instruments are systematically examined at the Institute where also basic methods are developed for measuring the dose and the dose rate of α and γ radiation sources. Currently, attention is devoted to the development of standard methods for measuring the flux density, energy spectrum and angular distribution of thermal neutrons. Monoenergetic neutron sources, such as those based on (d,d) and (γ ,n) reactions are investigated. Standard sources are prepared by depositing the radioactive material on a stainless steel or Al support at a thickness of about 100 μ g. During the first stage of the study, natural U, ^{239}Pu , ^{60}Co , ^{90}Sr + ^{90}Y , and ^{204}Tl were used as the chief emitters. Spherical, 40 and 25-mm Ra- γ -Be sources were used as reference standard for the neutron flux density measurements, for the calibration of thermal neutron sources, a paraffin block containing a Po- α -Be, Pu- α -Be, Ac- α -Be, or Ra- α -Be source in its center was employed. The current metrological studies carried out at the Institute are described. (TTT)

759 HIGH-PRESSURE CHAMBER FOR STANDARD DOSIMETRY. E. Tschirf and H. Wildpaner (Osterreichische Hochschule, Vienna). Acta Phys. Austriaca, 18: 287-91 (1964). (In German)

A device for absolute measurements, designed to express gamma doses according to the x-ray definition, was developed for the calibration of radiation sources. The theory of the device is outlined, and a description is given. The calculation of the dose output and the pertinent correction factors is indicated. (J S R)

760 (EUR-1883 i) AUTORADIOGRAFIA QUANTITATIVA. PARTE I PREPARAZIONE DEGLI STANDARD RADIOATTIVI A CONCENTRAZIONE SCALARE DI TRACCIANTE. (Quantitative Autoradiography. Part I Preparation of the Radioactive Standards with Step-Type Concentration of Tracer). L. Matteoli, P. Logi, and S. Salamanna (Istituto di Ricerche Breda S.p.A., Milan). 1964. 20p. Dep (mn).

Quantitative interpretation of the results of an autoradiographic investigation may be possible if one uses a

radioactive calibration source series prepared with isotopes of suitable energy and with known step type concentration. Details are given of a method for the preparation of radioactive standard films having uniform constant thickness, the method is based on the use of photographic gelatin as a support of the tracer and on a modification of Goldberg's classic method for the preparation of thin gelatin layers with variable thickness for photometric measurements. Details on the following points are reported: basic physico-chemical properties of gelatin, preparation of slides for deposition of the gelatin-tracer solution, selection of lateral inserts referring especially to the desired thicknesses, choice of suitable tracer concentrations and preparation of radioactive solutions, drying-up and preservation of obtained films, control of thickness and tracer distribution, mounting of standard series and selection of source supports. Some autoradiographies of the obtained standard series and the corresponding photometric traces are included. Finally, a method is described for the preparation of radioactive films having constant concentration and growing thickness ("wedges"), to ascertain the influence of thickness variations on the autoradiographic image blackening for every employed radioisotope. As an example, the autoradiographies of two "wedges" of ^{45}Ca are reported. (auth)

761 SELECTION OF W K α_1 AS THE X RAY WAVELENGTH STANDARD. J. A. Bearden (Johns Hopkins Univ., Baltimore). Phys. Rev. 137: B455-61 (Jan 25 1965).

Precision measurements showed that the λ unit scale of x-ray wavelengths based on Mo K α_1 = 707.831 $\text{\AA}$ is about 20 ppm smaller than that in general use for Cu K α_1 and longer wavelengths and for substantially all crystal parameters. Furthermore, the conversion from the Cu K α_1 1.537400 kx to $\text{\AA}$ was increased from 1.00202 to 1.002056 $\pm$ 5 ppm. New techniques permit wavelength measurements to be made with relative probable errors of ± 1 ppm. New wavelength and crystal-parameter tables are now necessary. Thus the opportunity arises for introducing an x-ray wavelength standard. To select the best wavelength for the standard the following studies were carried out: relative measurements of five wavelengths with five crystals employing a least squares adjustment, γ -ray study of single crystal diffraction patterns and the use of a γ -ray wavelength as a standard, crystal imperfections and their effect on wavelength measurements, effect of chemical impurities on grating constants, and redetermination of the absolute wavelength scale. The requirements of a standard are analyzed and the advantages of the W K α_1 line listed. Its wavelength is 0.209010 $\text{\AA}$ $\pm$ 5 ppm on the absolute scale, and without error as the designated standard. With this standard new wavelength tables were prepared which include a large number of new measurements of secondary wavelength standards used as reference lines in many original measurements. Probable errors on both the relative and the absolute scale were included. (auth)

762 (UCRL-13128) PART I FABRICATION PROCESS FOR HIGH-VOLTAGE PIN DETECTORS. PART II APPENDIX. RESEARCH AND DEVELOPMENT ON FABRICATION OF PIN AND LID DETECTORS AND THE DRY RUN INTERFACE SYSTEM. (Solid State Radiations, Inc., Los Angeles). Sept 1, 1964. For California Univ., Livermore. Lawrence Radiation Lab. Contract W-7405-eng-48. 113p. Dep (mn), \$4.00(cy), 3(mn). OTS.

Process specifications are given for the various operations involved in the manufacture of PIN gamma transient detectors using boron-doped p-type silicon. Development work on the fabrication of lithium-ion-drift detectors for high sensitivity and of PIN detectors for high speed is reported. A dry run system for field testing detectors with simulated gamma-ray bursts is described, and some test results are given. (D L C)

763 (JUL-179-RX) H $_2$ O-STANDARD-PILE. G. Borchardt and B. Hasenclever (Kernforschungsanlage Institut für Reaktorexperimente, Jülich). Sept 1964. 14p. Dep (mn).

In addition to the paraffin stack and the manganese bath, a water bath is also available as a neutron standard. The construction of such a water bath for use as a neutron standard was described. The water container, shielding calculations, Ra-Be neutron source, movable coordinate system, addition irradiation device for foils, the hollow body, the rotary disc, and the water purification are considered. (J S R)

764 (ORNL 3631) EVIDENCE OF THE ABSENCE OF LONG LIVED ISOTOPES OF PROMETHIUM FROM FISSION OF URANIUM, AND THE PURIFICATION OF PROMETHIUM FOR THE ESTABLISHMENT OF A PRIMARY SPECTROGRAPHIC STANDARD P B Orr R S Pressly, and E J Spitzer (Oak Ridge National Lab Tenn) Jan 1965 Contract W-7405-eng-26 21p Dep, \$2 00(OTS)

A sample of high-purity promethium produced by uranium fission was separated by ion exchange on Dowex 50 W-X4 hydrogen form resin, with diethylenetriamine pentaacetic acid and citric acid as eluants. Within the limits of detection, no isotope of promethium with a half life of greater than 2.6 yr was found in the product which had decayed through two half lives of ^{147}Pm . The promethium contained only traces of yttrium, samarium and neodymium and was of sufficient purity to establish spectra for a promethium standard. (auth)

765 HYDROGEN MASER AND CESIUM BEAM TUBE FREQUENCY STANDARDS COMPARISON H E Peters (Varian Associates, Beverly Mass) J Holloway A S Bagley, and L S Cutler Appl Phys Letters, 6, 34-5 (Jan. 15, 1965)

Direct frequency comparisons between a hydrogen maser and a cesium beam tube frequency standard are summarized. (D C W)

766 HYDROGEN MASER FREQUENCY COMPARISON WITH SWISS CESIUM ATOMIC BEAM STANDARD H E Peters (Varian Associates, Beverly, Mass) and P Kartaschoff Appl Phys Letters, 6, 35-6 (Jan 15, 1965)

Direct frequency comparisons between a hydrogen maser and the 4-m cesium beam tube of the Laboratoire Suisse de Recherches Horlogeres are summarized. (D.C.W.)

767 STANDARD RADIOACTIVITY MEASUREMENTS. Yu. Naoru. Genshiyoku Kogyo, 9 No. 2, 28-32(1963) (In Japanese)

For calibrating radioactivity values, a standard solution is used whose activity is expressed in Curies. An absolute method may be direct with data obtained in Curies or indirect, using a calorimeter. Principles of methods using various counters are described. By a modified method the specific activity of a 20- $\mu\text{C/g}$ solution was measured directly, background effects were unimportant at this high activity. The precision of ^{60}Co measurements was $\pm 0.5\%$. Calorimetric determinations, in which the error is 1 μwatt , were made on ^3H . The decay rate differed from that of a U. S. NBS standard by only 0.1%, and the result agreed with a gas counting method. (IIC-MG)

768 THE CALIBRATION OF THE NATIONAL BUREAU OF STANDARDS' TRITIATED-TOLUENE STANDARD OF RADIOACTIVITY S B Garfinkel, W B Mann, R W Medlock, and O Yura (National Bureau of Standards, Washington, D C) Intern J Appl Radiation Isotopes, 16, 27-33 (Jan 1965)

The difficulties encountered, and their solution, when calibrating a radioactivity standard of tritiated toluene by comparison with the NBS tritiated-water standard by means of liquid-scintillation counting, are described. Leaks in the seals of commercial vials, giving rise to uncontrolled oxygen quenching, were eliminated by modifying the seals. White plastic caps gave higher count rates than black plastic caps. A new and highly precise method of dilution was used. The ratio of the activities of the two standards was determined with a standard error of less than 0.1% (auth)

769 (UCRL-Trans-1145(L)) INDUSTRIAL METROLOGY—EFFECT OF TEMPERATURE ON THE CALIBRATION OF STANDARDS Paul Grand Translated for Univ of California Lawrence Radiation Lab, Livermore, from Rev Gen Mecan, 39-40 (1955-56) 92p Dep (mn), \$8 60(fs), \$2 96(mf) JCL

A study is made of the effects of temperature on the calibration accuracy of standards whose tolerances are between several microns and several hundredths of a mm and may have relative values as low as 8×10^{-8} . Measurement errors due to a variable ambient temperature in the measurement room are calculated. The effects of aging on the lengths of standards are also considered. Criteria for minimizing these errors are outlined. (D L C)

770 (BDX-613-43) A STANDARDS AND CALIBRATION PROGRAM IN A LARGE DEFENSE PLANT J F

Hadley (Bendix Corp Kansas City, Mo) Nov 1963 Contract [AT(29-1)-613] 12p (CONF 631108 1) Dep (mn), \$1 00(cy), 1(mn) CFSTI

From IEEE Symposium on Measurements and Instrumentation, Kansas City, Mo

A description is given of Bendix's standards and calibration system and its relationship to the AEC Standards and Calibration system and to the National Bureau of Standards. The primary standards laboratory maintains reference standards for all electrical, environmental and dimensional measurements in the plant. Five departments are provided for periodic calibration of all measuring instruments. Evaluation of the calibrations and vendor calibration are discussed. (D L C)

771 REPORT OF THE RBE COMMITTEE TO THE INTERNATIONAL COMMISSION FOR RADIATION PROTECTION AND FOR RADIOLOGICAL UNITS AND MEASUREMENTS Keinecigic 7-B151-203 (Oct 1964) (In German)

A study on the significance and application of the RBE (relative biological effectiveness) in radiation protection is presented. It represents a comprehensive survey of the theoretical basis and experimental data available. The origin of the present RBE value, specification of the radiation quality, experimental RBE data, generalizations from the experimental data, application to men, dependence of the RBE on the radiation energy, evaluation of the dose equivalent RBE values for accidental radiation exposures and emergency radiation exposures, problems of acute radiation burden and limits of the RBE concept are discussed. 99 references are included. (I S R)

772 NUCLEAR MEASUREMENTS Jozef Spaepen (European Central Bureau for Nuclear Measurements, Geel, Belg) Euratom Bull, 4: No 1, 2-7 (Mar 1965)

The activities of the Euratom standards bureau for nuclear measurements are outlined, including preparation of samples and standards, development of counting techniques; and research on threshold reactions, dosimetry, fast neutron scattering, boron, and preparation of foils containing fissile isotopes. The facilities of the bureau are briefly considered. (D C W.)

773 WORKING STANDARDS AND COBALT-60 FIRST-ORDER DISCHARGE REFERENCE γ EMITTERS A F Driehko, F M. Karavaev, L. P. Kul'kova, and E A Khol'nova. p 11-13 of "Novye Nauchno-Issledovatel'skie Raboty po Metrologii. Informatsionny Sbornik." Moscow-Leningrad, Izdatel'stvo Staidartov, 1964 (In Russian)

The standards were fabricated from metallic Co in the form of 2.00 ± 0.04 -mm diameter and 2.0 ± 0.1 -mm high cylinders encapsulated in Al. By 1963 6 series of emitters were completed, each containing 8 individual sources with activities ranging from 0.5 to 400 μC . In view of the relatively short half life of ^{60}Co , the lowest-intensity sources were gradually removed from the list of available working standards. The certified sources were destined to be transmitted to the various research institutes and the Bureau of Standards and to departmental laboratories (TTT)

774 (NP-15052) REPORT ON THE INTERNATIONAL COMPARISON OF THE $4\pi\beta(\text{PC})$ - γ METHOD BY MEANS OF ^{60}Co , MARCH/APRIL 1963 A Rytz (Bureau International des Poids et Mesures, Sevres (France)) Apr 15, 1965 36p Dep (mn)

Seventy-eight high-quality solid sources of ^{60}Co , each measured by C B N M and N P L and one of 20 national or international laboratories, gave an excellent survey of the mutual agreement between $4\pi\beta(\text{PC})$ - γ measurements made in different parts of the world, any two laboratories measuring the same source agree in 95% of the cases within less than 0.61%, the agreement between C B N M and N P L is about twice as good. The corrections to be applied to the measurements and the sources of error inherent to $4\pi\beta$ - γ counting are analyzed in great detail. The decay scheme dependent correction is found to be adequately expressed by $(1 - \epsilon_\beta)/\epsilon_\beta$ multiplied by a constant which has to be determined experimentally. The measurements of the specific activity of a ^{60}Co solution distributed simultaneously show a dispersion of 1.4% as compared to 3.1% obtained 14 months earlier. The presence of systematic errors due to various manipulations of solutions is highly probable. Some evidence of a systematic difference of about 0.5% as to the method used for deter-

mining the mass of the aliquot is put forward. Solid sources of the type used in this comparison might be useful standards of radioactivity during many years and should be used for evaluating the long term stability of a specified counting equipment (auth)

775 ABSOLUTE ENERGY STANDARDS FOR VAN DE GRAFF ACCELERATORS. G. C. Phillips (Rice Univ., Houston, Tex.) p 261-78 of "Nuclidic Masses" Vienna-New York, Springer-Verlag, 1964

A survey of measurements made at Rice University on neutron-threshold energies for (p,n) reactions, resonance energies for (p, α) and (p, γ) reactions, and the energy of ^{210}Po alpha particles is presented. The set of absolute calibration energy standards obtained is included (D C W)

776 GO NO-GO GAUGE (Engineering Materials) (Lawrence Radiation Lab. Univ. of California Berkeley) 3 drawings (CAPF-1208)

The standard etched wiring board with 22 contacts is $4\frac{3}{8}$ in $\times$ $4\frac{3}{16}$ in. A gauge was designed for a rapid dimensional check of the standard printed wiring board. The gauge checks the width of the board, the width, length and location of the insertion tab and the position of contacts (For Details See TID-4100) (M C G)

777 CONVENIENT CADMIUM-METAL STANDARD FOR CHECKING NEUTRON, SOIL MOISTURE PROBES. Bowman D. H., King, K. M. (Ontario Agricultural Coll., Guelph) Soil Sci. Soc. Am. Proc., 29: 325-7 (May-June 1965)

A convenient standard was devised for checking the calibration of a neutron-scattering soil moisture depth probe at five fixed points. For a calibration check the probe was placed into one of five waterproof steel tubes immersed in water. Fixed points were obtained by attaching different amounts of cadmium sheet metal to the outside of the tubes to absorb different amounts of the thermal neutrons scattered back by the water. Cadmium-metal standards were applicable as well to surface probes (auth)

778 (ORNL-3782, pp 24-8) MISCELLANEOUS ELECTRONICS DEVELOPMENTS. (Oak Ridge National Lab., Tenn.)

Standards for instrument module packaging and nuclear instrument design are discussed. Discussions are also included concerning stable power supplies for x-ray spectrometers and development of d-c power amplifiers to drive fractional-hp servo motors (J R D)

779 (ZFK-PHA-12, pp 66-9) THE STANDARDIZATION OF SEMICONDUCTOR DETECTORS. Kaufmann, C. In German.

Proposals are made for the standardization of semiconductor detectors, especially surface barrier detectors, so that the conditions of preparation and coupling would be the same. The suggestions are intended only as the basis for discussion among the users of semiconductor detectors and not as rigid guidelines. (J.S.R.)

780 A PRECISION DOSIMETER ACCORDING TO KUESTNER-PYCHLAU. Pychlau, H., Pychlau, P. (Physikalisch-Technische Werkstaetten Dr. Pychlau KG, Freiburg i. B.). Fortschr. Gebiete Roentgenstrahlen Nuklearmed., 103: 91-5 (1965). (In German).

An account is given of a further development in the large standard dosimeter devised by Kuestner. The new precision dosimeter after Kuestner-Pychlau is suitable to serve as secondary standard for the calibration of practical dosimeters used and to carry out comparative measurements between standards of the various national laboratories (auth)

781 STANDARD MODULE SYSTEM (Engineering Materials). (Lawrence Radiation Lab., Univ. of California, Livermore). (CAPE-1226).

21 drawings.

The versatile system of modular plug-in units described conform to the standards adopted by the AEC Committee on Nuclear Instrument Modules. They are easily interchanged or replaced and cost less for updating and expanding. Modules are available in two panel heights, 5.25 and 8.75 in. Panel width are in nominal multiples of 1.35 in., with accommodation for twelve single-width modules in the bin. The 5.25-in. module can plug into an 8.75-in. bin using an adapter plate. The system makes the maximum use of the volume available in a 19 in. relay rack (F J H)

782 (AEET-224) FACILITY FOR STANDARDIZATION OF RADIONUCLIDES. Gupta, U. C.; Srivastava, P. K.; Misra, S. C.; Sidhu, N. P. S.; Dhinra, K. C.; Khera, G. D.; Sahoo, H. K.; Rao, P. S. (Atomic Energy Establishment, Trombay (India). Electronics Div.). 1965. 38p. Dep. mn.

Techniques and instruments used for the standardization of radionuclides in the Electronics Division are described. The standardization procedures are briefly described and the accuracy of the results obtained using several methods are tabulated. Standardization of radioactive sources includes determination of the total disintegration rate and radiochemical purity of the sample under study (P C H)

783 (NP-15663) STANDARD REFERENCE MATERIALS. HALF LIVES OF MATERIALS USED IN THE PREPARATION OF STANDARD REFERENCE MATERIALS OF NINETEEN RADIOACTIVE NUCLIDES ISSUED BY THE NATIONAL BUREAU OF STANDARDS. Anspach, S. C., Cavallo, L. M.; Garfinkel, S. B.; Hutchinson, J. M. R., Smith, C. N. (National Bureau of Standards, Washington, D. C.). Nov. 15, 1965. 12p. (NBS-MISC.PUBL-260-9). GPO \$0.15

Values are given for the half lives of materials used in the preparation of standard samples of ^{22}Na , ^{45}Ca , ^{46}Sc , ^{54}Mn , ^{57}Co , ^{60}Co , ^{65}Zn , ^{85}Kr , ^{85}Sr , ^{90}Sr , ^{88}Y , ^{95}Nb , ^{125}I , ^{139}Ce , ^{141}Ce , ^{147}Pm , ^{203}Hg , and ^{204}Tl issued by the National Bureau of Standards. Instrumentation, source preparation and the determination of impurities are also discussed (auth)

784 (COO-119-233, pp 94-6) PREPARATION OF ^{90}Sr STANDARD IN PLASTIC BLOCK FOR DENSITOMETRIC EVALUATION OF RADIOAUTOGRAMS. Atherton, D. R.; Jee, W. S. S. (Utah Univ., Salt Lake City. Radiobiology Div.).

A bioplastic block with uniformly distributed ^{90}Sr was prepared for use as a standard for the evaluation of autoradiograms produced by exposure of film to tissue containing ^{90}Sr . The procedure and materials are reported (C H)

785 RADIOACTIVE REFERENCE SOURCE AND METHOD FOR MAKING THE SAME. Christianson, Charles; Miglio, Ralph C. (to U. S. Navy). U. S. Patent 3,217,165. Nov. 9 1966. Filed June 12, 1961.

A method of preparing a beta radioactivity reference source consists of horizontally supporting a thin flat absorbent pad, saturating the pad with a known quantity of a predetermined percent solution of a material of known beta activity by evenly distributing the droplets of the solution on the upper surface of the pad, and air drying the pad. The specific activity of a radioactive salt can be determined by saturating two pads of identical geometry with identical quantities of identical percent solutions of a given salt, drying the pads, and counting the radioactivity emitting from the pads in the same geometry in the same measuring device. (B.L.M.)

786 THE THERMAL NEUTRON ABSORPTION CROSS SECTION OF THE ARL BORON STANDARD. Wynchank, S. A. R.; Cox, A. L.; Collie, C. H. (Oxford Univ.). Nucl. Instrum. Methods, 39: 350 (Jan. 11, 1966).

Information is given pertinent to the results of the measurement of thermal neutron absorption cross section of the new ARL boron standard ($\sigma_{\text{g ARL}}$) for the isotopic composition. The results of a mass spectrometric measurement on this and other boron standard indicates that the ^{10}B content of the ARL boron standard is $19.744 \pm 0.093\%$. Also $\sigma_{\text{g ARL}}$ is predicted as being 756 ± 4 barn. Further details are given of the chemical analysis of the solutions in which measurements were made of thermal neutron lifetime (J I P)

787 (RI-RI A-259), pp 73-9) A COMPARISON OF A DOUBLE DIFFRACTING X-RAY UNIT WITH A STANDARD X-RAY DIFFRACTION UNIT. Clark, W. I. (Battelle-Northwest Richland Wash. Pacific Northwest Lab.)

A sample of unirradiated uranium with a random orientation was run on a standard x-ray diffraction unit then in a double-diffraction unit. The relative intensity of the diffraction patterns for the 1s plane was calculated by setting the 021 plane equal to 100. The difference between the experimental values and the standard intensity values was determined and this difference plotted as a function of the 2 θ values. The set of data from the standard unit had a

random distribution whereas the data points from the double-diffracting unit seemed to form an inverted parabola. A curve of the general form $y = a + bx + cx^2$, $y = 0$ was calculated using the least-squares method. The standard intensity ratios were modified to reflect the difference between the double diffracting and standard unit. This difference was caused by a slight misalignment of the single crystal. This curve would hold true only for those data run under these instrumental conditions. (auth)

788 CALIBRATION OF A ^{60}Co SOURCE BY COMPARISON WITH A WIAK RADIUM STANDARD. Bierman, A.; Feige, Y. (Israel Atomic Energy Commission, Yavneh). *Int. J. Appl. Radiat. Isotop.*, 17: 79-80 (Jan. 1966).

A ^{60}Co source of $\sim 6\text{C}$ was calibrated by comparing its output to that of a ^{226}Ra standard. Both sources were measured with a meter using the same ionization chamber (range 2-5 R). Since the exposure and distance were the same for both sources, their dose rates were in inverse ratio to the exposure times. The dose rate in the irradiation room at 50 cm from the cobalt source was 33.6 R/hr at the time of measurement with a maximum error of 6% (F J H).

789 (AD-620276) BETA PARTICLE STANDARDS FOR ^{14}C AND OTHER ELEMENTS IN THE FORM OF RADIOACTIVE MONOLAYERS. Beischer, Dietrich E. (Naval School of Aviation Medicine, Pensacola, Fla.). May 23, 1950. 15p. (NM-001-059.16-03). CFSTI \$1.00 cy, \$0.50 mn.

The properties of radioactive monolayers for use as beta sources are discussed. The use of radioactive monolayers as standards in assay work, radioautography, and dosage determinations by means of G-M counters is recommended. (D C W)

790 (PPAD-584D) GUIDE LINE FOR USE OF STANDARD NUCLEAR INSTRUMENT MODULES. Bis-sell, R. C.; Droegge, T. F. (Princeton-Pennsylvania Accelerator, Princeton, N. J.). Feb. 15, 1966. Contract AT(30-1)-2137. 21p. Dep. mn. \$1.00 cy, \$0.50 mn.

A user's manual which contains most of the drawings, standards and pin assignments that are needed to make effective use of the nuclear instrument module system is presented. (D C W)

791 (RT/PROT-(65)31) ON THE POSSIBILITY OF OBTAINING A STANDARD SOURCE OF THERMAL NEUTRONS. Mishev, I. T. (Comitato Nazionale per l'Energia Nucleare, Rome (Italy)). Oct. 1965. 9p. Dep. mn.

After corresponding investigations a method was obtained to realize a standard thermal neutron source with 4% geometry using a standard fast neutron source embedded in a paraffin sphere with thickness 7 cm and external radius R. (auth)

792 MOESSBAUER SPECTROSCOPY. SOME RECENT APPLICATIONS TO CHEMICAL PROBLEMS. Herber, Rolfe H. (Rutgers, State Univ., New Brunswick, N. J.). pp 3-12 of Moessbauer Effect Methodology. Vol. 1. Gruverman, Irwin J. (ed.). New York, Plenum Press, 1965.

Standards in chemical Moessbauer spectroscopy are discussed briefly. Characteristics of sodium nitroprusside that make it the recommended standard absorber for ^{57}Fe Moessbauer work are listed. Moessbauer studies of the molecular structure of ^{119}Sn compounds, particularly SnH_4 , are reviewed. Tables show isomer shifts for several source matrices and reference absorbers from the nitroprusside standard and Moessbauer data for five- and six-coordinate organotin compounds. (29 references) (A G W)

793 STANDARDIZATION OF THE DIFFERENTIAL CHEMICAL SHIFT FOR ^{57}Fe . Spijkerman, J. J.; Ruegg, F. C.; DeVoe, J. R. (National Bureau of Standards, Washington, D. C.). pp 115-20 of Moessbauer Effect Methodology. Vol. 1. Gruverman, Irwin J. (ed.). New York, Plenum Press, 1965.

Among materials considered as standard reference absorbers for ^{57}Fe Moessbauer studies, sodium nitroprusside appears most promising. Its use and properties are discussed briefly. No suitable standard for ^{119}Sn Moessbauer studies has yet been found. (A G W)

794 METHODS AND PREPARATION AND APPLICATION OF RADIONUCLIDE STANDARDS. Bucina, Ivan

(C V V R Prague). pp 151-73 of Sbornik Referatu III. (Clovstini Radiochemické Konference. [Vol. 1]). [Roz] Ústav Jaderného Vyzkumu. Československá Akademie Věd [1965]. (In Czech).

A survey was made of standards available at the Institute for Research, Production and Application of Radioisotopes and of methods for their preparation, measurement and application. Radium standards in solid form and in solutions were prepared. Measurements were made with a spherical 4" ionization chamber with a Townsend compensation circuit. In the ionization chamber the influence of positional dependence was eliminated by a 5 mm Pb filter. Absolute measurements on standard solutions were made with a 4" proportional counter using coincidence and coincidence methods. Accuracy and correctness were checked by international comparisons. For measurement of ^{137}Cs and ^{131}I by the liquid scintillation method, combustion methods, and windowless counter methods, special types of standards were designed. Absolute measurement of ^{137}Cs was made by compensated internal proportional counters. For contamination measurements in water, air, and surfaces, surface standards with the radioactive material contained in a lacquer layer with a weight of less than 1 mg/cm² were prepared. Gamma standards, standards for spectrometry, and metal standards for α and β radiation are available in the form of sealed standards. (auth)

795 (AFC-tr-6466/1, pp 114-20) THE USE OF STANDARD SOURCES OF BETA RADIATION AND BREMSSTRAHLUNG IN INDUSTRIAL CONTROL INSTRUMENTS. Bogdanov, N. I.; Dambert, N. A.; Tumul'kan, A. D.; Yanushkovskii, V. A. Translated from Radiokt. Izotopy i Yadernye Izlucheniya v Nar. Khoz. SSSR. Tr. Vses. Soveshch., Riga, 1960, 1. (1961).

Several standard beta and bremsstrahlung sources are described and their use in industrial control instruments is discussed. (G O Y)

796 (SC-DC-66-1491) ORGANIZATION AND MANAGEMENT OF A STANDARDS AND CALIBRATION PROGRAM FOR A RESEARCH AND DEVELOPMENT LABORATORY. Schneider, R. L. (Sandia Corp., Albuquerque, N. Mex.). Apr. 1966. Contract AT(29-1)-789. 10p. (CONF-660522-1) Dep. mn. CFSTI \$1.00 cy, \$0.50 mn. From National Conference of Standards Labs., Annual Meeting, Gaithersburg, Md.

A measurement standards and instrument calibration program for a research and development laboratory is described. The description of this program deals primarily with the organizational philosophy of the system and does not delve into the technical aspects of standards or instrument calibration. (M O W)

797 A STANDARD REFERENCE MATERIAL FOR MOESSBAUER SPECTROMETRY OF IRON AND ITS COMPOUNDS. Spijkerman, J. J.; Ruegg, F. C.; DeVoe, J. R. (National Bureau of Standards, Washington, D. C.). pp 254-9 of STI-DOC-10/50.

The preparation and properties of single crystals of sodium nitroprusside as a standard reference material for Moessbauer studies are briefly discussed. (D C W)

798 THE CENTRAL BUREAU FOR NUCLEAR MEASUREMENTS: EURATOM'S BUREAU OF NUCLEAR STANDARDS. Spaepen, J. (EURATOM, Geel, Belg.). Atompraxis, 12: 205-7 (Apr.-May 1966). (In German).

The Euratom Treaty provides for the setting-up of a Central Bureau for Nuclear Measurements (CBNM), specializing in nuclear measurements for isotope analyses and in the absolute measurement of radiation and neutron absorption. The setting up of this Bureau as a Euratom JRC establishment was initiated at Geel, Belgium, in 1960. Its tasks are the creation of primary standards and their comparison with those of other laboratories; improvement of measurement devices and methods; accurate measurement of nuclear data; basic research; analytical and measuring operations on behalf of outside parties—all within the nuclear field. The CBNM is engaged in neutron measurements, isotope analyses, and absolute counting of radionuclides. The CBNM has created a central laboratory which supplies on request analyzed samples for nuclear measurements. These samples are prepared by a number of techniques—metallurgical electrolysis, electrospraying, evaporation, etc. About 2500 samples were prepared in 1965. Priority is accorded to neutron-measurements standards. (auth)

799 (SC-4452D(M)) SANDIA CORPORATION STANDARD ENVIRONMENTAL TEST METHODS. (Sandia Corp., Albuquerque, N. Mex.). June 1966. Contract AT(29-1)-789 100p. Dep. mn. CFSII \$4.00 cy, \$0.75 mn.

Supersedes SC-4452C(M).

Requirements in the form of Process Standards covering the instrumentation equipment and methods to be used in conducting environmental tests on components are presented. General guidance is included to help design development and test personnel achieve uniformity of testing. A check list for preparation of the environmental testing portion of product specifications is also included to promote uniformity. (B G D)

800 STANDARD GENERAL METHODS FOR ANALYSIS OF RADIOISOTOPES. Amer. Soc. Test. Mater., ASTM Stand., 474-84(1966).

General procedures are given for analysis of radioisotopes by heavy metals spot tests, gross beta particle counts, aluminum absorption curves, determinations of gamma impurities, free-acid determination, total-solids determination, and determination of nonvolatile materials. (P C S)

801 CONVERSION COEFFICIENTS USEFUL AS CALIBRATION STANDARDS. van Nootjen, B., Hamilton, J. H. (Vanderbilt Univ., Nashville). pp 642-3 of Internal Conversion Processes. Hamilton, Joseph H. (ed.). New York, Academic Press, 1966.

A survey was made of conversion coefficients which were accurately measured for use as calibration standards. The criteria for selection are that the conversion coefficient be determined by more than one method with consistent results, and that the transition of interest can be observed in a very simple decay with a reasonable half life. Only the α_K of the 279-keV transition in ^{203}Tl successfully meets these conditions, but a few others are considered good. Since this number of isotopes is so limited other cases which were accurately measured at least once are also listed. (J F P)

802 MICRON REGION PRESSURE STANDARD FOR URANIUM HEXAFLUORIDE. Pappas, W. S. (Oak Ridge Gaseous Diffusion Plant, Tenn.). Rev. Sci. Instrum., 37 1217-19(Sept. 1966). (K-L-6096).

A standard was developed for calibrating uranium hexafluoride pressure gages in the micron region. The device employs the equilibrium dissociation pressure of uranium hexafluoride furnished by the sodium fluoride complex salt at easily controlled temperatures above ambient. The pressure signal obtained is in good agreement with reported dissociation pressure measured by the transpiration method. The principles are applicable to noncorrosive gas solid systems, for example some oxides, carbonates, and hydrides dissociate reversibly to give a definite oxygen, carbon dioxide, or water vapor pressure at a given temperature. (auth)

803 (ANL-7136, pp 255-65) ISOTOPE STUDIES: TECHNIQUES AND APPLICATIONS. (Argonne National Lab., Ill.).

Progress reported on studies on the effects of trace amounts of isotopes on biological systems. Data are included on the effects of D_2O on pancreatic lipase, the effects of D_2O on beef heart aconitase, and the metabolism of ^3H -thymidine in mice. Techniques are described for the exchange labeling of chromatographic systems and for isotopic fractionation during analytical separations. Standards are presented for the evaluation of scintillation counters. (C H)

804 MEASUREMENT OF AIRBORNE ACTIVE DEPOSIT FROM ^{222}Rn (THORON). Behounek, F.; Fiser, B. (Technical Univ., Prague. Nuclear Research Inst., Prague). Health Phys., 12 1307-10(Sept 1966).

A simple routine method for the determination of the airborne active deposit from ^{222}Rn has been worked out. It is based on the use of a solid ThO_2 -standard and on the counting of β particles. (auth)

805 (K-1632(Pt.1)) A GRAVIMETRIC GAS FLOW STANDARD. PART I. DESIGN AND CONSTRUCTION. Collins, W. T.; Selby, T. W. (Oak Ridge Gaseous Diffusion Plant, Tenn.). May 18 1965. Contract W-7405-eng-26 68p. Dep. mn. CFSII \$3.00 cy, \$0.75 mn.

A versatile standard for measurement of gas flow has been designed and constructed. The design is based on use of a gravimetric technique in which the time required to collect a given mass of air in a weighing bottle is determined. Equal-arm balances of 2 and 50 kilogram capacity are used to weigh the mass of air collected. The balances have been modified to operate automatically using servo-operated chain weights and are remotely controlled from a central control console. Cylindrical weighing bottles having fiber glass-epoxy filament wound walls are used to collect the air samples. The largest bottle weighs about 44 kilograms (366 liter volume) and the smallest weighs about 1 kilogram (3 liter volume). Design criteria and construction features are discussed. Current estimates of the uncertainties indicate that the mass flow rate can be determined to ± 0.1 percent over the range of 0.06 to 1650 grams of dry air per minute. (auth)

806 STANDARD NUCLEAR INSTRUMENT MODULES /Q-2800 (Engineering Materials). (Oak Ridge National Lab., Tenn.). (CAPE-1477).

45 drawings.

The modules comply with specification drawings for $5/8$ and $3/4$ in. standard modules developed and adopted by the AEC Committee on Nuclear Instrument Modules. The modules can be assembled easily with simple hand tools. Components are fabricated from extruded Al bars and angles, die cast Al, and sheet Al. Shields are of Cd plated brass. Any or all Al components or assemblies of components may be die cast Al if all dimensional tolerances are met. The bin has space for 12 single-width modules and a $5/8$ in. wide power panel. The power panel provides space for mounting an a-c power switch, pilot light, and voltage test points. All module design details are dimensioned in both in. and mm. (For details see TID-4100 Suppl. 37) (F S)

807 REVISION OF THE HARWELL ^{240}Pu SOURCE STRENGTH AND $\bar{\nu}$ FOR ^{235}U AND ^{252}Cf . Fieldhouse, P. (Atomic Weapons Research Establishment, Aldermaston, Eng.). Culliford, E. R.; Mather, D. S.; Colvin, D. W.; MacDonald, R. I.; Sowerby, M. G. J. Nucl. Energy Pt A and B 20 549-55(July 1966).

There is now strong evidence that the intensity of the Harwell ^{240}Pu neutron standard is some 2% lower than the value of $(2.036 \pm 0.030) \times 10^4$ n/sec quoted in the original calibration and relative to which $\bar{\nu}^{252}\text{Cf}$ (spontaneous) and $\bar{\nu}^{235}\text{U}$ (thermal) have been determined. (auth)

808 STANDARD GRAPHITE BLOCK. Ivkovic, Magdalena, Zdravkovic, Zoran, Sotic, Obrad. Bull. Boris Kidric Inst. Nucl. Sci., 17: 99-114(Apr. 1966).

A graphite block was calibrated for the thermal neutron flux of the Ra-Be source using In foils as detectors. Experimental values of the thermal neutron flux along the central vertical axis of the system were corrected for the self-shielding effect and depression of flux in the detector. The experimental values obtained were compared with the values calculated on the basis of solving the conservation neutron equation by the continuous slowing-down theory. In this theoretical calculation of the flux the Ra-Be source was divided into three resonance energy regions. The measurement of the thermal neutron diffusion length in the standard graphite block is described. The measurements were performed in the thermal neutron region of the system. The experimental results were interpreted by the diffusion theory for point thermal neutron source in the finite system. The thermal neutron diffusion length in graphite was calculated to be $L = 50.9 \pm 3.1$ cm for the following graphite characteristics: density—1.7 g/cm³, B content—0.1 ppm, absorption cross section—3.7 mb. (auth)

809 SLOWING DOWN SPECTRUM AND NEUTRON TEMPERATURE IN A THERMAL NEUTRON FLUX DENSITY STANDARD. Geiger, K. W.; van der Zwan, L. (National Research Council, Ottawa). Metrologia, 2: 1-5(Jan. 1966).

Epithermal and thermal flux parameters for the thermal flux density standard at the National Research Council were measured to allow a more accurate calculation of activation rates. The epithermal spectrum was found to follow a $E^{-0.95}$ law where E is the neutron energy. The effective neutron temperature in the irradiation cavity was found to be 42°C, which is 22°C higher than the moderator temperature. A formula to calculate the reaction rate is given. (auth)

810 EXPERIMENTAL TECHNIQUES AND STANDARDS USED FOR EVALUATING AND CALIBRATING SURVEY INSTRUMENTS. Thompson, I. M. G. (Central Electricity Generating Board, Berkeley, Eng.). Vienna, International Atomic Energy Agency, 1966, Preprint No. SM-76/5, 18p. (CONF-660807-33). ORAU.

From Symposium on Neutron Monitoring for Radiological Protection, Vienna.

During the past three years neutron survey instruments have been calibrated against measured neutron fluxes in the energy range from thermal to 20 MeV. Thermal neutron monitors are calibrated in fluxes produced by moderating D/D neutrons in a polythene assembly, the flux density being measured by calibrated BF₃ counters. To measure neutron fluxes in the range from 30 keV to 20 MeV a long counter is used, which has been calibrated with sealed neutron sources of known outputs. The manganese sulphate bath technique has been employed to determine the outputs from the neutron sources, and a comparison with the N.P.L. manganese bath for the output from a 3-curie americium/beryllium source gave agreement to within 0.4%. A simplified technique using activated manganese foil is employed to calibrate the detectors used in the manganese bath experiment. The A.W.R.E. 3-MeV Van de Graaff was used to produce neutrons with energies from 30 keV to 2.1 MeV and from 16 MeV to 19 MeV. The ⁷Li(p,n)⁷Be reaction was used to give neutrons from 30 keV to 500 keV, the T(p,n)³He reaction was used for the range of 700 keV to 2.1 MeV, and the T(d,n)⁴He reaction was used for the range 16 to 19 MeV. The positive ion accelerator at Berkeley is used to produce 2.5 MeV neutrons from the D(d,n)³He reaction, and 14 MeV neutrons from the T(d,n)⁴He reaction. A standard thermal flux density was established using four americium/beryllium (α ,n) neutron sources in a graphite moderator, this flux will be used to calibrate foils and other detectors useful in the establishment of standards. The characteristics of some health physics survey instruments, as determined by the calibration techniques described, are briefly discussed. (auth)

811 CALIBRATION OF URANIUM METAL FOILS AS STANDARDS BY AN ALPHA-GAMMA COINCIDENCE METHOD. Nelson, L. C. Jr., Zyskowski, C. (Atomic Energy Commission, New Brunswick, N. J.). Vienna, International Atomic Energy Agency, 1966, Preprint No. SM-79/23, 16p. (CONF-661012-20). DTIC.

From IAEA Symposium on the Standardization of Radionuclides, Vienna.

Methods for the nondestructive determination of the total uranium-235 or the uranium-235 enrichment level in fabricated fuel elements or fuel element assemblies by gamma ray spectrometry depend upon a comparison of the unknown unit with an almost identical known unit or upon the destructive analysis of at least one of several units being analyzed. An alternative to this is to make corrections for the self absorption of the gamma rays in each unit analyzed. The most common method uses transmission-type absorption data to calculate the mass absorption coefficient. It has been shown that when these corrections are appreciable errors are introduced giving results that are not consistent. In addition when different cladding or alloying metals are used unknown absorption factors are sometimes introduced making a correct analysis difficult. If, however, the disintegration rates and decay of the several isotopes of uranium were well known and if the efficiency of the various detectors were known accurately then the absorption coefficients for almost any configuration could be calculated. Studies of the decay schemes were made using electrodeposited films of National Bureau of Standards isotopic uranium standards and both a surface barrier-type semiconductor alpha detector and a lithium-drifted germanium gamma-ray detector. Estimates of the energies and relative yields of both the alpha particles and the gamma rays were made. These results were then used to set up the surface barrier detector and a sodium iodide gamma-ray detector to study and measure the alpha-gamma coincidences so that quantitative measures of the decay rates from each of the electrodeposited films could be made. The weight of uranium in each film was calculated from the decay rate, the known isotopic distributions and the decay schemes. The self absorption of the films was assumed to be negligible. Inherently then, the detector efficiencies were obtained from the coincidence data. The uranium metal foils of finite thickness and mockups with various cladding materials were assembled and measured to determine gamma-ray attenuation, scatter and geometrical efficiencies of various systems. Data and figures are presented showing the alpha particle and gamma-ray spectra, their energies and yields wherever new or improved data were determined. (auth)

812 PROPOSED NEUTRON FLUX DENSITY STANDARDS AT THE NATIONAL PHYSICAL LABORATORY. Aston, E. J., Robertson, J. C., Ryves, T. B. (National Physical Lab., Teddington, Eng.). Vienna, International Atomic Energy Agency, 1966, Preprint No. SM-76/1, 12p. (CONF-660807-7). ORAU.

From Symposium on Neutron Monitoring for Radiological Protection, Vienna.

Facilities are being provided at the National Physical Laboratory to establish monoenergetic neutron flux density standards over a large part of the energy range from thermal to 19 MeV. A 3-MeV Van de Graaff positive ion accelerator is used in conjunction with a 25°-0-25° analyzing magnet to direct accelerated beams of protons, deuterons or alpha particles along one of three flight tubes. The target of the left-hand beam is situated in a low scatter environment where monoenergetic neutrons over a wide energy range are produced by suitable choice of charged particles, target material, particle energy and angle. Flux densities will be measured by associated particle detectors, proton recoil detectors, threshold and resonance detectors and a long counter. The right-hand beam will be devoted to total output measurements with a flat response detector such as the manganese bath or the boron pile. These instruments are highly suited to neutron measurement in the intermediate energy range. The center beam is devoted to a thermal neutron flux facility. The charged particle beam is oscillated rapidly between two targets situated about a meter apart in a graphite pile measuring 250 cm × 150 cm × 150 cm. A zero gradient thermal flux density of about 10 n/cm² sec will be produced in a 100 cm³ cavity between the two targets and by means of a thermal column, a thermal neutron beam of about one maximum permissible level will be provided. Much of the installation work was carried out and measurements are expected to commence shortly. (auth)

813 (IA-1082 pp 21-4) RADIOISOTOPE PRODUCTION (Israel Atomic Energy Commission Yavne, Soreq Nuclear Research Center).

The production of ^{99m}Tc, neohydrin-¹⁹⁷Hg, carrier-free ³⁵S and colloidal ¹⁹⁸Au is discussed. Progress was made toward the production of beta and gamma standard calibration sources for energy calibration and as quantitative standards. (PCH)

814 PRECISION GAMMA-RAY ENERGY MEASUREMENTS. Ramayya, A. V. (Vanderbilt Univ., Nashville), Hamilton, J. H., Brahmavar, S. M., Pinajian, J. J. Phys. Lett., 24B 49-51 (Jan. 9, 1967).

The energies of several transitions which are useful as calibration standards over the energy range from 800 to 1850 keV were measured with an accuracy of 0.10 keV. (auth)

815 (BNL-986) REPORT ON THE MARK II BNL STANDARD COBALT RADIATION SOURCE, BONDED TYPE. Kuhl, O. A.; Oltmann, A.; Wagner, J. (Brookhaven National Lab., Upton, N. Y.). Apr. 1966. Contract AT(30-2)-Gen-16. 26p. Dep. mn. CFSTI \$3.00 cy, \$0.65 mn.

A brief history of radiation source development at BNL and a discussion of source design factors preface a description of the latest design of the BNL standard cobalt radiation source. This is identified as the BNL Mark II bonded-type source. Specifications, a description of methods for testing for compliance with the specifications, and the results of these tests are included. (auth)

816 X-RAY WAVELENGTHS. Bearden, J. A. (Johns Hopkins Univ., Baltimore). Rev. Mod. Phys., 39 78-124 (Jan. 1967).

Inconsistencies in accepted values (in x units) of x-ray reference lines have recently been demonstrated although all are supposedly based on "good" calcite crystals. Factors supporting the selection of the W K α_1 line as the X-Ray Wavelength Standard are critically discussed. A review is given of the experimental measurements which are used to establish the wavelength of this line on an absolute angstrom basis. Its value is λ W K α_1 (0.2090100 ± 5 ppM) Å. This may be used to define a new unit denoted by Å*, such that the W K α_1 wavelength is exactly 0.2090100 Å*, hence 1 Å* = 1 Å ± 5 ppM. The wavelengths of the Ag K α_1 , Mo K α_1 , Cu K α_1 , and the Cr K α_2 have been established as secondary standards with probable error of approximately one part per million. Sixty-one additional x-ray lines have been used as reference values in a comprehensive review and reevaluation of more than 2700 emission and absorption wavelengths. The recommended wavelength values are listed in Å* units together with probable errors, corresponding energies are given in keV. A second table lists the wavelengths in numerical order and likewise includes their energies in keV. (auth)

817 THE NEUTRON SPECTRUM IN THE THERMAL FLUX DENSITY STANDARD AT THE NATIONAL RESEARCH COUNCIL, CANADA. Geiger, K. W. (National Research Council, Ottawa). pp 289-94 of Proceedings of the International Conference on Radiation Measurements in Nuclear Power, Berkeley Nuclear

Laboratories (C.E.G.B.), Gloucestershire, England, Sept. 1966. London, The Institute of Physics and The Physical Society, [1967].

This standard is a rigid assembly consisting of a graphite and a polyethylene moderator in which are embedded six $^{241}\text{Am}-\text{Be}$ (α, n) sources. The subcadmium flux density is $n\phi_0 = 8700 \pm 130 \text{ cm}^{-2} \text{ sec}^{-1}$. The neutron temperature is 22°C above the moderator temperature. The epithermal flux spectrum does not follow the $1/E$ law but decreases less rapidly with energy. An epithermal flux index $r'(E)$, analogous to the Westcott index r , is calculated, which varies with the resonance energy of an activated detector foil. Improvements in the geometry are suggested in the light of the results. However, since at present for most activations in the standard flux only cadmium ratio measurements are required, the epithermal spectrum is of little consequence (auth).

818 DESIGN AND CALIBRATION OF A THERMAL FLUX DENSITY STANDARD. Thompson, I. M. G. (Berkeley Nuclear Labs., Eng.). pp 311-17 of Proceedings of the International Conference on Radiation Measurements in Nuclear Power, Berkeley Nuclear Laboratories (C.E.G.B.), Gloucestershire, England, Sept. 1966. London, The Institute of Physics and The Physical Society, [1967].

A thermal flux density standard has been constructed to calibrate foils and other small detectors. The flux was determined from absolute measurements made with activated gold foils. The foils were activated in an air cavity 8 cm long by 5.5 cm in diameter, situated at the center of a graphite cube of 42 cm side. The graphite cube was surrounded by a polythene reflector and either four or six $^{241}\text{Am}/\text{Be}$ (α, n) sources can be placed at the centers of opposing faces of the graphite block. The flux density below cadmium cut-off, $n_{th} V_0$, was estimated to be $1.85 \times 10^4 \text{ cm}^{-2} \text{ sec}^{-1}$ for the four-source arrangement, and $2.69 \times 10^4 \text{ cm}^{-2} \text{ sec}^{-1}$ for the six-source arrangement (auth).

819 (IHT-1-17) EICHNORMALE FUER EINE NEUE METHODE ZUR MESSUNG DES PROFILS DER ELEKTRISCHEN LEITFAEHIGKEIT IN KREISZYLINDRISCHEN PLASMEN. (Calibration Standard for a New Method for Measurement of the Profile of Electric Conductivity in Circular Cylindrical Plasmas). Burkhardt, H.; Hirsch, K. (Technische Hochschule, Stuttgart (West Germany). Institut fuer Hochtemperaturforschung). Sept. 1965. 73p. (In German). (CONF-660448-2). Dep. mn.

From Meeting of the Professional Group on Plasma and Gas Discharge Physics, Kiel, Germany.

Construction materials of Cu or graphite plastic mixtures with electric conductivities lying in the area of light arc plasmas were developed and investigated. From the new construction materials a tube system of six different diameters was prepared. This system permits, through arrangement of suitable tubes, the preparation of a number of seven-stage conductivity profiles which can be used as calibration standards for measurement of the electric conductivity in plasmas by the induction method. The calibration curves for a two-stage profile were given (tr-auth).

820 STANDARD FISSION NEUTRON SOURCE. Kooi, J.; Mijnheer, B. J.; Aten, A. H. W. Jr. (IKO, Amsterdam). Radiachim. Acta, 6: 218 (Dec. 1966).

A cylindrical fission neutron source that contains approximately $1 \mu\text{g}$ of ^{252}Cf is described. The results of measurements of the angular dependence of neutron emission and of the absolute number of neutrons emitted are included (D C W).

821 TRANSFER MEASURING EQUIPMENT FOR THE COMPARISON OF R STANDARDS IN A WIDE ENERGY RANGE. Zsdanszky, K.; Hizo, J.; Peter, M. (National Office of Measures, Budapest). pp 41-4 of Proceedings of the Second Symposium on Health Physics, Vol. I. Budapest, Publishing Group of the Central Research Institute for Physics, 1966.

See CONF-660948-(Vol.1).

The principle of a high-accuracy dosimetric equipment incorporating a special ionization chamber and designed in the first line for the comparison of R standards in a wide energy range on an international level is discussed. Fitted out with several chambers of various sizes the equipment is used for other dosimetric purposes as a secondary standard (auth).

822 (LA-DC-8781) THE $^1\text{H}(n, n)$ CROSS SECTION AS A NUCLEAR STANDARD. Hopkins, John C. (Los Alamos Scientific Lab., N. Mex.). [1967]. Contract W-7405-eng-36. 31p. (CONF-670517-1). Dep. CFSTI.

From IAEA Meeting on Nuclear Standards Needed for Neutron Cross Section Measurements, Brussels, Belgium.

The suitability of the $^1\text{H}(n, n)$ cross section as a primary standard for neutron-flux measurements in the energy range above 100 keV is examined. The use of the $^1\text{H}(n, n)$ cross section in relative measurements in proton recoil devices and in counter calibration applications is discussed. The total cross section is well known while the differential elastic cross section is very

poorly known. A prescription is given for the calculation of the differential cross section at all energies. The conclusion is that the $^1\text{H}(n, n)$ cross section would be a suitable primary standard for energies above 100 keV. A recommendation is made for action in three areas: the techniques for flux measurement should be improved, an accurate differential cross section measurement should be made, and a serious theoretical study should be made to calculate the differential and total cross sections from known phase shifts (auth).

823 OBRAZTSOVYE ISTOCHNIKI IONIZIRUYUSHCHIKH IZLUCHENII. (Standard Sources of Ionizing Radiations). Dorofeev, G. A.; Inikhov, G. N. [Moscow], Atomizdat, 1967. 128p.

Procedures for testing and calibration of dosimetric and radiometric devices requiring knowledge of the technical characteristics of the standard sources used are reviewed. Construction of standard α , β , γ and neutron sources is also considered (J S R).

824 THE ENERGY OF THE ^{40}K GAMMA RAY AND ITS USE AS A CALIBRATION STANDARD. King, J. D.; Neff, N.; Taylor, H. W. (Univ. of Toronto). Nucl. Instrum. Methods, 52: 349-50 (1967).

The energy of the ^{40}K gamma ray was re-measured in order to increase its usefulness as a calibration line for Ge(Li) spectrometers. The observed value, $1460.75 \pm 0.06 \text{ keV}$ has an uncertainty which is improved by better than an order of magnitude over previous determinations. In addition the energies of two gamma rays emitted by natural-occurring thorium were determined with improved precision: the $727.1 \pm 0.1 \text{ keV}$ gamma ray emitted by ^{212}Bi and the $911.07 \pm 0.07 \text{ keV}$ gamma ray emitted by ^{212}Ac (auth).

825 STANDARD FISSION NEUTRON SOURCE. Kooi, J.; Mijnheer, B. J.; Aten, A. H. W. (Inst. for Nuclear Physics, Amsterdam). Int. J. Appl. Radiat. Isotop., 18: 439-40 (June 1967).

The preparation of a source containing approximately $1 \mu\text{g}$ of ^{252}Cf is described. The dimensions were the same as those of a standard Ra/Be source (outside diameter 15 mm, height 15 mm) with a weight of about 20g. The absolute neutron emission was found to be $3.596 \pm 0.022 \times 10^6 \text{ n/sec}$. Measurements were made of the angular dependence of the neutron emission (UK).

826 (ANL-7320, pp 679-87) AN INTERNATIONAL COMPARISON OF FISSION DETECTOR STANDARDS. Amundson, P. I.; Broomfield, A. M.; Davey, W. G. (Argonne National Lab., Idaho Falls, Idaho); Stevenson, J. M. (Atomic Energy Establishment, Winfrith (England)).

Parallel-plate fission chambers presently in use in Idaho Division of Argonne National Laboratory for measurements of fission ratios have been compared with selected chambers from the Zebra reactor group at Winfrith, the fast reactor group at Cadarache, and the critical experiments group at Los Alamos. An attempt has been made to tie these measurements in with foils used for measurements of differential cross sections at Los Alamos and Aldermaston. At present comparisons with Winfrith have been made using ^{235}U , ^{233}U , and ^{239}Pu chambers. Measurements were made both in the Zebra reactor at Winfrith and in Idaho Division's Fast Source Reactor. Comparisons of Winfrith ^{235}U , ^{233}U , and ^{239}Pu chambers with similar chambers used in the Vera reactor at Aldermaston have been made in Zebra. The comparison with Cadarache has been limited to a direct ^{235}U chamber comparison. A French re-appraisal of calibration techniques resulted in a quoted mass only a few percent different from that estimated from a comparison with the Idaho Division and Winfrith chambers. The comparison with Los Alamos values involves fission-ratio comparisons in the Flattop reactor and a ^{235}U thermal comparison in the thermal column of the Water Boiler reactor with standards used by various groups measuring differential cross sections. A list of 9 references is included (auth).

827 SOLID-STATE PLUG-IN CIRCUITS (Engineering Materials). (Savannah River Operations Office (AEC), Aiken, S. C.). (CAPE 1631).

7 drawings.

Seven standard solid-state circuits are described. The circuits are used in radiation instruments and include a pulse amplifier, variable discriminator, pulse shaping univibrator, counting tube (dekatron) driver, count rate meter, and multiple range and time constant circuits to operate with the count rate meter. The circuits may be combined to make instruments for specific needs (For details see TID-4100 Suppl. 41) (F S).

828 (NP-16866) STANDARDS OF PERFORMANCE FOR FILM BADGE SERVICES. Barber, Donald E. (Michigan Univ., Ann Arbor, Dept. of Environmental Health). National Sanitation Foundation, Ann Arbor, Mich., Sept. 1966. 47p. Public Health Service Free.

Standards of performance for film badge services are of general concern to film badge services, users of these services, and regu-

latory agencies. A quality control program self-imposed by film badge services, but involving all of these groups, is described. Film badge performance evaluation procedures have been devised to generate data sufficiently broad in scope to serve as the basis for control limits. The evaluation procedures and control limits will be applied in periodic examinations of film badge services. Irradiation procedures, dosimetry, and a measure of film badge accuracy appropriate to the practical use of film badges are discussed. Approximately 2 000 film badges were irradiated with various types and energies of radiation. Exposures ranged from 0.002 to 497 roentgens. Film badge services helped design the test procedures, submitted badges for exposure, interpreted exposures, and assisted in determining provisional performance control limits. All services were informed of the test procedures to be used in the test. However, the services did not know which badges were exposed to what type, energy, or dose of radiation. A measure of accuracy, called an "error factor," was determined for each service for each type and energy of radiation in the test. These error factors are tabulated to show the accuracy of the film badge services tested. Frequency distributions of the error factors served as the basis for selection of control limits used to define acceptable performance. Administrative procedures for periodically evaluating film badge service performance and for recognizing acceptable performance are also described. (auth)

829 CALIBRATION OF ^{65}Zn AND ^{54}Mn GAMMA-SPECTROMETRIC SOURCES. Bazhenov, V. A., Bochkarev, V. V.; Golubev, Yu. M.; Ivanov, Yu. F.; Nikol'skaya, N. L.; Sokolova, T. N. *Izmer. Tekh.*, No. 6, 70-2 (June 1967). (In Russian).

Sources of ^{65}Zn and ^{54}Mn can be calibrated by direct comparison with standard sources of ^{46}Sc , which has a 0.885 MeV gamma ray comparable to 0.835 MeV gamma ray in ^{54}Mn and a 1.119 MeV gamma ray comparable to the 1.119 MeV gamma ray of ^{65}Zn . The ^{46}Sc source can be calibrated by 4 π beta-gamma coincidence counting with an error of only $\pm 0.5\%$ in the activity determination. On comparing count rates of the standard ^{46}Sc source with ^{65}Zn sources on a 30×20 mm NaI(Tl) crystal having a resolution of 8.5% for the 662 keV ^{137}Cs line, it was found that the error of determining the number of gamma quanta emitted by the ^{65}Zn source per unit time over an angle of 4 π was less than 1%, which significantly exceeded the accuracy obtained by other methods. The accuracy of calibrating a ^{54}Mn source by comparison with a ^{46}Sc source was $\pm 2\%$, but it was necessary to introduce a correction for the difference in counting efficiencies of the 0.835 and 0.885 MeV gammas of ^{54}Mn and ^{46}Sc respectively. It was also necessary to subtract the Compton scattering contribution from the 1.119 MeV gamma line of ^{46}Sc (TTT).

830 REPORT OF THE GOVERNMENT CHEMIST, 1966. London, Her Majesty Stationary Office, 1967. 182p. 15s.

The report contains a section on radiochemistry covering the following topics: fallout in drinking water; fallout in London rain-water; tritium determination in natural waters; neutron activation analysis; liquid scintillation counting; calibrated radium standards; and alpha spectrometry. (UK)

831 (BDX-613-98) REPORT ON DEVELOPMENT OF INDUCTANCE STANDARDS. Simpson, H. E. (Bendix Corp., Kansas City, Mo.). July 1967. Contract AT(29-1)-613. 15p. Dep. CFSTI.

A set of standards was developed to meet the demands for precision inductors in the range from 0.05 μH to 100 μH . The standard inductors are repeatable, well defined and usable over a frequency range from 1 kHz to 2.5 MHz, and provide suitable devices for the comparison of unknown inductors. Precision connector type inductance standards were developed. The inductors employ binding post connections on $\frac{3}{4}$ -in. centers with separate shorting terminals which provide a definite standardizing condition. (F S)

832 (K-L-6181) GRAVIMETRIC STANDARD FOR PRIMARY GAS FLOW MEASUREMENTS. Collins, W. T. (Oak Ridge Gaseous Diffusion Plant, Tenn.). Oct. 18, 1967. Contract W-7405-eng-26. 13p. (CONF-671101-4) Dep. CFSTI. From Annual Meeting of the American Society of Mechanical Engineers, Pittsburgh, Pa.

A gravimetric standard consisting of a balance, weighing bottles, bottle valve, sealing device, control orifice, and diverting valves is used for primary gas flow measurement. The calibration and precision of the standard are given. (F S)

833 (SC-TM-67-765) DETECTION OF SHIFTS IN THE VALUES OF SATURATED STANDARD CELLS USED AS REFERENCES. McCallum, R. E., Quinlan, R. E. (Sandia Corp., Albuquerque, N. Mex.). Nov. 1967. Contract AT(29-1)-789. 30p. Dep. CFSTI.

A method for monitoring the stability of individual cells in reference groups has been developed and proven by large scale tests. If significant shifts in the voltages of the cells are shown

to have occurred, certificate values can then be adjusted. Only data acquired in normal tests for certification of saturated standard cells are used. (auth)

834 (SC-TM-67-775) ORGANIZATION 4631-1 CALIBRATION AND CERTIFICATION POLICY FOR STANDARD IFAKS AND VACUUM GAUGES. Ford, L. M. (Sandia Corp., Albuquerque, N. Mex.). Oct. 1967. Contract AT(29-1)-789. 10p. Dep. CFSTI.

Sandia organization 4631-1 is a secondary standards laboratory for certifying and calibrating standard leaks and vacuum gauges for Organization 2411 AEC integrated contractors. Sandia technical organizations and Sandia suppliers. The capabilities and ranges of the equipment used are described and the reference standards used in the calibrations are listed. (F S)

835 ABSOLUTE CALIBRATION OF THE CANADIAN NEUTRON STANDARD BY BF_3 CHAMBER TECHNIQUE. Sharma, D., Shahani, M. G. (Atomic Energy Establishment, Trombay, India). pp. 194-205 of Proceedings of the All India Symposium on Radioactivity and Metrology of Radionuclides, Bombay, March 14-18, 1966. Bombay, Atomic Energy Establishment Trombay, 1966.

See CONF-660341.

A description of the absolute calibration of the Canadian neutron standard using the boron trifluoride ionization chamber technique is presented. The correction factors necessary for the calibration are discussed. (W H K)

836 PRESENT STATUS OF NEUTRON SOURCE STANDARDIZATION IN INDIA. Shahani, M. G.; Jain, N. C.; Sharma, D.; Gupta, U. C. (Atomic Energy Establishment, Trombay, India). pp. 35-50 of Proceedings of the All India Symposium on Radioactivity and Metrology of Radionuclides, Bombay, March 14-18, 1966. Bombay, Atomic Energy Establishment Trombay, 1966.

See CONF-660341.

In order to establish national neutron standards, two Ra-Be sources were calibrated using the gold-foil activation technique and the BF_3 chamber technique. It is concluded that the gold-foil and BF_3 techniques are laborious and time-consuming and require more corrections as compared with the manganese sulfate bath technique. (S F L)

837 INTERNATIONAL STANDARDIZATION IN THE FIELD OF MEASUREMENT DEVICES USING RADIOISOTOPES. PROBLEMS AND ORIENTATION. Goldmann, A. (CEN, Rome). pp. 357-66 of Aspetti Scientifici e Tecnici delle Applicazioni Industriali dei Radioisotopi. Rome, Comitato Nazionale Energia Nucleare, 1967. (In Italian).

From Conference on Industrial Applications of Radioisotopes, Rome, June 23-24, 1966. See CONF-660661.

The organization of an international committee for the standardization of measurement devices using radioisotopes is outlined. The primary problems to be solved are indicated. The composition of the study committee is given. (J S R)

838 IMPROVED STANDARDS FOR NEUTRON SOIL WATER METERS. Ursic, S. J. (Dept. of Agriculture, Washington, D. C.). *Soil Sci.*, 104, 323-5 (Nov. 1967).

Economical standards made from polyethylene cylinders 2.5 to 4.5 inches in diameter proved highly satisfactory for operational checks and recalibrations of neutron soil water probe systems. They were used in conjunction with laboratory calibrations by the water-addition technique. Probes with curvilinear calibration lines were calibrated by correlating their readings with those of a system that had a linear response. (auth)

839 EXPERIMENTAL DETERMINATION OF THE OPTIMAL GEOMETRY OF A THERMAL NEUTRON FLUX STANDARD. Andreev, O. L., Yarytsyna, I. A. *At. Energ. (USSR)*, 23, 348-50 (Oct. 1967). (In Russian).

A plexiglass cube 690 mm on edge containing an inner graphite cube whose dimensions could be varied was used to moderate the fast neutrons from six Pu-Be neutron sources. A small boron counter having an operating volume of 2 cm^3 was used to count the thermal neutron flux in an air cavity in the center of the cube. The counter was covered with cadmium in order to investigate the quality of the neutron flux. The relative flux was determined at various distances from the neutron sources to the air cavity. On decreasing the graphite thickness, the thermal neutron flux increased, and attained a maximum in pure plexiglass containing no graphite. The quality of the neutron flux improved in all cases on moving the neutron sources from the graphite into the plexiglass. In the absence of graphite the thermal neutron flux maximum corresponded to a position of the neutron sources at a depth of 33 mm from the edge of the air cavity, that is, at a distance close to the thermal neutron diffusion length in plexiglass. In the presence of graphite the maximum is shifted to a distance of 23 mm. The graphite causes a certain increase in neutron in

tensity The graphite should be omitted to obtain a maximum thermal neutron flux per unit of fast neutrons from the neutron sources (TIT)

840 CALIBRATIONS OF THE THERMAL NEUTRON FLUX DENSITY STANDARDS UNDER THE INTERNATIONAL INTER-COMPARISON PROGRAM. Inoue, Yajiro; Yura, Osamu; Michikawa, Taichi; Yamashita, Mikio (Electrotechnical Lab., Tokyo). Denki Shikensho Iho (Japan), 31: 972-84(1967).

As a part of the world-wide program of the intercomparison of the thermal neutron flux density standards, seven particular standards of different countries were calibrated in terms of the neutron capture cross section of Au by following the identical procedures. The procedures and method of calibration, precision determination of the disintegration rate of the induced activity by means of the $4\pi\beta\gamma$ coincidence method and the final results are described. The overall accuracy attained of the final results ranges from about 1 to 1.5% in the sum of random and systematic errors, depending upon the Cd ratios of the particular neutron fluxes. It is shown that the major part of the error in the final results arises from the uncertainties of the associated parameters, such as the Cd correction factor, the effective capture cross section of Au and a correction factor for flux depression, self-shielding and edge effect (auth)

841 PRIMARY STANDARD DATA AND STANDARD SAMPLES. Spaepen, J. (Central Bureau for Nuclear Measurements, Geel, Belg.). pp 241-65 of Nuclear Data for Reactors. Vienna, International Atomic Energy Agency, 1967.

From IAEA Conference on Nuclear Data, Paris. See STI/PUB-140(Vol.1); CONF-661014-(Vol.1).

The accuracy requirements for primary standard cross sections, in the interval from thermal energy to 15 MeV, are derived from the needs for precise neutron data, requested for reactor purposes. The accuracy attained at present for possible standard cross sections is discussed, and the situation is reviewed as far as the properties of corresponding samples and detectors are concerned. The $^{10}\text{B}(n,\alpha)^7\text{Li}$, $^7\text{Li}^*$ (below 100 keV) and $^1\text{H}(n,n)$ (above 100 keV) cross sections are proposed as primary standards for flux measurements, and recommended values are given, where possible. On the other hand, energy regions where improvement of accuracy is still needed, are indicated. Suggestions for future work are given in the conclusions. It is pointed out, in particular, that a high-precision measurement of the $^{10}\text{B}(n,\alpha)$ cross section near 100 keV would establish a sufficiently accurate primary standard in the 1 to 100-keV region if the cross section behaves still as $1/V$ at 100 keV. The suggestions pertain also to secondary working standards of which a brief list is given without, however, reviewing the present status in detail (auth)

842 (TID-20893(Rev.2)) STANDARD NUCLEAR INSTRUMENT MODULES. Adopted by AEC Committee on Nuclear Instrument Modules. Costrell, Louis (National Bureau of Standards, Washington, D. C.). Jan. 1968. 31p. Dep. GPO \$0.25.

Specifications for standard nuclear instrument modules are presented to assure mechanical and electrical interchangeability of modules. Bin and power supply specifications are included (W H K.)

843 STANDARD RADIOASSAY TECHNIQUES: A STATUS REPORT. Moeller, Dade W. (Harvard Univ., Boston). Health Lab. Sci., 4: 146-52(July 1967).

Measurements of the concentrations of radioactive materials in the environment, involving the application of a variety of chemical and instrumental methods to many types of media, is reviewed. The professional societies and other organizations associated with the development of the analytical procedures for such measurements are considered under 3 broad categories: international, governmental, and professional societies. A list of radiological methods developed or under consideration by various societies is given. More than a dozen international organizations, federal agencies, and professional societies are actively participating in programs related to the development of standard radioassay techniques. An evaluation of the present situation is given, and some of the problems faced in the development of standard radioassay techniques are discussed. One is the need for methods which are accurate and yet sensitive enough to determine near zero concentrations of radiocontaminants in an ever-increasing variety of media. Another problem results from the continual advancement of electronic radiation detection instrumentation, leading to publication of methods which are already out of date. Still another problem is the lack, in many cases, of sufficient collaborative studies either to confirm the soundness of a method or to correct its deficiencies. Too often, techniques have been published which contained errors or lacked sufficient detail for routine use (BBB)

844 STANDARDS OF PERFORMANCE FOR FILM BADGE SERVICES. Barber, Donald E. Environmental Health Series-

Radiological Health. Washington, D. C., Public Health Service, 1966. 47p. (PHS-999-RH-20). GPO Free.

A quality control program self-imposed by film badge services is described. Film badge performance evaluation procedures have been devised to generate data sufficiently broad in scope to serve as the basis for control limits. The evaluation procedures and control limits will be applied in periodic examinations of film badge services. Irradiation procedures, dosimetry, and a measure of film badge accuracy appropriate to the practical use of film badges are discussed. Approximately 2,000 film badges were irradiated with various types and energies of radiation. Exposures ranged from 0.002 to 497 roentgens. Film badge services helped design the test procedures, submitted badges for exposure, interpreted exposures, and assisted in determining provisional performance control limits. All services were informed of the test procedures to be used in the test. However, the services did not know which badges were exposed to what type energy, or dose of radiation. A measure of accuracy, called an error factor, was determined for each service for each type and energy of radiation in the test. These error factors are tabulated to show the accuracy of the film badge services tested. Administrative procedures for periodically evaluating film badge service performance and for recognizing acceptable performance are also described (auth)

845 (NBS-TN-283) NUCLEAR AND RADIATION STANDARDS OF IMPORTANCE TO THE NATIONAL ATOMIC ENERGY PROGRAM. Koch, H. W.; Donnert, H. J.; Havens, W. W. Jr.; Rogosa, G. L.; Rosen, L. (National Bureau of Standards, Washington, D. C.). Mar. 31, 1966. 44p. GPO \$0.35.

A systematic approach to physical measurements in nuclear physics requires the establishment, availability, and use of standards. The standards of measurement may consist of standard cross sections, foils, counters, and evaluated nuclear data. Because of the fundamental importance of measurement standards, the Nuclear Cross Section Advisory Group has examined the definitions, requirements, characteristics, and availability of nuclear and radiation standards of importance to the national atomic energy program (auth)

846 1968 BOOK OF ASTM STANDARDS WITH RELATED MATERIAL. PART 31 PHYSICAL AND MECHANICAL TESTING OF METALS: METALLOGRAPHY, NONDESTRUCTIVE TESTING, FATIGUE, EFFECT OF TEMPERATURE. Philadelphia, American Society for Testing and Materials, 1968. 1,065p. \$19.00.

A book of standards is presented on physical and mechanical testing of metals. Standards covering the following topics are presented: calibration of mechanical testing machines, extensometers, and strain gages, corrosion of metals, effects of temperature on metals, inspection and testing agencies, mechanical tests, metallography, nondestructive testing, physical testing, radiation effects, temperature measurement, and related information. A complete subject index is included. (R C K)

847 EVALUATION OF A METHOD FOR ASSAY OF TRITIUM SOLUTIONS USING A SEALED STANDARD. Burke, C. W. (Post Graduate Medical School, London). Int. J. Appl. Radiat. Isotop., 19: 597-600(July 1968).

Pulse height shift in liquid scintillation counting occurs on alteration of the channels ratio (counts in monitor channel/counts in counting channel). For tritium, a linear relationship between channels ratio and counting efficiency can be produced if the right discriminator settings are used. This linear relationship holds true over a wide range of efficiencies, independently of the chemical nature of quenching agents, provided color quenching is not severe. It is suggested that extrapolation of the line to the higher efficiency of a sealed standard will enable unknown samples to be standardized. This possibility is examined and some factors in its validity are presented. (auth)

848 NATIONAL PHYSICAL LABORATORY, TEDDINGTON, ENGLAND. REPORT FOR 1967. London, Her Majesty's Stationery Office, 1968. 235p., 24s.

A summary is included of the work of the Division of Radiation Science, covering X-ray dosimetry, chemical and solid state dosimetry, β -ray dosimetry, neutron cross-section measurements, thermal neutron flux density standards, fast neutron flux standards, miscellaneous radioactivity measurements, radiocarbon dating, etc (U K)

849 RADIOACTIVE VOLTAGE STANDARD. Braudaway, David W. (Sandia Corp., Albuquerque, N. Mex.). ISA (Instrum. Soc. Amer.) Trans., 6: 273-7(1967).

Standard cells that serve as a voltage reference are vulnerable to environment and use conditions. An alternate method of generating a voltage that is related to predictability of radioactive decay is described. The design and characteristics of a working model of the calorimeter necessary to utilize this method are presented briefly. Also discussed are the characteristics of the required radioactive source (auth)

850 (IN-1203, pp 52-61) STANDARDS AND QUALITY CONTROL (Idaho Nuclear Corp., Idaho Falls).

Topics covered include bias and precision data, standards and reagents calibration of pipetting equipment, controls for low-level uranium analysis, and improvement in quartz water distillation apparatus (M C G)

851 DEVELOPMENTS IN STANDARD NEUTRON CROSS SECTIONS Gibbons, J. H. (Oak Ridge National Lab., Tenn.), pp 111-24 of Neutron Cross Sections and Technology. Goldman, D. T. (ed.). Washington, D. C., National Bureau of Standards, 1968.

From 2nd Conference on Neutron Cross Sections and Technology, Washington, D. C. See NBS-SPEC PUBL -299(Vol.1), CONF-680307-(Vol.1).

Neutron cross section standards are reviewed with emphasis on reaction cross sections such as fission and capture. Special attention is given to $^{10}\text{B}(n, \alpha)^7\text{Li}^*$, ^{235}U since this reaction is one of the best means of comparing intermediate and fast neutron cross sections with thermal values. Recent measurement of other standard cross sections are also discussed and recommendations for additional experiments are given (auth)

852 REVIEW OF SOME FAST NEUTRON CROSS-SECTION DATA Kanda, Y. (Tokyo Inst. of Tech.), Nakasima, R. pp 193-200 of Neutron Cross Sections and Technology. Goldman, D. T. (ed.). Washington, D. C., National Bureau of Standards, 1968.

From 2nd Conference on Neutron Cross Sections and Technology, Washington, D. C. See NBS-SPEC PUBL -299(Vol.1), CONF-680307-(Vol.1).

Some of the existing cross-section data which are usually adopted as standards in fast neutron experiments are reviewed. The compiled cross-section data are those for $^{27}\text{Al}(n, \alpha)$, $^{56}\text{Fe}(n, p)$, $^{63}\text{Cu}(n, 2n)$, and $^{65}\text{Cu}(n, 2n)$ reactions in the energy range from threshold to 20 MeV. The raw data points are so much scattered that recommendation of the cross section value is difficult to make within the accuracy of 10%. This is mainly due to the ambiguity in determining the flux of neutrons and to the statistical fluctuations in the number of counts. In some cases, the inaccuracy in the neutron energy determination may lead to serious discrepancy. Discussions are presented concerning the activation method and the rejected data. The most probable excitation function is obtained for each reaction by means of the least squares method (auth)

853 IMPROVED VALUES FOR ENERGY LEVELS, RITZ STANDARDS, AND INTERFEROMETRICALLY MEASURED WAVELENGTHS IN Th I. Valero, Francisco P. J. (Univ. Nacional, La Plata, Argentina). Consejo Nacional de Investigaciones Cientificas y Tecnicas, La Plata, Argentina). J. Opt. Soc. Amer., 58 1948-53(Aug. 1968).

Improved values for 18 even energy levels and 102 odd energy levels of Th I were calculated from interferometrically measured wavelengths. The wavelengths of 756 lines in the range from 3062 to 11,060 Å were calculated as Ritz standards from the values obtained for the energy levels. The accuracy of the wavelengths was tested using the combination principle and was found to be one part in 1.3×10^8 to 3.6×10^7 (auth)

854 THE CONSTRUCTION AND CALIBRATION OF A STANDARD THERMAL NEUTRON FLUX FACILITY AT THE NATIONAL PHYSICAL LABORATORY. Ryves, T. B. Paul, E. B. (National Physical Lab., Teddington, Eng.). J. Nucl. Energy, 22 759-75(Dec. 1968).

The standard thermal flux was produced by sources consisting of Be targets bombarded by a deuteron beam from a Van de Graaff accelerator. The sources were set in a large graphite moderator block. The flux was easily controlled over a range of about 10^4 to 10^6 n/cm²/sec in a small central region of about 150 cm³ by reference to a standard boron-loaded ionization chamber and was reproducible to $\pm 0.1\%$ over a period of 6 months. Over this region the flux density was flat to about $\pm 0.2\%$. The epithermal flux component was at most 1% of the total and the measured shape of the epithermal flux spectrum was proportional to $E^{-1.06}$ where E is the neutron energy. The Westcott flux convention was modified in order to calculate the reaction rates of materials when the neutron slowing down spectrum varied as $1/E^{1+\beta}$ ($|\beta| < 1$). The effective cross section for a thin detector may be written as $\sigma_0 [g(T)/fC(\beta)Th(\beta)]^{1/\sigma_0}$ where $C(\beta)Th(\beta)$ is a renormalization correction to the epithermal flux fraction f at temperature T. $h(\beta)$ is the correction to the reduced resonance integral I defined for a $1/E$ flux, σ_0 is the 2200 m/sec absorption cross section and $g(T)$ is the Westcott function (auth) (UK)

855 (AAEC/TM-488) CALIBRATION OF THE AAEC STANDARD THERMAL NEUTRON FLUX FACILITY. Parry, J. K., Urquhart, D. F. (Australian Atomic Energy Commission

Research Establishment, Lucas Heights) Dec 1968. 43p Dep.

The Australian Atomic Energy Commission (AAEC) standard thermal neutron flux facility contains two ten-curie Pu Be neutron sources, embedded in a 1.12 m dia $\times$ 61 cm high cylindrical paraffin wax reflector at points 24 cm from the axis. The sources are on opposite sides of a central rectangular graphite moderator (48 cm high $\times$ 42 cm $\times$ 31 cm) containing a central irradiation cavity 12.7 $\times$ 12.7 $\times$ 5.1 cm. The conventional thermal neutron flux below the cadmium cut-off energy at the center of the irradiation cavity was $1.387 \pm 0.024 \times 10^4$ cm⁻² sec⁻¹ on April 21 1967. This value was obtained by an absolute measurement in which the ^{198}Au activity produced in gold foils was measured by the $4\pi\beta$ - γ coincidence method. This value was found to be in good agreement (within $\pm 0.5\%$) with values obtained by comparing the AAEC flux with overseas standards. Measurement showed the neutron temperature in the cavity to be 18.5 ± 7 C above the moderator temperature (auth)

856 PROBLEMS IN THE PRODUCTION OF RADIOACTIVE STANDARD AND MEASURING SOURCES. Schindler, G., Koch H. (Institut fuer Angewandte Radioaktivitaet Leipzig). Isotopen praxis, 4 470-2(Dec. 1968). (In German).

Problems in the production of radioactive standard and measuring sources as well as methods and production techniques are reported on (auth)

857 CAMAC: A EUROPEAN STANDARD SPECIFICATION FOR MODULAR INTERFACE UNITS BETWEEN NUCLEAR EXPERIMENTS AND DATA PROCESSING EQUIPMENT. Nucl. Eng. Int., 14 345-7(Apr. 1969).

The development of the CAMAC system as agreed by the Esone Committee, is reviewed. Illustrations are given of the standard CAMAC module, showing dimensions and of the adaptor unit for use with the American NIM system with which CAMAC is basically compatible. Procedure during a dataway operation is described (UK)

858 ACCURATE GAMMA-RAY ENERGY MEASUREMENTS IN THE DECAYS OF ^{20}Bi , ^{208}Tl , AND ^{212}Bi . Brahmavar, S. M., Hamilton, J. H. (Vanderbilt Univ., Nashville). Nucl. Instrum. Methods 69 353-4(Apr 1969).

The gamma-ray energies of the 1770.06 $\pm$ 0.07-keV transition in ^{20}Bi and the 727.05 $\pm$ 0.07-keV transition in ^{212}Bi along with six additional transitions in the decay chain of ^{228}Th were measured more carefully for use as energy calibration standards (auth)

859 (GEPP-61) CALIBRATION OF STANDARD LEAKS USING AN ANALYTICAL GAS MASS SPECTROMETER. Mason, T. M. (General Electric Co., St. Petersburg, Fla. Neutron Devices Dept.). Feb. 18, 1969. Contract AT(29-2)-656. 11p. Dep. CFSTI.

An analytical gas mass spectrometric method of calibrating standard leaks is discussed. This method has an estimated ± 5 percent accuracy, the calibration can be completed in one day, and it has the capability of measuring active gases and distinguishing between gases in the system (auth)

860 CALIBRATION FOR GAMMA RADIATION DETECTION INSTRUMENTS. Lindbeck, S. L. (NUS Corp., Washington, D. C.); Steigelmann, W. H., Williams, E. F. Jr. Nucl. Eng. Design, 9 311-14(Mar. 1969).

A device for precise calibration of gamma radiation detection instruments is described. The new calibrator will be a primary standard for a nationwide radiobiological instrument maintenance and calibration program. The calibrator's 500-Curie, ^{137}Cs - ^{137}Ba source gives a uniform beam over a range of dose rates of 0.002 to 500 R/hr. Motor driven, tungsten alloy shutters, controlled either manually or by an electric timer, permit three beam intensities: 1/1000, 1/50, or full. Leakage with all shutters closed is less than 2 mR/hr at 2 cm from the source shield. The instrument stand, specially built to minimize radiation scatter, is fully adjustable and supports a television camera for remote observation (auth)

861 (INR-1021) TEMPERATURE STABILITY OF THE VOLTAGE STANDARD USING ZENER DIODES. Pazdzierski, Jerzy (Inst. of Nuclear Research, Warsaw (Poland)). 1968. 19p. (In Polish). Dep. CFSTI (U. S. Sales Only).

The compensation methods of the Zener diode voltage change caused by the variation of the temperature are discussed. Simple circuits for temperature compensation of the voltage standard realized on the available Zener diodes are given and methods of selection assuring temperature stability better than 0.005 %/deg are described (auth)

862 (LA-4041) AEC STANDARD MODULES FOR FIELD INSTRUMENTATION. Fullwood, Ralph R. (Los Alamos Sci-

entific Lab., N. Mex.), June 1, 1969 Contract W-7405-eng-36. 42p. Dep. CFSTI.

A series of AEC standard modules has been designed for field instrumentation of nuclear explosive experiments. The objectives of this work were to provide systematic instrumentation logic so that technicians can set up a recording station by simply obeying logical rules, to provide digital control where possible, and to achieve a design compatible with other AEC standard, commercial, or laboratory instrumentation modules. The operation of individual modules is described and as an example, a field configuration using plate film that records with automatic oscilloscope calibrations and two forms of moving film that record with automatic calibrations is presented (auth)

863 (BARC-388) ESTABLISHMENT OF A STANDARD THERMAL NEUTRON FLUX DENSITY AT THE BHABHA ATOMIC RESEARCH CENTRE. Shahani, M. G.; Sharma, D. (Bhabha Atomic Research Centre, Bombay (India)), 1969. 22p. Dep. CFSTI (U. S. Sales Only).

A standard of thermal neutron flux density has been established for calibrating thermal neutron detectors. The moderating geometry consists of six $^{241}\text{Am}-\text{Be}$ (α, n) sources having total neutron emission rate of 6.6×10^6 n/sec imbedded in a graphite pile (163 cms $\times$ 122 cms $\times$ 152 cms). The thermal neutron flux density in a small air cavity (5 cms $\times$ 5 cms $\times$ 15 cms) at the center of the assembly has been absolutely measured in terms of ^{197}Au neutron capture cross section by $4\pi\beta-\gamma$ coincidence counting of high purity circular gold foils. Various corrections have been applied and sources of errors have been discussed. The Westcott flux density below cadmium cut-off energy at the center of the cavity is estimated to be 6454 ± 1.8 percent neutrons $\text{cm}^{-2} \text{sec}^{-1}$. The flux density in the central 5 cm region of the cavity has been found to be constant to better than 0.7 percent by $4\pi\beta$ counting of irradiated Mn-Ni foils. BARC flux standard has been directly compared with the standards maintained at the National Bureau of Standards, Washington, Electrotechnical Laboratory, Tokyo and Mendeleev Institute for Metrology, Leningrad by exchanging irradiated gold foils (auth)

864 ESTABLISHMENT OF A STANDARD THERMAL-NEUTRON FLUX DENSITY AT THE BHABHA ATOMIC RESEARCH CENTRE. Shahani, M. G.; Sharma, D. (Bhabha Atomic Research Centre, Trombay, India). pp 515-29 of Radiation Protection Monitoring. Vienna, International Atomic Energy Agency, 1969.

From Regional Seminar for Asia and Far East on Radiation Protection Monitoring, Bombay, India. See STI/PUB-199, CONF-681203.

A standard of thermal-neutron flux density has been established for calibrating thermal-neutron detectors. The moderating geometry consists of six $^{241}\text{Am}-\text{Be}(\alpha, n)$ source having a total neutron emission rate of 6.6×10^6 n/s and imbedded in a graphite pile (163 cm $\times$ 152 cm). The thermal-neutron flux density in a small air cavity (5 cm $\times$ 5 cm $\times$ 15 cm) at the center of the assembly has been absolutely measured in terms of ^{197}Au neutron capture cross-section by $4-\pi\beta-\gamma$ coincidence counting of high purity circular gold foils. Various corrections have been applied and sources of errors discussed. The Westcott flux density below cadmium cut-off energy at the center of the cavity is estimated to be $6454 \pm 1.8\%$ n $\text{cm}^{-2} \text{s}^{-1}$. The flux density in the central 5-cm region of the cavity has been found to be constant to better than 0.7% by $4-\pi\beta$ counting of irradiated Mn-Ni foils. The BARC flux standard has been directly compared with the standards maintained at the National Bureau of Standards, Washington, the Electrotechnical Laboratory, Tokyo, and the Mendeleev Institute for Metrology, Leningrad, by exchanging irradiated gold foils (auth)

865 STANDARD INTENSITY ELECTROMAGNETIC FIELD INSTALLATION FOR CALIBRATION OF RADIATION HAZARD MONITORS FROM 400MHz TO 40GHz. Woods, D. (Univ. of Surrey, Guildford, Eng.). Non-Ioniz. Radiat., 1 9-17(June 1969).

An installation for producing electromagnetic fields of intensities up to 20 mW cm^{-2} for calibrating field intensity monitors is described. It consists of an anechoic chamber (designed for frequencies up to 40 GHz), a transmitting aerial of known characteristics and a range of high power sources. Owing to space and cost the chamber only operates down to 1 GHz. From 600 MHz to 400 MHz the standard field is generated in an oversize waveguide terminated in a matched load. Mention is made of the different conditions existing in front of a horn radiator, near-field zone, Fresnel region, Fraunhofer region. Maximum field intensities which can be generated over various circular apertures are given, together with an estimate of the limit of uncertainty in the value of the standard intensity field at different frequencies (auth) (UK)

866 METHOD FOR STANDARDIZING THE GAMMA-RAY EMITTED RADIATION SOURCES AND THE PORTABLE SURVEY METERS AT THE RESTRICTED AREA. Lim, Yong Kyu; Ro,

Seung Gy; Lim, Woo Yung (Atomic Energy Research Inst., Seoul), J Nucl Sci. (Seoul), 9 15-20(1969). (In Korean)

A method for standardizing γ radiation sources and portable survey meters at restricted areas, namely, the place surrounded with 30 cm thickness of concrete and $7.9 \text{ m} \times 5.8 \text{ m} \times 3.7 \text{ m}$ (h) in its inner space dimension was presented. Scattering effect of ^{60}Co and ^{226}Ra γ rays went to minimum at 0.6 to 0.7 of radiation source-detector distance(D) over concrete floor-detector height(H), and also the effects due to self-absorption, air build-up, and geometrical factors were negligible at 60 to 70 cm in D and 100 cm in H while any scattering object is not close to the radiation source or the detector. It is considered, therefore, to be optimum standardizing condition of radiation sources and radiation detecting instruments in restricted areas (auth)

867 (CONF-680461-4) STANDARD FLUX OF THERMAL AND EPI-THERMAL NEUTRONS. Mijneer, B. J., Aten A H W. Jr (Instituut voor Kernfysisch Onderzoek Amsterdam (Netherlands)). [nd] 5p Dep CFSTI (U S Sales Only) From Professional Commission on Nuclear Physics Bad Neuenahr, Germany

The requirements for a standard neutron flux permitting measurements with bulky instruments are discussed. A standard flux for epithermal neutrons using an Am-Be source is described (J W R)

868 (TID-20893(Rev.3)) STANDARD NUCLEAR INSTRUMENT MODULES. Adopted by AEC Committee on Nuclear Instrument Modules. Costrell, Louis (National Bureau of Standards, Washington, D. C.), Dec 1969. 39p. Dep. GPO \$0.40.

An updated and clarifying revision of the standard Nuclear Instruments Modules specifications to assure mechanical and electrical interchangeability of transistorized modular instruments is presented (W H K)

869 NUCLEAR INSTRUMENT MODULES AT THE JAPAN ATOMIC ENERGY RESEARCH INSTITUTE. Kinbara, Setsuro, Kumahara, Tadashi (Japan Atomic Energy Research Inst., Tokai, Japan). Nippon Genshiryoku Gakkaishi, 11 726-34(Dec 1969). (In Japanese)

Technical information on the nuclear instrument module system used in the Japan Atomic Energy Research Institute (JAERI) for general nuclear experiments is presented. This JAERI module system accords with the NIM standard adopted in 1966 by the USAEC. Already in JAERI nearly 1,000 units of the module representing 47 varieties, have been produced and supplied to various laboratories in JAERI. The module system possesses many features embodied in the pulse shape discriminating circuit, the time pickoff circuit and the high resolution spectrometry system. A description is given of these features, and also of the circuit configuration and characteristics of these units, which include general purpose nuclear instruments (auth) (NSA of Japan)

870 IMPROVEMENTS IN OR RELATING TO LIQUID SCINTILLATION SPECTROMETRY. (to Packard Instrument Co Inc.). British Patent 1,185,072. 18 Mar 1970. Priority date 11 Apr 1966, United States.

An external standard source array and transfer mechanism for positioning the entire array alternately in a first operative position adjacent but external to a sample including a radioactive isotope and a second inoperative position remote from the sample is described. The array comprises two external standard radioactive sources having known but different emission characteristics and a spacer for maintaining said sources in a fixed separated relation. The transfer mechanism is adapted to shift the array between the first operative position with both sources adjacent but external to a sample and a second inoperative position with both sources remote from the sample (W H K)

871 OPTIMAL CONTROL OF THE RADIOACTIVE VOLTAGE STANDARD. Braudaway, David W. (Sandia Corp Al-buquerque, N. Mex.), Mohler, Ronald R. ISA (Instrum Soc. Amer.) Trans., 8 202-7(1969)

To simplify operation of the radioactive voltage standard, control of the system balance is necessary. Before the control can be synthesized, a system mathematical model must be developed. A system mathematical model, a suitable performance index, and the developed, optimal control are described. Also discussed are the results of a computer simulation of the system behavior and a means of realizing the developed control (auth)

872 (CEA-N-1281) CONNECTIONS TO BE USED BETWEEN PRINCIPAL DETECTORS OF IONIZING RADIATIONS AND THEIR ELECTRONIC INSTRUMENTS. Lefevre, Roger, Roquefort, Henri (Commissariat a l'Energie Atomique, Saclay (France), Centre d'Etudes Nucleaires) Feb 1970. 40p. (In French) Dep CFSTI (U S Sales Only)

The most important input and output connections, connectors and cables that link detectors of ionizing radiation with their associated electronic instruments are described. As a guide for the user, a list of standard connectors and cables for every kind of instruments is given. Preferred connections to be used for each particular case are indicated. In addition, several examples of connections between detectors and apparatus, connector types and their associated cables, and various configurations of ground and earth circuits are given. (France)

- 873** COMPUTER ANALYSIS OF NUCLEAR SPECTRA AND γ -ENERGY STANDARDS. Kern, Jean (Univ. Fribourg, Switzerland) Nucl Instrum Methods, 79 233-9(1970)

After a review of the most accurately known gamma calibration lines, we present a method of obtaining new secondary standards of similar precision, but extending to higher energies. In our approach, we simultaneously use the pair-peak method, energy combinations, experimental non linearity curves, averages over several measurements and accurate peak position determinations. The latter is obtained in fitting the spectra by an appropriate analytical expression. The new calibration lines extend up to 2 MeV and exhibit precisions between 15 and 40 eV. They belong to the decays of ^{88}Y , $^{110\text{m}}\text{Ag}$, ^{140}La and ^{207}Bi . (auth)

- 874** STANDARD FAST NEUTRON SPECTRA. Profio, A. E. (Univ. of California, Santa Barbara). Trans. Amer. Nucl. Soc.; 13: 259(Jun-Jul 1970).

From American Nuclear Society Meeting, Los Angeles, Calif. See CONF-700608.

- 875** (ICRU-13) NEUTRON FLUENCE, NEUTRON SPECTRA, AND KERMA. (International Commission on Radiation Units and Measurements, Washington, D. C.). 15 Sep 1969. 57p. ICRU, Washington, D. C. \$3.00.

The description and measurement of neutron radiation fields is studied. Neutron fluence and flux density, energy fluence and energy flux density, and kerma and kerma rate are considered. Definitions are presented, measurement techniques and standards are discussed, and ICRU recommendations for further development and a better understanding of neutron measurements are presented. (W. H. K.)

- 876** (NYO-2472-67) ON THE CURRENT STATUS OF MOESSBAUER SPECTROSCOPY STANDARDS. Herber, Rolfe H. (Rutgers-The State Univ., New Brunswick, N. J. School of Chemistry). [1970]. 15p. Dep. CFSTI.

The present status of velocity calibration standards for Moessbauer spectrometers is discussed, including such methods as measuring the magnetic hyperfine spectrum of metallic iron, the frequency modulation of the motion of the Moessbauer source, and cosine smearing for determining line positions at large Doppler velocities. Also, isomer shift standards are discussed including iron-57, tin-119, indium-129 and others. (W. H. K.)

- 877** SECONDARY-STANDARD IONIZATION CHAMBER DESIGN. Kemp, L. A. W. (National Physical Lab., Middlesex, Eng.). Phys. Med. Biol.; 15 557-8(Jul 1970)

Due to the inadequacy of secondary standard instruments a therapy level exposure meter with its associated ionization chamber was developed. The design of the chamber incorporated very high purity, high density extruded graphite in the cup material and the hollow collecting electrode was made from aluminum of 99.99% purity. (UK)

- 878** (WASH-1147, pp 40-8) PHYSICAL PROTECTION STANDARDS. Hightower, E. D. (Division of Security (AEC), Washington, D. C.).

Physical protection policies in testing and approving physical security devices are considered. Protective barriers, intrusion alarm systems, repositories, and access controls were studied. (M.C.G.)

- 879** APPLICATION OF SOLID-STATE TRACK RECORDERS FOR NEUTRON SPECTRA MEASUREMENTS IN A REACTOR IRRADIATION FACILITY. Koehler, W. (International Atomic Energy Agency, Vienna). Radiat. Eff.; 3 231-3(Jun 1970)

In connection with the IAEA-neutron seed irradiation programme a standard neutron irradiation facility has been constructed. The application of solid state track recorders for fast neutron spectra measurements inside this facility is discussed. Fissionable targets of ^{235}U , ^{239}Pu , ^{237}Np , ^{238}U and ^{232}Th will be used and an approximative solution for the incident neutron spectrum will be obtained by a five-group method. (auth)

- 880** (SCL-DR 70-83) MEASUREMENT CAPABILITIES OF THE SANDIA LABORATORIES, LIVERMORE, STANDARDS LABORATORIES. Wilson, J. L. (Sandia Labs., Albuquerque, N. Mex.). Aug 1970. 28p. (SCL-DR-67-81). Dep. CFSTI.

- 881** METHOD AND APPARATUS FOR POSITIONING A RADIOACTIVE STANDARD IN A RADIOACTIVE SAMPLE COUNTING APPARATUS. Smith, Roy E.; Olson, Robert E. (to Packard Instrument Co.). United States Patent 3,515,876. 2 Jun 1970. Filed 10 Apr 1967.

A pneumatic system is described for shifting a radioactive standard source from a remote location into a liquid scintillation counting chamber in which the standard source is located and retained within the counting chamber by magnetic attraction. (auth)

- 882** PROPOSED ISOMER SHIFT STANDARDS FOR MOESSBAUER SPECTROSCOPY. Cohen, R. I. (Bell Telephone Labs, Inc., Murray Hill, N. J.); Kallius, G. M. Nucl Instrum Methods, 86 209-12(1970)

The need for isomer shift reference standards for Moessbauer spectroscopy and appropriate criteria for choosing such standards are discussed. Using these considerations an extensive table of proposed reference materials is given. (auth)

- 883** (NBS-Handbook-107) RADIOLOGICAL SAFETY IN THE DESIGN AND OPERATION OF PARTICLE ACCELERATORS. (American National Standards Inst., New York). Jun 1970. 14p. GPO \$0.30.

Recommended safety standards for the design and operation of particle accelerators with primary energies less than 100 MeV are presented. Topics include radiation protection design criteria, operational health physics, radiation measurements, and dose assessment. (W. H. K.)

- 884** (LA-4465, pp 27.1-6) PRECISE METHOD FOR THE DETERMINATION OF SECONDARY STANDARDS FOR DEUTERON ANALYZING TENSORS. Keaton, P. W. Jr.; Armstrong, D. D.; Lawrence, G. P.; McKibben, J. L.; Ohlsen, Gerald G. (Los Alamos Scientific Lab., N. Mex.).

From LASL contributions to the 3rd international symposium on polarization phenomena in nuclear reactions, Madison, Wisconsin, August 31-September 4, 1970.

- 885** (NBS-SPEC. PUBL-331) RADIOACTIVITY CALIBRATION STANDARDS. Proceedings of a Special Session of the International Conference of the American Nuclear Society Meeting on the Constructive Uses of Atomic Energy, Washington, D. C., November 10-15, 1968. Mann, W. B., Garfinkel, S. B. (eds.). (National Bureau of Standards, Washington, D. C.). Aug 1970. 118p. (CONF-681141). GPO \$1.25.

Experimental procedures and methods used in nine international radioactivity standardization laboratories are described. The possibility of attaining accuracies of the order of 0.01% are discussed. The desirability of carrying out consistency checks of gamma-ray standards with time, using a 47y ionization chamber is emphasized. The validity of radioactivity standards is examined. International comparisons organized by the International Bureau of Weights and Measures are discussed. An analogue method of liquid-scintillation counting is described. Certain types of radioactivity standards are criticized. The fields of interest of the two Canadian laboratories are discussed. Details of the work in progress at the Boris Kidric Institute and National Bureau of Standards are presented. (auth)

- 886** ELECTROMETERS FOR STANDARD IONIZATION CHAMBERS. Oppelt, Jiri (Czechoslovak Inst. of Metrology, Prague). Jad. Energ.; 16: 380-1(1970). (In Czech).

Various features of different electrometer systems for standard ionization chambers are compared. (auth)

- 887** (NBS-TN-556) DEVELOPMENT AND CURRENT STATUS OF THE STANDARD NUCLEAR INSTRUMENT MODULE (NIM) SYSTEM. Costrell, Louis. (National Bureau of Standards, Washington, D. C.). Oct 1970. 15p. GPO \$0.30.

The need for a standard module system, history of development, advantages, general description, NIM instruments and dataway operations are discussed. (W. H. K.)

- 888** USA STANDARD: IMMEDIATE EVACUATION SIGNAL FOR USE IN INDUSTRIAL INSTALLATIONS WHERE RADIATION EXPOSURE MAY OCCUR. ANSI N 2.3 1967. New York; United States of America Standards Institute (1967). 12p. Available from American National Standards Inst., New York.

The characteristics of a standard signal that shall be used for situations requiring immediate, rapid, and complete evacuation are presented. This standard is primarily for use in industrial installations where ionizing radiation exposures may occur, but it may be used for other establishments where immediate evacuation is required to prevent injury. Devices required to activate the signal are briefly discussed, and the design of the signal generator is described. (W. H. K.)

889 ANALYSIS OF RESULTS OF THE BUREAU INTERNATIONAL DES POIDS ET MESURES THERMAL NEUTRON FLUX DENSITY INTERCOMPARISON. Murphey W. M., Caswell R. S. (National Bureau of Standards, Washington, D. C.). *Metrologia*, 6: 111-15 (Oct 1970).

The results of an international comparison of thermal-neutron flux density standards sponsored by the Neutron Working Group of the Bureau International des Poids et Mesures were analyzed using a method conceptually different from a companion analysis by Axton. Both methods, however, yield nearly the same results. All individual values are within $\pm 2.6\%$ of the adjusted value, the average absolute deviation being about 1% (auth).

890 AMERICAN STANDARD BASIS FOR GM COUNTER TUBES. ANSI N 3.1-1965. New York, American Standards Association, Inc. (1965). 1p. Available from American National Standards Inst., New York.

Standard bases for GM counter tubes are designated as the 3 pin, Pee Vee (JETEC A31) and the 4 pin Medium base (JETEC A32). Pin connections are dictated. (W. H. K.)

891 DESIGN OF TRIE-AIR IONIZATION CHAMBERS. Wyckoff, H. O., Attix, I. H. National Bureau of Standards Handbook 64. Washington, D. C., National Bureau of Standards (1967). 19p. Available from Superintendent of Documents, GPO, Washington, D. C.

General design characteristics are given for standard free-air type ionization chambers for x-rays from 50 to 300 kilovolts. Included are the plate-separation requirements, elimination of electric-field distortion, data on air-attenuation and scattering effects, current measurement techniques, and other relevant features. (auth)

892 STANDARD METHOD FOR MEASURING THERMAL NEUTRON FLUX BY RADIOACTIVATION TECHNIQUES. ASTM E 262-70. Philadelphia, American Society for Testing and Materials (1970). 5p. Available from American Society for Testing and Materials, Philadelphia.

A general procedure for measuring an unknown thermal neutron flux by neutron activation techniques is defined. Three thermal-neutron activation procedures are detailed: cobalt method, standard foil technique using pure gold, and secondary standard foil techniques using pure indium, indium-aluminum alloy, and dysprosium-aluminum alloy. The techniques presented are limited to measurements at room temperature, but special problems in high temperature environments are discussed. The useful neutron-flux ranges for each detector material are listed. (W. H. K.)

893 STANDARD METHOD FOR MEASURING NEUTRON FLUX BY RADIOACTIVATION TECHNIQUES. ASTM E 261-70. Philadelphia, American Society for Testing and Materials (1970). 11p. Available from American Society for Testing and Materials, Philadelphia.

The best threshold foil technique for neutron flux measurements by radioactivation techniques is presented. Reactor neutron spectra are divided into three energy ranges (thermal, resonance, and fast) which require different detectors and detection procedures that are discussed. Fission threshold detectors for fast neutrons are treated. Requirements for activation detector materials, irradiation procedures, and counting instruments and procedures are discussed. (W. H. K.)

894 STANDARD METHOD FOR MEASURING FAST-NEUTRON FLUX BY RADIOACTIVATION OF IRON. ASTM E 263-70. Philadelphia, American Society for Testing and Materials (1970). 6p. Available from American Society for Testing and Materials, Philadelphia.

A standard method for measuring fast neutron fluxes using the threshold reaction $^{54}\text{Fe}(n,p)^{54}\text{Mn}$ is given. The reagents and materials are specified, and the irradiation, separation, and counting procedures are described. A NaI(Tl) scintillation gamma spectrometer is used. The necessary calculations are explained. (W. H. K.)

895 STANDARD METHOD FOR MEASURING FAST-NEUTRON FLUX BY RADIOACTIVATION OF NICKEL. ASTM E 264-70. Philadelphia, American Society for Testing and Materials (1970). 5p. Available from American Society for Testing and Materials, Philadelphia.

A standard method for measuring fast neutron fluxes using the threshold reaction $^{58}\text{Ni}(n,p)^{58}\text{Co}$ is given. Material preparation and packaging and irradiation and counting procedures are described. A NaI(Tl) scintillation gamma spectrometer and a precision balance are used. Calculations are detailed. (W. H. K.)

896 STANDARD METHOD FOR MEASURING FAST-NEUTRON FLUX BY RADIOACTIVATION OF SULFUR. ASTM E 265-

70. Philadelphia, American Society for Testing and Materials (1970). 5p. Available from American Society for Testing and Materials, Philadelphia.

A standard method for measuring fast neutron fluxes using the threshold reaction $^{32}\text{S}(n,p)^{32}\text{P}$ is described. Sulfur can be used either the powder or pellet form. Aqueous separation techniques and pellet burning techniques are outlined. The counting technique is described and the calculations are elaborated. (W. H. K.)

897 STANDARD METHOD FOR MEASURING FAST-NEUTRON FLUX BY RADIOACTIVATION OF ALUMINUM. ASTM E 266-70. Philadelphia, American Society for Testing and Materials (1970). 5p. Available from American Society for Testing and Materials, Philadelphia.

A standard method for measuring fast neutron fluxes using the threshold reaction $^{27}\text{Al}(n,\alpha)^{24}\text{Na}$ is described. A thallium-activated sodium iodide scintillation gamma spectrometer and a precision balance are required in addition to high purity aluminum foil or wire. The procedure and calculations are described. (W. H. K.)

898 STANDARD METHOD OF CALCULATION OF NEUTRON DOSE TO POLYMERIC MATERIALS AND APPLICATION OF THRESHOLD-FOIL MEASUREMENTS. ASTM D 2365-68. Philadelphia, American Society for Testing and Materials (1969). 18p. Available from American Society for Testing and Materials, Philadelphia.

Calculation of the neutron dose in polymeric materials based on the chemical composition of the material, the neutron spectrum, and the integrated flux exposure is described. Methods for neutron dose calculations for a known neutron spectrum, for an unknown neutron spectrum, and for thermal neutron capture reactions are presented. Also, procedures for measurement of integrated neutron fluxes with threshold foils are detailed. (W. H. K.)

899 USA STANDARD SIGNAL CONNECTORS FOR NUCLEAR INSTRUMENTS. ANSI N 3.3-1968. New York, United States of America Standards Institute (1969). 7p. Available from American National Standards Inst., New York.

Standard coaxial connectors for signal cables for nuclear instruments are described. (W. H. K.)

900 AMERICAN NATIONAL STANDARD CRITICALITY ACCIDENT ALARM SYSTEM. ANSI N 16.2-1969. Hinsdale, Ill., American Nuclear Society (1970). 4p. Available from American Nuclear Society, Hinsdale, Ill.

Guidelines for the establishment and maintenance of an alarm system to initiate personnel evacuation in the event of inadvertent criticality are presented. (W. H. K.)

901 STANDARD METHODS FOR CHEMICAL ANALYSIS OF REACTOR AND COMMERCIAL COBALTUM. ASTM E 195-68. Philadelphia, American Society for Testing and Materials (1968). 9p. Available from American Society for Testing and Materials, Philadelphia.

Methods are described for the determination of Nb, Mo, W, and Fe in commercial Nb. Nitrogen is determined by a distillation and photometric measurement of the yellow complex of ammonia with Nessler reagent. The method is applicable to concentrations of N from 20 to 1000 ppm. Molybdenum and W are determined photometrically using dithiol and the method is applicable to concentrations from 50 to 1000 ppm. Iron in concentrations from 150 to 1000 ppm is determined photometrically using 1:10 phenanthroline. (B. L. M.)

902 STANDARD METHODS FOR CHEMICAL ANALYSIS OF CARBON AND GRAPHITE. ASTM C 560-69. Philadelphia, American Society for Testing and Materials (1969). 12p. Available from American Society for Testing and Materials, Philadelphia.

Methods are described for the determination of Si, Fe, Ca, Al, Ti, V, and B in carbon or graphite. The preferred concentration of the sought element in the final solution, the limits of sensitivity, and the precision of the results are tabulated. Si is determined photometrically as the silicomolybdic acid, Fe is determined photometrically as the Fe(II)-ortho-phenanthroline complex, and Ca is precipitated as the oxalate, dissolved and determined by measuring the decrease in absorbance when added to a dilute KMnO_4 solution. Al is determined photometrically using 2-quizarinsulfonic acid, Ti is determined photometrically by the peroxide colorimetric method, and B is determined by the curcumin-oxalic acid colorimetric method. The interferences are listed for all procedures. (B. L. M.)

903 STANDARD METHOD OF TEST FOR URANIUM BY CONTROLLED-POTENTIAL COULOMETRY. ASTM E 217-70. Philadelphia, American Society for Testing and Materials (1970).

8p Available from American Society for Testing and Materials Philadelphia

Determination of U by controlled potential coulometry is carried out at 3.25 V vs SCE in a solution that is 0.5 M H_2SO_4 . Electrolysis is terminated when the current decreases to 50 μA and the analytical result is computed on the basis of a 2 electron change from U(VI) to U(IV) using Faraday's law. Preliminary electrolytic reduction at 0.75 V eliminates the interferences of most strong oxidants. Copper(II) is reduced along with U(VI) and constitutes an interference which must be circumvented by coulometric reoxidation of the Cu(I) formed. Anion interferences are minimal. The effects of most fission products are small but Mo interferes seriously and a separation of a medium other than H_2SO_4 is required. Oxygen interferes seriously and the supporting medium must be O_2 free prior to electrolysis which must be carried out under a blanket of inert gas. If necessary U may be separated from interferences by extraction with methyl isobutyl ketone followed by oxidation and dissolution with a bisulfate melt and HClO_4 . The relative standard deviation of the method is 1% (B L M).

904 STANDARD METHOD FOR COLORIMETRIC DETERMINATION OF URANIUM IN AQUEOUS SOLUTIONS (ASTM E 318-69 Philadelphia, American Society for Testing and Materials (1969) 5p Available from American Society for Testing and Materials Philadelphia

Uranium can be determined in aqueous solutions containing 30 to 750 $\mu\text{g/ml}$ by measuring the absorbance of the U dibenzoyl methane complex at 415 m μ . After oxidation of the U with KMnO_4 the U(IV) is extracted with hexone from an aqueous phase salted with an acid deficient solution of $\text{Al}(\text{NO}_3)_3$ and tetrapropylammonium nitrate. Color is developed in the hexone phase. Large amounts of Th and Ce(IV) interfere. The precision in a single laboratory was 1.7% RSD (B L M).

905 STANDARD METHOD OF TEST FOR THORIUM IN INDUSTRIAL WATER AND INDUSTRIAL WASTE WATER (ASTM D 2333-68 Philadelphia, American Society for Testing and Materials (1968) 5p Available from American Society for Testing and Materials Philadelphia

Thorium was determined spectrophotometrically using 1 (o-arsenophenylazo) 2 naphthol 3,6 disulfonic acid after the Th had been coprecipitated with Ca as the oxalate salts and redissolved. The method is sensitive to $<1 \times 10^{-8}$ g Th/g H_2O . The absorbance of the complex was measured at 545 m μ . Ferric iron is the primary interference and its interference is minimized by adding hydroxylamine hydrochloride and boiling the test solution to reduce the iron (B L M).

906 STANDARD METHOD OF TEST FOR URANIUM AND PLUTONIUM CONCENTRATIONS AND ISOTOPIC ABUNDANCES (ASTM E 267-70 Philadelphia, American Society for Testing and Materials (1970) 9p Available from American Society for Testing and Materials Philadelphia

The concentration of Pu and U and their isotopic abundances in solutions of reactor fuels either before or after irradiation was determined by mass spectrometric analysis. A minimum sample containing 50 μg of irradiated U will contain sufficient Pu for measurement. Ion exchange separations were used to separate Pu and U from fission products and then to separate and purify the Pu and U prior to mass spectrometric analysis. The precision of the method on an interlaboratory basis was 0.7% RSD (B L M).

907 STANDARD METHOD OF TEST FOR ATOM PERCENT FISSION IN URANIUM AND PLUTONIUM FUEL ^{148}Nd METHOD (ASTM E 321-69 Philadelphia, American Society for Testing and Materials (1969) 9p Available from American Society for Testing and Materials Philadelphia

Fission product Nd is chemically separated from irradiated U and Pu fuels and determined by isotopic dilution mass spectrometry to measure the burnup of the fuel. The two rare earths adjacent to Nd do not interfere with the procedure and interferences from other rare earths either natural or fission product are removed by an ion exchange separation. The minimum sample size should be 70 ng of ^{148}Nd . The method is described in detail and can be applied directly to U fuels containing <0.5 initial Pu with 1 to 100 GW day/metric t burnup. The precision of the method both for a single laboratory and for 8 participating laboratories is $\sim 1\%$ (B L M).

908 STANDARD METHOD OF TEST FOR ATOM PERCENT FISSION IN URANIUM AND PLUTONIUM FUEL (MASS SPECTROMETRIC METHOD) (ASTM F 244-69 Philadelphia, American Society for Testing and Materials (1969) 7p Available from American Society for Testing and Materials Philadelphia

A computerized mass spectrometric method is described for the determination of the heavy element at fission in irradiated U fuel with an initial Pu content of 0 to 50% from the isotopic analysis of the fuel before and after irradiation. The analysis must be carried out under conditions as nearly ideal as possible and the sample before irradiation must be representative of the fuel. Atomic ratios of the isotopes ^{235}U , ^{238}U , ^{239}Pu , ^{240}Pu , ^{241}Pu and ^{242}Pu to ^{238}U are measured mass spectrometrically. The at fission attributed to fission of ^{235}U , ^{239}Pu and ^{241}Pu is separately calculated and then summed to obtain the total heavy element at fission (B L M).

909 STANDARD METHOD OF TEST FOR ATOM PERCENT FISSION IN URANIUM FUEL (RADIOCHEMICAL METHOD) (ASTM E 219-69 Philadelphia, American Society for Testing and Materials (1969) 5p Available from American Society for Testing and Materials Philadelphia

The determination of the U at fission that has occurred in U fuel from an analysis of the ^{137}Cs ratio to U ratio after irradiation is described. The method is applicable to high density clad U fuels (metal alloys or ceramic compounds) in which no separation of U and Cs has occurred. The fuels are best aged for several months after irradiation in order to reduce the 13 day ^{136}Cs activity. The fuel is dissolved and diluted to produce a solution containing a final concentration of U of 100 to 1000 mg U/l. The ^{137}Cs concentration is determined by ASTM method F 320 for Radiochemical Determination of Cesium 137 in Nuclear Fuel Solutions and the U concentration is determined by ASTM method E 267 for Determination of Uranium and Plutonium Concentrations and Isotopic Abundances. ASTM method E 318 for Colorimetric Determination of Uranium in Aqueous Solutions or ASTM method E 217 Test for Uranium by Controlled Potential Coulometry. Calculations are given for correcting the ^{137}Cs concentration for decay during and after irradiation. The accuracy of this method is limited not only by the experimental errors of the ^{137}Cs and U determinations but also by the accuracy with which the fission yield and the half life of ^{137}Cs are known (B L M).

910 STANDARD METHOD OF TEST FOR RADIONUCLIDES OF RADIUM IN WATER (ASTM D 2460-70 Philadelphia, American Society for Testing and Materials (1970) 5p Available from American Society for Testing and Materials Philadelphia

A method is described for separating and determining α -emitting Ra isotopes in water at concentrations of ~ 1 pCi/l. Ra is collected from H_2O by coprecipitation with mixed Ba and Pb sulfates. The precipitate is dissolved in ammoniacal EDTA and the Ba and Ra sulfates are reprecipitated with acetic acid to separate them from Pb and other radionuclides. The precipitate is dried, weighed to determine chemical yield and α counted to determine total disintegration rate of Ra isotopes. For a single operator the intrinsic precision of the method is $\sim 5\%$ (B L M).

911 STANDARD METHOD OF TEST FOR RADIOACTIVE CESIUM IN WATER (ASTM D 2577-69 Philadelphia, American Society for Testing and Materials (1969) 6p Available from American Society for Testing and Materials Philadelphia

Radioactive Cs in water in concentrations >1 $\mu\text{Ci/l}$ is determined by γ counting of a Cs tetraphenylborate solution in amyl acetate. The method is limited to Cs isotopes of mass 134, 136, 137 and 138. Fission product extraction is prevented by the presence of EDTA in the solution to be extracted. Macro amounts of NH_4^+ , Rb^+ , K^+ , Ag^+ and Na^+ interfere with the determination. After the extraction and measurement of the γ spectrum the spectrum is resolved into its components by graphical or algebraic methods and the count rate due to each isotope is obtained. For a single operator precision of the method is better than $\pm 1\%$ (B L M).

912 STANDARD METHODS FOR RADIOCHEMICAL DETERMINATION OF ^{137}Cs IN NUCLEAR FUEL SOLUTIONS (ASTM E 320-70 Philadelphia, American Society for Testing and Materials (1970) 6p Available from American Society for Testing and Materials Philadelphia

Cesium 137 can be determined in solutions resulting from the dissolution of irradiated fuel elements for the determination of burnup by γ spectrometry after precipitation along with an inert Cs carrier as either the perchlorate or chloroplatinate. The elements or solution of elements must be allowed to cool for 130 days to allow for the decay of ^{86}Rb and ^{136}Cs . The presence of ^{134}Cs and ^{136}Cs also contributes a positive bias to the determination and a computer correction for these is necessary. All radioassays were made with a γ spectrometer capable of

better than 10% resolution of the 0.66-MeV ^{137}Ba γ ray. In an interlaboratory comparison, the RSD was 1.4% for the chloro-platinate separation and 1.7% for the perchlorate separation (B L M)

913 STANDARD METHODS FOR ANALYSIS OF ^{32}P ASTM I 182-62 Philadelphia; American Society for Testing and Materials (1965). 2p. Available from American Society for Testing and Materials, Philadelphia

Radiochemical purity and the absolute disintegration rate of ^{32}P preparations are determined. Other ASTM methods are referred to for the following determinations: ^{32}P activity by β counting, ^{35}S and other low-energy β contamination by aluminum absorption curve, γ contamination by scintillation counting, and chemical characteristics by chemical tests. The chemical tests include determination of heavy metal contaminants, free acid, total solids, and nonvolatile materials (B L M)

914 STANDARD METHOD FOR MEASUREMENT OF ALPHA PARTICLE RADIOACTIVITY OF INDUSTRIAL WATER AND INDUSTRIAL WASTE WATER, ASTM D 1943-66, Philadelphia; American Society for Testing and Materials (1966). 7p. Available from American Society for Testing and Materials, Philadelphia

Alpha activity for alpha emitters having energies above 3.9 MeV and at activity levels above 0.5 pCi/ml of water can be determined by direct measurement of the activity with a proportional or scintillation counter after the volume of the sample has been reduced by evaporation or some chemical means to yield a minimum weight of the material having a measurable α activity (B L M)

915 STANDARD METHOD OF TEST FOR RADIOACTIVE BARIUM IN INDUSTRIAL WATER AND INDUSTRIAL WASTE WATER, ASTM D 2038-68 Philadelphia; American Society for Testing and Materials (1968). 8p. Available from American Society for Testing and Materials, Philadelphia

Barium-139 and ^{140}Ba were determined in water at concentrations $>10^{-7}$ Ci/l by repeated precipitations with added Ba carrier as BaCl_2 from cold HCl solutions, final precipitation as BaSO_4 for determination of chemical yield, and counting of the barium by γ or β counters. Large amounts of stable Ba cause an overestimation of chemical yield. For a single operator, the precision of the method is better than 2% for a random counting error of $<1\%$ (B L M)

916 STANDARD GENERAL METHODS FOR ANALYSIS OF RADIOISOTOPES, ASTM E 181-62 Philadelphia; American Society for Testing and Materials (1965). 11p. Available from American Society for Testing and Materials, Philadelphia

Methods are described for the following tests for the analysis of radioisotopes: heavy metal spot test, gross β count, aluminum absorption curve, determination of γ impurities, free acid, total solids, and nonvolatile materials. The presence of heavy metals is indicated by their precipitation with H_2S . Beta particles having a maximum energy of 0.220 MeV or greater are counted, and the method is used primarily for radioisotope products of specific activities that are sufficiently high that the solids left on dried mounts are less than 1 mg/cm². The aluminum absorption curve covers the determination of the approximate energies and intensities of β spectra in radioactive sources. The γ -emitting impurities are determined using a γ spectrometer with a NaI(Tl) crystal. The free acid is defined as that acid exclusive of complexes or salts with inherent acid properties and is determined to ~ 0.5 pH unit by measuring a volume of the solution with a pH meter or pH paper. Total solids are those materials that do not evaporate or ignite at a temperature sufficient to evaporate the mineral acids, HCl and HNO_3 , and is determined by weighing the residue after evaporation and drying at 110°C. Nonvolatile matter covers the determination of material that does not evaporate or ignite at a temperature sufficient to convert C to CO or to CO_2 and is determined by weighing the residue after ignition at 600°C (B L M)

917 STANDARD METHOD OF TEST FOR RADIOACTIVE MANGANESE IN WATER, ASTM D 2039-69 Philadelphia; American Society for Testing and Materials (1969). 6p. Available from American Society for Testing and Materials, Philadelphia

Manganese-54 and ^{56}Mn were determined in water at concentrations $>10^{-7}$ Ci/l by precipitating the radioactive Mn with a carrier as MnO_2 , reprecipitation as manganese ammonium phosphate for calculation of chemical yield, and counting the final precipitate with a γ counter for ^{54}Mn and ^{56}Mn or with a β particle detector for ^{56}Mn only. Large amounts of Cl^- in the original sample make precipitation difficult, and stable manganese affects the calculation

of the chemical yield. For random counting errors of $<1\%$, the precision of the method with a single operator is better than 2% (B L M)

918 STANDARD METHODS OF TEST FOR RADIOACTIVE IODINE IN INDUSTRIAL WATER AND INDUSTRIAL WASTE WATER, ASTM D 2334-68, Philadelphia; American Society for Testing and Materials (1968). 11p. Available from American Society for Testing and Materials, Philadelphia

Three methods described for the determination of radioactive iodine (masses 129, 131, 132, 133, 134, and 135) in industrial water and industrial waste water are: (1) heterogeneous isotopic exchange of iodide with AgI, (2) distillation of elemental iodine into cold CCl_4 , and (3) extraction of iodine isotopes into CCl_4 . For all methods a complete oxidation-reduction cycle is carried out to ensure the desired chemical form of the iodine, and all methods are completed by the precipitation of iodine as AgI, which is then determined radiometrically. The single operator precision is within 2% when the random counting error is 1% (B L M)

919 STANDARD METHOD FOR MEASUREMENT OF GAMMA RADIOACTIVITY OF INDUSTRIAL WATER AND INDUSTRIAL WASTE WATER, ASTM D 1690-61, Philadelphia; American Society for Testing and Materials (1967). 5p. Available from American Society for Testing and Materials, Philadelphia

A method applicable to the absolute or relative determination of γ emitters in the energy range >0.1 MeV and in the concentration range of 10^{-2} to 10^{-5} $\mu\text{Ci/ml}$ of radioactively homogeneous water by scintillation counting is described (B L M)

920 STANDARD METHOD FOR MEASUREMENT OF BETA PARTICLE RADIOACTIVITY OF INDUSTRIAL WATER AND INDUSTRIAL WASTE WATER, ASTM D 1890-66, Philadelphia; American Society for Testing and Materials (1966). 9p. Available from American Society for Testing and Materials, Philadelphia

The method is suitable for either absolute or relative determinations of β emitters in industrial water and industrial waste water and is applicable to β emitters having maximum energies >0.1 MeV and at activity levels >0.5 pCi/ml of radioactively homogeneous water. Either proportional or Geiger-Mueller counters can be used to measure the β activity of the evaporated samples, but the proportional counter is preferable where a wide range of counting rates is encountered due to its shorter resolution time and greater stability (B L M)

921 STANDARD METHOD OF TEST FOR ^{59}Fe IN WATER, ASTM D 2461-69, Philadelphia; American Society for Testing and Materials (1969). 5p. Available from American Society for Testing and Materials, Philadelphia

Radioactive iron in water in concentrations above 0.1 $\mu\text{Ci/l}$ was determined by separating the ^{59}Fe from other activities by hydroxide precipitation along with nonradioactive Fe, by liquid-liquid extraction, and ion exchange and by counting with a γ counter or spectrometer or a β detector. Quantities of nonradioactive Fe >0.2 mg in the sample taken and substances, such as tartrate, that prevent the initial precipitation will interfere with the determination. The method may be used for absolute measurements by calibrating the radiation detector with a standard ^{59}Fe solution or for relative measurements by comparison. For a single operator, the precision is within 3% when the random counting error is 1% or less (B L M)

922 RECOMMENDED PRACTICE FOR DETERMINING CHANGES IN CHEMICAL REACTIVITY OF INORGANIC MATERIALS EXPOSED TO HIGH ENERGY RADIATION, ASTM E 183-62, Philadelphia; American Society for Testing and Materials (1965). 4p. Available from American Society for Testing and Materials, Philadelphia

Two methods are recommended for determining the changes in chemical reactivity of substances exposed to high-energy radiation. These methods are differential thermal analysis or thermogravimetric and derivative thermogravimetric analysis. These methods are based on the continuous measurement of heat evolved or changes in weight accompanying reactions of irradiated substances. When feasible, other measurements that contribute to the correct analysis of the changes are complete chemical, spectrographic, and x-ray analyses as well as density of sample prior to and following irradiation (B L M)

923 STANDARD METHOD OF TEST FOR ASH IN GRAPHITE, ASTM C 561-69, Philadelphia; American Society for Testing and Materials (1969). 2p. Available from American Society for Testing and Materials, Philadelphia

Ash in graphite was determined by ignition at 750°C in a Pt dish until no black specks indicated C, and then at 950°C for 1 hr. The net weight of the residue leads directly to calculation of ash content. (B L M)

924 USA STANDARD AND IEEE TEST PROCEDURE FOR SEMICONDUCTOR RADIATION DETECTORS (FOR IONIZING RADIATION). ANSI N 42.1 1969. New York: Institute of Electrical and Electronics Engineers, Inc. (1969). 12p. Available from Inst. of Electrical and Electronics Engineers, New York

Standard test procedures for determining the electrical characteristics and the radiation detection characteristics of semiconductor detectors are described. Electrical characteristics include current-voltage characteristics, capacitance-voltage characteristics, noise measurement by pulse-height distribution, noise measurement by oscilloscope and root-mean-square voltmeter, noise linewidth as a function of amplifier time constants, detector noise spectrum measurements, detector electric rise time, ambient sensitivity, and vibration and environmental tests. Radiation detector characteristics include dead layer determination, delineation of sensitive area, measurement of sensitive thickness, gamma ray counting efficiency, charge collection time, spectral resolution, and radiation damage measurements. (W H K)

925 USA STANDARD AND IEEE TEST PROCEDURE FOR AMPLIFIERS AND PREAMPLIFIERS FOR SEMICONDUCTOR RADIATION DETECTORS (FOR IONIZING RADIATION). ANSI N 42.2 1969. New York: Institute of Electrical and Electronics Engineers, Inc. (1969). 19p. Available from Inst. of Electrical and Electronics Engineers, New York.

Standard test procedures are described for noise or linewidth measurements, preamplifier noise performance, main amplifier noise, pulse height linearity, count rate effects, overload effects, pulse-height dependence on rise time, pulse-height stability, and crossover walk. (W H K)

926 STANDARD METHOD OF TEST FOR ABSORBED GAMMA RADIATION DOSE IN THE FRICKE DOSIMETER. ASTM D 1671 1963. Philadelphia: American Society for Testing and Materials (1965). 3p. Available from American Society for Testing and Materials, Philadelphia.

The apparatus, reagents, calibration procedure, and equations for measurement of gamma radiation in the range of 0.2×10^4 to 4×10^4 rads by oxidation of ferrous ammonium sulfate (Fricke dosimeter) and determination of the ferric ion concentration spectrophotometrically are described. (W H K)

927 RECOMMENDED PRACTICE FOR STANDARD CALIBRATION AND FORM FOR NUCLEAR LOGS. API RP 33 1959. Dallas: American Petroleum Institute (1959). 12p. Available from American Petroleum Inst., Washington, D. C.

Specifications are presented for the API (American Petroleum Institute) Nuclear Logging Calibration facility for establishing standard API Gamma-Ray and API Neutron Units for nuclear logs, for calibrating logging tools in these units, and for a standard nuclear log form and heading. (L C L)

928 MEASUREMENT OF NEUTRON FLUX AND SPECTRUM FOR PHYSICAL AND BIOLOGICAL APPLICATIONS. National Bureau of Standards Handbook 72. Washington, D. C.; National Bureau of Standards (1960). 98p. (NCRP-23). Available from Superintendent of Documents, GPO, Washington, D. C.

The measurement of neutron flux and spectra is discussed; various methods are compared, and results of intercomparisons are given. Methods of measurement are discussed for the emission rate of radioactive neutron sources, thermal-neutron flux, epithermal-neutron flux, intermediate-neutron flux, fast-neutron flux, and neutron energy spectra. Neutron radiation instruments for area survey and personnel monitoring involving flux and spectrum measurements are included. Typical spectra of various neutron sources are shown. (auth)

929 STANDARD SPECIFICATION FOR THERMOCOUPLES, SHEATHED TYPE K, FOR NUCLEAR OR FOR OTHER HIGH RELIABILITY APPLICATIONS. ASTM E 235-67. Philadelphia: American Society for Testing and Materials (1968). 12p. Available from American Society for Testing and Materials, Philadelphia.

The requirements for sheathed, Type K, thermocouples for nuclear applications are presented. General design, manufacturing, inspection, testing, and shipping aspects are considered. (R W R)

930 PHYSICAL ASPECTS OF IRRADIATION. National Bureau of Standards Handbook 85. Washington, D. C.; National Bureau of Standards (1964). 114p. (ICRU-10b). Available from Superintendent of Documents, GPO, Washington, D. C.

Various techniques for the measurement of absorbed dose and exposure are discussed. Characteristics of radiation (x, γ , and neutron) instrumentation are covered in some detail, including the more sophisticated work on standards. The specification and measurement of radiation quality of incoming beams and γ - and x-ray spectra are considered. Available data for stopping-power ratios and the average energy (W) required to produce an ion pair in a gas were reviewed. On this basis, modifications of about 1 or 2 percent in stopping-power ratios and up to 1 percent in W are required. (R W R)

931 (NBS-SPEC. PUBL-260-27) STANDARD REFERENCE MATERIALS. URANIUM ISOTOPIC STANDARD REFERENCE MATERIALS. Certification of Uranium Isotopic Standard Reference Materials. Garner, E. L., Machlan, L. A., Shields, W. R. (National Bureau of Standards, Washington, D. C.). Apr 1971. 162p. GPO \$1.25.

An ignition procedure was developed that will yield reproducible stoichiometry for U_3O_8 . The effects of temperature, length of ignition, rate of cooling, pressure and type of atmosphere were investigated. This ignition procedure was used for the blending of high-purity ^{235}U and ^{238}U isotopes to prepare calibration standards for the determination of bias effects in the thermal emission mass spectrometry of uranium. A description of the features of the mass spectrometer instrumentation including the source, collector, and expanded scale recorder is given. Two specific analytical procedures were used for the isotopic analysis of uranium and are adaptable, within a general framework, to fit the particular ion current intensity requirements of a wide range of isotopic distributions. Mass discrimination due to evaporation and ionization on the filaments, and other parameters such as temperature, time, sample size, sample mounting, total sample composition, acidity, filament material, pressure, non-ohmic response, R-C response and source memory were studied. The absolute isotopic abundances of 18 uranium SRMs were determined by thermal emission mass spectrometry. The general approach was to determine absolute $^{235}U/^{238}U$ ratios by using calibration mixes to correct for filament bias. Then the absolute ^{234}U and ^{236}U were determined by ^{235}U isotope dilution. For SRM U-0002, isotope dilution was the only practical means of determining the low abundance of ^{235}U as well as the ^{234}U . The limits given for the isotopic composition of the uranium SRMs are at least as large as the 95 percent confidence limits for a single determination and include terms for inhomogeneities of the material as well as analytical error. (auth)

932 (DP-1260) IMPROVED AIR MONITOR IN A STANDARD NUCLEAR INSTRUMENT MODULE. Woodward, William J. (Du Pont de Nemours & Co., Aiken, S. C., Savannah River Lab.). Jun 1971. Contract AT(07-2)-1. 13p. Dep. NTIS.

An instrument was developed for multichannel monitoring of airborne radioactive contaminants using scintillation detectors. Each channel is contained in a single-width nuclear instrument module (NIM) and consists of an amplifier, an integral discriminator, and a five-range count rate meter covering 0-300 000 counts/min. Up to ten monitoring channels and a high voltage power supply can be installed in any standard NIM bin. (auth)

933 AMERICAN NATIONAL STANDARD AND IEEE STANDARD TEST PROCEDURE FOR GEIGER-MUELLER COUNTERS. ANSI N42.3 1969. IEEE No. 309 1969. New York: Institute of Electrical and Electronics Engineers, Inc. (1969). 8p. Available from Institute of Electrical and Electronics Engineers, New York.

Standard test procedures for Geiger-Mueller counters are presented. Specifications for the test conditions, counter parameters, and test equipment are given, and pulse characteristics are defined. (W H K)

934 FILM BADGE SERVICES. NSF Standard No. 16 1966. Ann Arbor, Mich.; National Sanitation Foundation (1966). 27p. Available from National Sanitation Foundation, Ann Arbor, Mich.

A standard prescribing minimum requirements for film badge services is presented. (W H K)

935 (RDT-C-2-1-T) DETERMINATION OF INSULATION COMPACTION IN CERAMIC INSULATED CONDUCTORS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Aug 1970. 6p. RSO.

A standard prescribing requirements for determination of insulation compaction in ceramic insulated conductors for use in nuclear and associated applications is presented. (W H K)

936 (RDT-C-4-5-T) SMALL PERMANENT MAGNET FLOWMETER FOR LIQUID METAL SERVICE. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Nov 1970. 20p. LMEC.

A standard prescribing requirements for the design, fabrication, testing and inspection of a permanent magnet flowmeter for liquid metal service to be used in a gas environment is presented (W H K)

937 (RDT-C-5-1-T) INDUCTIVE LEVEL MEASUREMENT SENSOR FOR USE IN LIQUID METAL (Division of Reactor Development and Technology (AEC) Washington D. C.), Apr 1970 30p LMEC

A standard prescribing requirements for the design, material selection, fabrication and examination of inductive level measurement sensors for use in liquid metals is presented (W H K)

938 (RDT-C-5-2-T) RESISTIVE LEVEL MEASUREMENT SENSOR FOR USE IN LIQUID METAL (Division of Reactor Development and Technology (AEC) Washington D. C.), Apr 1970 30p LMEC

A standard prescribing requirements for the design, material selection, fabrication, examination, and shipping of resistive level measurement sensors for use in liquid metals is presented (W H K)

(RDT-C-6-3-T) LIQUID METAL PRESSURE MEASUREMENT SYSTEM, FLUSH-MOUNTED EDDY CURRENT TYPE INDUCTIVE ABSOLUTE OR GAGE, (Division of Reactor Development and Technology (AEC) Washington, D. C.) Oct 1970 19p LMEC

A standard prescribing requirements for the material selection, fabrication, examination and installation of eddy current pressure gages for use in liquid metals is presented (W H K)

940 (RDT-C-7-1-T) THERMOCOUPLE MATERIAL, IRON AND CONSTANTAN SOLID CONDUCTOR (BARE, FIBERGLASS INSULATED AND SHEATHED OVER FIBERGLASS INSULATION) (Division of Reactor Development and Technology (AEC) Washington D. C.) Apr 1970 11p RSO

A standard prescribing requirements for solid conductor iron and Constantan thermocouple material: of four types, bare fiberglass insulated, and sheathed over fiberglass insulation for use in nuclear and associated applications is presented (auth)

941 (RDT-C-7-2-T) THERMOCOUPLE MATERIAL, IRON-CONSTANTAN, MAGNESIUM-OXIDE INSULATED AND SHEATHED (Division of Reactor Development and Technology (AEC) Washington D. C.) Apr 1970 10p RSO

A standard prescribing requirements for thermocouple material consisting of iron and Constantan conductors magnesium oxide insulation and a sheath of seamless stainless steel tubing for use in nuclear and associated applications is presented (auth)

942 (RDT-C-7-3-T) THERMOCOUPLE MATERIAL, COPPER AND CONSTANTAN SOLID CONDUCTOR (BARE, FIBERGLASS INSULATED AND SHEATHED OVER FIBERGLASS INSULATION) (Division of Reactor Development and Technology (AEC) Washington D. C.) Apr 1970 10p RSO

A standard prescribing requirements for solid conductor copper and Constantan thermocouple materials of four types, bare fiberglass insulated and sheathed over fiberglass insulation for use in nuclear and associated applications is presented (auth)

943 (RDT-C-7-4-T) THERMOCOUPLE MATERIAL, COPPER-CONSTANTAN, MAGNESIUM-OXIDE INSULATED AND SHEATHED (Division of Reactor Development and Technology (AEC) Washington D. C.) Apr 1970 9p RSO

A standard prescribing requirements for thermocouple material consisting of copper and Constantan magnesium oxide insulation and a sheath of seamless stainless steel tubing for use in nuclear and associated applications is presented (W H K)

944 (RDT-C-7-6-T) THERMOCOUPLE ASSEMBLY, NUCLEAR GRADE CHROMIUM ALUMINUM, STAINLESS STEEL SHEATHED MAGNESIUM OXIDE INSULATED (Division of Reactor Development and Technology (AEC) Washington D. C.) Jul 1970 21p RSO

A standard prescribing material and assembly requirements for seamless stainless steel sheathed magnesium oxide insulated Chromel P/Alumel thermocouple assemblies for use in direct contact with flowing high temperature liquid sodium fluid in nuclear reactor systems is presented (W H K)

945 (RDT-C-8-2-T) LIQUID SODIUM BLARING FILM THICKNESS, VARIABLE RESISTANCE TRANSDUCER, PROXIMITY MEASUREMENT SYSTEM (Division of Reactor Development and Technology (AEC) Washington D. C.) Oct 1970 19p LMEC

A standard prescribing requirements for the material selection, fabrication and examination of displacement gages for use in liquid sodium systems is presented (W H K)

tion fabrication and examination of displacement gages for use in liquid sodium systems is presented (W H K)

946 (RDT-C-9-1-T) SINGLE-POINT STRIP-CHART RECORDING POTENTIOMETER (Division of Reactor Development and Technology (AEC) Washington D. C.), Aug 1970 8p RSO

A standard prescribing requirements for single-point strip-chart recording potentiometers for use in nuclear and associated applications is presented (W H K)

947 (RDT-C-9-2-T) MULTIPPOINT STRIP-CHART RECORDING POTENTIOMETER (Division of Reactor Development and Technology (AEC) Washington D. C.) Sep 1970 10p RSO

A standard prescribing requirements for multipoint strip-chart recording potentiometers for use in nuclear and associated applications is presented (W H K)

948 (RDT-C-18-1-T) CERAMIC ELECTRICAL INSULATORS (Division of Reactor Development and Technology (AEC), Washington D. C.) Jul 1970 9p LMEC

A standard prescribing requirements for ceramic electrical insulators for use in high temperature nuclear and associated applications is presented (W H K)

949 (RDT-F-3-2-T) CALIBRATION SYSTEM REQUIREMENTS (Division of Reactor Development and Technology (AEC) Washington D. C.) Feb 1969 5p RSO

A standard prescribing requirements for the calibration of measuring and test equipment for use in nuclear and associated applications is presented (W H K)

950 AMERICAN NATIONAL STANDARD FOR HIGH VOLTAGE CONNECTORS FOR NUCLEAR INSTRUMENTS. ANSI N42.4 1971 New York Institute of Electrical and Electronics Engineers Inc (1971) 8p Available from Institute of Electrical and Electronics Engineers Inc New York

A specification standard for coaxial high voltage connectors for nuclear instruments for dc applications up to 5000 V and ac applications up to 3000 V rms at 60 Hz is presented (W H K)

951 CAMAC A SYSTEM OF COMPUTER-DIRECTED ELECTRONICS Tradosky, K (Gesellschaft fuer Kernforschung mbH Karlsruhe, Ger) Atomwirtsch Atomtech, 15 No 3 394 (Aug 1970) (In German)

Computer application to measurement and control (CAMAC) represents a system of computer-directed electronics which was elaborated by the European standard of nuclear electronics (ESONE) committee of the European nuclear research laboratories CAMAC specifies the data exchange between an experimental station and a computer therefore it is more than a new standard of equipment such as ESONE and nuclear instrument modules (NIM) CAMAC is a modular system that also determines mechanical dimensions power supply and digital as well as analog signals in such a way that a compatible system of computer-directed electronics can be designed Practical applications are discussed with respect to counters and timers gamma spectrometry and nuclear fission (H B G)

952 RADIATION SILENT FOR X-RAY DIFFRACTION AND FLUORESCENCE ANALYSIS EQUIPMENT ANSI N43.2 196 New York American National Standards Institute (1967) 34p Available from American National Standards Institute New York

Standard guidelines for the radiation silent aspects of the design and operation of x-ray diffraction and fluorescence analysis equipment are presented (W H K)

953 (RDT-C-15-2-T) WIDE-RANGE (10 DECADE) NEUTRON FLUX MONITORING CHANNEL (Division of Reactor Development and Technology (AEC) Washington D. C.) Feb 1971 19p RSO

The basic requirements for the design fabrication testing shipping and quality assurance for a neutron monitoring channel capable of measuring ten decades of neutron flux using a single fixed position fission chamber are presented The standard is applicable to neutron flux monitoring channels for thermal fast and some research reactors that have neutron flux changes of ten decades or less and when the normal operating period is not shorter than about ten seconds (auth)

954 (SC DC 714161) NEUTRON ENERGY DEPENDENCE OF DAMAGE TO SEMICONDUCTOR DEVICES. McKenzie, J. M. (Sandia Labs., Albuquerque, N. Mex.), Jul 1971. 15p. Dep. NTIS.

An experimental neutron standard remote from the resonance region is proposed and an experimental procedure is developed to compare the damage effectiveness of an unknown spectrum to

the standard. A systematic set of experiments on semiconductor devices is developed to provide damage equivalences for the effects of different neutron spectra on various device parameters. A carrier generation lifetime damage constant, a carrier removal damage constant, and a damage constant of an operating majority carrier device were determined for different neutron spectra relative to the damage produced by 14.1 MeV neutrons (W H K)

955 (RDT-E-4-19-T) PLUGGING TEMPERATURE INDICATOR ASSEMBLY FOR SODIUM SERVICE. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Aug 1971. 18p. LMEC.

A standard prescribing requirements for plugging temperature indicator assembly for sodium service for nuclear and associated applications is presented.

956 (RDT-C-4-5-T(Rev.)) PERMANENT MAGNET FLOW-METER FOR LIQUID-METAL PIPING SYSTEMS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Aug 1971. 24p. LMEC.

A standard prescribing requirements for the design, fabrication, testing, and inspection of a permanent magnet flowmeter for liquid-metal service is presented. (W H K)

957 STANDARD INTERFACE CONCEPT FOR COMPUTER-CONTROLLED PARTICLE ACCELERATORS. (Richard D. R., Biswell L. R. (Los Alamos Scientific Lab., N. Mex.) IEF (Inst. Elec. Electron. Eng.), Trans. Nucl. Sci., NS-18, No. 3, 363-4 (Jun 1971)).

From National particle accelerator conference, Chicago, Ill. (1 Mar 1971). See CONF-710308.

A survey of the existing (and planned) particle accelerators throughout North America and Europe will immediately indicate the unmistakable proliferation of either partial or total digital computer control systems. The cybernetic-like tentacles of these systems have reached into the remotest areas of the particle accelerator. One also realizes that each facility has designed special hardware, unlike any other, to handle the interface problem between the accelerator and the computer. A further look will convince one that the various interface problems are similar. The practical solution to the standard interface concept for computer control systems is discussed. Such an accelerator computer independent scheme for interface could well save many man-years of redundant design effort and invoke considerable cost savings in system implementation. A system organized about the dataway and branch control highway of the CAMAC standard is a potential contender. (auth)

958 INTERNATIONAL INTERCOMPARISON OF THERMAL NEUTRON FLUX DENSITY STANDARDS USING $4\pi\beta\text{-}\gamma$ COINCIDENCE TECHNIQUE. Shahani, M. G., Sharma, D. (Bhabha Atomic Research Centre, Bombay). pp 279-84 of Proceedings of the Nuclear Physics and Solid State Physics Symposium, Univ. of Roorkee, December 28-31, 1969. Vol. II. Bombay, Dept. of Atomic Energy (1969).

From Nuclear Physics and solid state physics symposium, Roorkee, India (28 Dec 1969). See CONF-691208-(Vol. 2).

959 (RDT-C-15-3-T) CURRENT PULSE PREAMPLIFIERS FOR USE WITH FISSION COUNTERS. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Aug 1971. 30p. RSO.

A standard for the required performance, test procedures, and construction materials for preamplifiers for fission chambers is presented. Three types of preamplifiers are covered including single ended input and output, differential input and single ended output, and differential input and output. (W H K)

960 TENTATIVE METHOD FOR FAST-NEUTRON FLUX MEASUREMENTS BY TRACK-ETCH TECHNIQUE. ASTM E418-70T. Philadelphia: American Society for Testing and Materials (1970). 5p. Available from American Society for Testing and Materials, Philadelphia.

The measurement of neutron flux by the use of fissionable materials is discussed. Fission fragments emitted by the fissionable materials during neutron bombardment penetrate a suitable recording medium, such as plastic, glass, or mica, that is in contact with the fissionable material. Appropriate etching techniques render the path of the fragment in the recording medium visible under an optical microscope. Since measurement of the decay of radioisotopes is not involved in the method, irradiation times are limited only by the maximum number of fission-fragment tracks that can be clearly distinguished without pile-up—approximately $2 \times 10^5/\text{cm}^2$. The neutron-energy range over which the common fissionable materials are useful is between 1 keV and 18 MeV.

As with other methods used to determine neutron flux, the uncertainties in some cross-section data make it difficult to assign an over-all accuracy value to this method. (R W R)

961 (CONF-701002-, pp 488-99) STANDARD FOIL PREPARATION. Lauer, K. F. (European Atomic Energy Community, Geel (Belgium), Central Nuclear Measurements Bureau).

From Symposium on neutron standards and flux normalization, Argonne, Ill. (21 Oct 1970).

In Neutron standards and flux normalization.

The Central Bureau for Nuclear Measurements (CBNM) of Euratom has an extensive program of foil preparation and assaying. This program is devoted to the development and research of different techniques for foil preparation, the determination of isotopic compositions of foil material, and the development of methods for foil assaying by non-destructive methods and by quantitative destructive methods after the foils have been used. The spread found in the fission cross-section half-lives, and many other categories of nuclear data has led just recently to a more thorough examination of foil production and particularly of assaying. Problems encountered during preparation and assaying of "standard" foils used for the measurement of neutron standards or flux densities are discussed briefly. (auth)

962 (CONF-701002) NEUTRON STANDARDS AND FLUX NORMALIZATION. Proceedings of a Symposium held at Argonne National Laboratory, Argonne, Illinois, October 21-23, 1970. (Argonne National Lab., Ill.). Aug 1971. 525p. Dep. NTIS.

Separate abstracts were prepared for 40 of the 43 papers presented. The three remaining papers were previously included in NSA. For abstracts of these three papers see CONF-701002-1, CONF-701002-2, and CONF-701002-3 in a cumulative report number index. (W H K)

963 (CONF-701002-, pp 410-14) SOME VIEWPOINTS ON CROSS-SECTION STANDARDS AND RELATED PROBLEMS FOR FAST-NEUTRON ELASTIC- AND INELASTIC-SCATTERING MEASUREMENTS. Holmqvist, B. (Aktiebolaget Atomenergi, Studsvik (Sweden)).

From Symposium on neutron standards and flux normalization, Argonne, Ill. (21 Oct 1970).

In Neutron standards and flux normalization.

Problems connected with accurate measurements of fast-neutron elastic- and inelastic-scattering cross sections include a need for standard cross sections. In this paper the interest is concentrated on cross-section standards that can be used in the 100-keV energy range. But, in addition, problems concerning the million-electron-volt energy range are briefly discussed. Usually elastic and inelastic cross-section experiments are performed relative to the n-p and C(n,n) cross sections. However, the large recoil effect of the (n,p) reaction makes carbon a better standard below a neutron energy of about 1.5 MeV. Some comments are also made about the general properties of organic scintillation detectors and lithium glass scintillation detectors used for measurements of fast-neutron fluxes. (auth)

964 (CONF-701002-, pp 285-312) NEUTRON-CAPTURE-CROSS-SECTION STANDARDS. Carlson, A. D. (Gulf Radiation Technology, San Diego, Calif.).

From Symposium on neutron standards and flux normalization, Argonne, Ill. (21 Oct 1970).

In Neutron standards and flux normalization.

Techniques employed in measuring capture cross sections are reviewed to determine what conditions should be satisfied by capture-cross-section standards. The elements satisfying most of these conditions are Rh, Ag, In, I, Tb, Ho, Tm, Ta, Re, Ir, and Au. For each of these elements, the measurements of the capture cross section are examined to determine the status of the cross section as a working standard. (auth)

965 PRECISE METHOD FOR THE DETERMINATION OF SECONDARY STANDARDS FOR DEUTERON ANALYZING TENSORS. Keaton, P. W. Jr.; Armstrong, D. D.; Lawrence, G. P.; McKibben, J. L.; Ohlsen, G. G. (Los Alamos Scientific Lab., N. Mex.). pp 849-51 of Polarization Phenomena in Nuclear Reactions. Barschall, H. H. (ed.). Madison, Wis., Univ. of Wisconsin Press (1971).

From third international symposium on polarization phenomena in nuclear reactions, Madison, Wis. (Aug-Sep 1970). See COO-7-593, CONF-700811.

966 TENTATIVE METHOD FOR COLORIMETRIC DETERMINATION OF TECHNETIUM IN AQUEOUS SOLUTIONS. ASTM E417-70T. Philadelphia: American Society for Testing and Materials (1970). 5p. Available from American Society for Testing and Materials, Philadelphia.

The method is applicable to known volumes from the processing of irradiated nuclear fuel and from laboratory studies on irradiated nuclear fuel. It can be used for solutions that contain as little as $0.4 \mu\text{g}$. The method is based on measurement of the absorbance of the technetium thiocyanate complex in chloroform. Two comparison standards bracketing the unknown are used (M C G)

967 STANDARD METHOD OF TESTING DEUTERIUM OXIDE ASTM D2184-68 Philadelphia American Society for Testing and Materials (1968) 6p Available from American Society for Testing and Materials Philadelphia

Measurement of the isotopic composition of hydrogen in heavy water is described. Measurement of the specific gravity of heavy water is a precise and accurate method for determining the isotopic composition to ± 0.03 at δ deuterium (M C G)

968 TENTATIVE METHODS FOR MEASURING FAST NEUTRON FLUX FOR ANALYSIS FOR ^{140}Ba PRODUCED BY ^{238}U FISSION ASTM E393-69T Philadelphia, American Society for Testing and Materials (1969) 7p Available from American Society for Testing and Materials Philadelphia

Two procedures are described for measurement of fast neutron fluxes by determining ^{140}Ba from the $^{238}\text{U}(n,f)$ fission product reaction. One method is the nondestructive determination of ^{140}Ba by direct counting of ^{140}La several days after the irradiation. The second method is chemical separation of ^{140}Ba and subsequent counting of it or its daughter ^{140}La . Neutron fluxes can be measured in the range from 10^7 to 10^{14} n/cm² sec (M C G)

969 STANDARD METHOD OF TEST FOR RADIOACTIVE TRITIUM IN WATER ASTM D2476-70 Philadelphia American Society for Testing and Materials (1970) 3p Available from American Society for Testing and Materials Philadelphia

A method is described for the liquid scintillation measurement of tritium radioactivity in water, H_2O or H_2O . The minimum detectable activity is 2 pCi/ml for a 50-ml sample counted for 20 min in a counter where the background is 30 cpm and the efficiency is 13.5%. Multiple solutes are used in the scintillator to provide the best combination of wavelength and pulse height for this application (M C G)

970 CURRENT STATUS OF MOESSBAUER SPECTROSCOPY STANDARDS Herber, Rolfe H. (Rutgers-The State Univ., New Brunswick, N. J.) pp 3-15 of Moessbauer Effect Methodology Vol. 6 /Gruverman, Irwin J. (ed.) Boston, New England Nuclear Corp. (1971).

From sixth symposium on Moessbauer effect methodology, Chicago, Ill. (25 Jan 1970).

Efforts to standardize the reporting of Moessbauer data are reviewed, including work on the velocity calibration of spectrometers and on isomer shift standards with respect to iron, tin, iodine, and other Moessbauer nuclides. Suggestions are made concerning nomenclature and conventions for reporting Moessbauer effect data. 43 references (auth)

971 SPECIFICATION FOR GAMMA RADIOGRAPHY EXPOSURE CONTAINERS FOR INDUSTRIAL PURPOSES, AND THEIR SOURCE HOLDERS British Standard 4097 1966 London, British Standards Institution (1966) 17p. Available from American National Standards Institute, New York

A standard prescribing requirements relating to shielding containers for sealed gamma sources for use in radiography is presented (W H K)

972 SPECIFICATION FOR GAMMA-RADIOGRAPHY SEALED SOURCES British Standard 3513 1962 London, British Standards Institution (1962) 15p Available from American National Standards Institute, New York

A standard prescribing requirements relating to the supply of a range of sealed gamma sources for use in radiography is presented. The standard covers sources of activity up to approximately 100 curies for cobalt-60 or 300 curies for cesium-137 or iridium-192 (W H K)

973 SPECTRA AND CONVERSION FACTORS OF NEUTRON CALIBRATION SOURCES Burger, G., Eckl, W.; Gredel, H. (Institut fuer Strahlenforschung, Neuherberg, Ger.) pp 467-75 of Advances in Physical and Biological Radiation Detectors Vienna; International Atomic Energy Agency (1971)

From Symposium on new developments in physical and biological radiation detectors; Vienna, Austria (23 Nov 1970) See STI/PUB-269; CONF-701112.

The absolute output and spectra down to $E_n = 700$ keV have been measured for several standard neutron sources (AmBe, PuBe,

AmF, AmB, ^{252}Cf). Spectral measurements were performed with organic scintillators. The principal features of the experimental technique and the method of data analysis are discussed. The measured spectra are compared with theoretical ones, the dose-fluence conversion factors are calculated and changes in these for different assumptions of the unknown low energy neutron spectrum are estimated. For some of the sources, leakage spectra from water moderators of varying sizes are calculated by a Monte Carlo code, the results are compared with measured leakage spectra and the corresponding conversion factors evaluated. The values for the unshielded sources decrease to about 70% when the sources are put into the center of a 12 in moderator (auth)

974 STANDARD METHOD FOR CONTROLLING QUALITY OF RADIOGRAPHIC TESTING ASTM F142-68 Philadelphia American Society for Testing and Materials (1968) 8p Available from American Society for Testing and Materials Philadelphia

Standards are presented for controlling the reliability or quality of radiographic images produced during the radiographic inspection of materials. These standards cover the technique used, the equipment and film material used, safety, and the recording of data on the method and results. The number of areas or parts to be radiographed and the acceptance standard to be applied shall be specified. The quality level required for radiography shall be at least 2 percent (2-27), unless a higher or lower quality is agreed upon by the purchaser and the supplier (L C L)

975 SPECIFICATION FOR DIRECT-READING PERSONAL DOSIMETERS FOR X- AND GAMMA RADIATION British Standard 3385 1961 London, British Standards Institution (1961) 8p Available from American National Standards Institute, New York

A standard prescribing requirements for the design of personnel quartz-fiber pocket ionization chamber for the measurement of integrated x and gamma radiation exposure doses in roentgens is presented (W H K)

976 (CONF-711002-, pp 122-33) PREPARATION OF STANDARD LAYERS BY VACUUM EVAPORATION. Eschbach, H. L. (European Atomic Energy Community, Geel (Belgium). Central Nuclear Measurements Bureau). Oct 1971.

From third international symposium on research materials for nuclear measurements, Gatlinburg, Tenn. (5 Oct 1971)

Methods used for preparing boron and lithium standard layers and some experimental results are discussed. Preparation methods for metallic uranium foils are discussed since their preparation and subsequent definition (together with other samples) are required for exact determination of the half-life of ^{234}U . Much the same care and precaution are involved as with the neutron flux standards (auth)

977 DETERMINATION OF THE THERMAL NEUTRON FLUENCE BY COBALT ACTIVATION MONITORS Koehler, W (IAEA, Vienna) Vaninbrouck, R. Int J Appl Radiat Isotop 22 No. 9, 529-41 (Sep 1971)

The determination of the thermal neutron fluence by cobalt activation monitors is a usual practice in reactor irradiation experiments. To facilitate a more uniform presentation and intercomparison of the experimental data the Working Group on Reactor Dosimetry elaborated recommendations for the experimental procedure concerning special types of monitors, measurement of the induced activity by comparison with calibrated ^{60}Co standards, nuclear constants to be used and corrections. In addition to pure cobalt monitors (discs 0.1 mm thick, 3 mm or 10 mm dia, wires 10 mm long, 0.125 mm dia), aluminum-1% cobalt discs (0.1 mm thick, 10 mm dia), prepared by CBNM, and aluminum-0.1% cobalt wires (10 mm long, 0.5 mm dia), offered by NBS, are recommended. The ^{60}Co standards distributed in 1963 were calibrated by the CBNM, in 1969 the IAEA offered four types of ^{60}Co -standards pursuant to these recommendations. The main nuclear constants involved in the method are the thermal activation cross section of ^{59}Co , $\sigma_0 = 37.3 \pm 0.2$ barns, the half-life of ^{60}Co , $T_{1/2} = 5.28 \pm 0.01$ yr, and the thermal absorption cross-section of ^{60}Co , $\sigma_1 = 2.0 \pm 0.2$ barns. The values of the correction for the diminution of ^{59}Co and ^{60}Co are given as well as those of the correction for the flux perturbation by the monitors. The correction for epithermal activation must be determined for each experiment. An overall accuracy of $\pm 2\%$ can be obtained, ratios of fluence values however, can be determined with an accuracy better than $\pm 1\%$ (auth)

978 PERSONAL PHOTOGRAPHIC DOSIMETERS ISO R 1757 1971(E). International Organization for Standardization (1971). 9p. Available from American National Standards Institute, New York

A standard prescribing requirements for the specification and testing of personal photographic dosimeters is presented (W H K)

979 GENERAL RECOMMENDATIONS FOR THE TESTING: CALIBRATION AND PROCESSING OF RADIATION MONITORING FILMS. BS 3890 1965. London, British Standards Institution (1965). 11p. Available from American National Standards Institute, New York.

A standard prescribing requirements for testing, calibrating, and processing radiation monitoring films is presented (W H K)

980 SPECIFICATION FOR FILM BADGES FOR PERSONNEL RADIATION MONITORING. BS 3664 1963. London; British Standards Institution (1963). 8p. Available from American National Standards Institute, New York.

A standard prescribing requirements for films badges for personnel monitoring is presented (W H K)

981 DIRECT READING POCKET TYPE ELECTROSCOPE EXPOSURE METERS. ISO R 1758 1971(F). International Organization for Standardization (1971). 3p. Available from American National Standards Institute, New York.

An ISO Recommendation prescribing requirements for direct reading pocket type exposure meters for x and/or gamma radiation from 30 keV to 3 MeV is presented (W H K)

982 INDIRECT READING CAPACITOR TYPE POCKET EXPOSURE METERS AND ACCESSORY ELECTROMETERS. ISO R 1759 1971(E). International Organization for Standardization (1971). 3p. Available from American National Standards Institute, New York.

An ISO Recommendation prescribing requirements for indirect reading capacitor type pocket exposure meters and associated electrometers for x and/or gamma radiation in the range from 30 keV to 3 MeV is presented (W H K)

983 (CONF-710301-(Vol 2), pp 528-42). PRF6FNT STATUS OF STANDARDS. London, H H. (National Bureau of Standards Washington, D. C.)

From third conference on neutron cross sections and technology, Knoxville Tenn. (15 Mar 1971).

The status of neutron cross section data for nuclei generally accepted as standards or potentially useful as such is presented. This includes our knowledge of the cross sections of the light elements from hydrogen through carbon. The accuracy with which these data are known over the energy range of interest in nuclear technology is presented. The status of the data for cross sections useful as secondary or relative standards for reactions such as capture and fission is presented. Areas of interest for future work to improve our knowledge of the cross-sections which comprise the basis of our measurement system for neutron cross sections and neutron flux are summarized (auth)

984 (AERE-M-2453). FISSION CHAMBERS AS SECONDARY STANDARDS FOR NEUTRON FLUX DENSITY MEASUREMENTS. Leake, J. W. (Atomic Energy Research Establishment, Harwell (England)). Jul 1971. 10p. Dep. NTIS (U. S. Sales Only), UK 9p.

Fission chambers to be used as secondary standards for the measurement of neutron flux density have been designed and manufactured. Each chamber has a high and a low sensitivity section (containing 42 mg and 8 mg of uranium, respectively) (auth)

985 ELECTROMETERS FOR STANDARD IONIZATION CHAMBERS. Oppelt, J. (Czechoslovakian Meteorological Inst., Prague). Radioisotopy, 11 No. 6, 1053-1100(1970). (In German).

For the development of standard devices in the field of ionizing radiation the properties of electrometers are discussed which are required for obtaining an accuracy of a few promille. Special attention is given to load measurement and to the influence of the parasitic capacity of the collector system (auth)

986 EXTERNAL DIAMETERS OF CYLINDRICAL RADIATION PROBES CONTAINING GEIGER-MUELLER OR PROPORTIONAL COUNTER TUBES OR SCINTILLATION DETECTORS. IEC Publication 256 1967. Geneva Bureau Central de la Commission Electrotechnique Internationale (1967). 5p. (In French and English). Available from American National Standards Institute, New York.

An IEC recommendation that specifies the external diameters of cylindrical radiation probes containing G-M counters, proportional counters, or a scintillation counter, and possibly a pre-amplifier is presented (W H K)

987 INDEX OF ELECTRICAL MEASURING APPARATUS USED IN CONNECTION WITH IONIZING RADIATION. IEC Publication 181 1964. Geneva, Bureau Central de la Commission

Electrotechnique Internationale (1964). 62p. (In French and English). Available from American National Standards Institute, New York.

An index of radiation measuring instruments currently manufactured by industry or likely to be manufactured in the near future which gives each instrument a designation and indication to permit its unambiguous identification is presented. Categories include basic radiation measuring apparatus, special apparatus for the control and the safety of nuclear reactors, special apparatus for health physics, special apparatus for prospecting and for the mining industry, and idiomatic gauges (W H K)

988 INDEX OF ELECTRICAL MEASURING APPARATUS USED IN CONNECTION WITH IONIZING RADIATION. IEC Publication 181A 1965. Geneva Bureau Central de la Commission Electrotechnique Internationale (1965). 75p. (In several languages). Available from American National Standards Institute, New York.

A supplement to IEC Publication 181 which was issued in 1964 and which gives designations and definitions, in French and English only, of electrical measuring apparatus used in connection with ionizing radiation, is presented. This supplement groups the designations in nine languages including French, English, Russian, Dutch, German, Italian, Polish, Spanish, and Swedish (W H K)

989 INDEX OF ELECTRICAL MEASURING APPARATUS USED IN CONNECTION WITH IONIZING RADIATION. IEC Publication 81B 1966. Geneva Bureau Central de la Commission Electrotechnique Internationale (1966). 74p. (In several languages). Available from American National Standards Institute, New York.

A supplement to IEC Recommendation 181 which designates and defines radiation measuring instruments is presented (W H K)

990 D.C. PERIODMETERS CHARACTERISTICS AND TEST METHODS. IEC Publication 295 1969. Geneva Bureau Central de la Commission Electrotechnique Internationale (1969). 36p. (In French and English). Available from American National Standards Institute, New York.

An IEC recommendation to establish standards concerning the electrical characteristics and test methods for dc periodmeters is presented (W H K)

991 EXTERNAL DIAMETER OF PLANCHETS USED IN NUCLEAR ELECTRONIC INSTRUMENTS. IEC Publication 248 1967. Geneva Bureau Central de la Commission Electrotechnique Internationale (1967). 5p. (In French and English). Available from American National Standards Institute, New York.

An IEC recommendation which gives the standard values for the external diameter of planchets used in nuclear electronic instruments in connection with ionizing radiation is presented (W H K)

992 ANALOGUE VOLTAGE RANGES AND LOGIC LEVELS FOR MAINS OPERATED NUCLEAR INSTRUMENTS. IEC Publication 323 1970. Geneva Bureau Central de la Commission Electrotechnique Internationale (1970). 7p. (In French and English). Available from American National Standards Institute, New York.

An IEC recommendation to establish standard voltage ranges and maximum permissible output voltages for analog signals and output impedances for analog circuits and to establish digital logic levels for binary signals for mains operated nuclear electronics instruments is presented (W H K)

993 SUPPLY VOLTAGES FOR TRANSISTORIZED NUCLEAR INSTRUMENTS. STABILIZED D.C. POWER SUPPLIES. TOLERANCES OF VOLTAGES. IEC Publication 293A 1970. Geneva Bureau Central de la Commission Electrotechnique Internationale (1970). 7p. (In French and English). Available from American National Standards Institute, New York.

An IEC recommendation for mains operated stabilized dc power supplies for transistorized instruments used in nuclear electronics is presented. The tolerances of standard stabilized dc power supply voltages are specified with respect to changes in mains voltage and load and to changes in ambient temperature (W H K)

994 SUPPLY VOLTAGES FOR TRANSISTORIZED NUCLEAR INSTRUMENTS. IEC Publication 293 1968. Geneva Bureau Central de la Commission Electrotechnique Internationale (1968). 7p. (In French and English). Available from American National Standards Institute, New York.

An IEC recommendation for standard values and tolerances of nominal ac mains supply voltages and frequencies for nuclear instruments and standard values of nominal stabilized dc supply

voltages for dc supply of nuclear instruments by mains-operated stabilized dc sources that are not an integral part of the instrument is presented (W H K)

995 STANDARDS AND THEIR DISSEMINATION IN THE FIELD OF RADIATION MEASUREMENT. Jennings, W A. (National Physical Lab., Teddington, Eng.). pp 2-3 of Radiation Dose and Dose Distribution Measurements in the Megarad Range Slough, Eng.; United Kingdom Panel on Gamma and Electron Irradiation (1971).

From Symposium on gamma and electron irradiation; Teddington, England (6 Jul 1970). See CONF-700659.

A brief account is given of the NPL's work and philosophy in the field of dosimetry, with special reference to standards and calibration services (UK)

996 CERTIFICATION OF CLASS I STANDARD SPECTROMETRIC GAMMA SOURCES. Konstantinov, A. A.; Anufriev, S. N. Meas. Tech. (USSR) (Engl. Transl.), 14 No. 2, 297-300 (Feb 1971).

Translated from Izmer. Tekh.; 14 No. 2, 77-80 (Feb 1971).

High accuracy can be obtained with the relative method of determining γ -radiation activity using a scintillation counter only when the samples are precisely positioned, especially for small distances between the source and the radiation detector. Because of the low levels of activity of the standards (approximately $0.5 \mu\text{Ci}$), standard spectrometric gamma sources must be calibrated for small distances between the source and the detector. Additional measurements taken with the source rotated through 180° greatly reduce the systematic error caused by inaccurate positioning. A large scintillation crystal of NaI(Tl) used as a detector reduces systematic error in relative measurements owing to the sources shifting from the detector axis and to variations in the dimensions of the radioactive spots of different sources (auth)

997 (ICRU-20) RADIATION PROTECTION INSTRUMENTATION AND ITS APPLICATION. (International Commission on Radiation Units and Measurements, Washington, D. C.). 1 Oct 1971. 60p. ICRU, Washington, D. C. \$3.50.

A basic discussion of radiation quantities and units, the interpretation of instrument readings in terms of such units, and the accuracy usually required is presented. Instrument characteristics for ionization chambers, gas proportional counters, G-M counters, scintillation counters, photographic devices, and solid state and activation devices are discussed. The choice and use of instruments for surveying, area monitoring, and environmental monitoring, particularly, sealed gamma-ray sources, sources of α rays and electrons, unsealed sources, reactors and sealed neutron sources, and accelerators are discussed. Also, the choice and use of instruments for individual monitoring are considered. The calibration of instruments is discussed, and data on thermal neutron instruments and dose equivalent instruments are presented (W H K).

998 PROPER HALF VALUE THICKNESS OF ALPHA EMITTERS. Zderadicka, J., Ploch, J., Bucina, I. (Inst. for Research, Production, and Use of Radioisotopes, Prague). Radioisotopy; 11: No. 6, 997-1017 (1970). (In Czech).

In connection with the preparation of standards for the semiconductor spectroscopy of alpha particles attention was paid to half-value-thickness determination of standards. The calculation of the proper half-value thickness of standards, based on the theory of alpha-particle interaction with matter, was experimentally verified by means of a set of emitters, which were prepared by vacuum sublimation of high-purity americium dioxide on highly polished stainless steel plates. Comparison of these emitters with electrolytically prepared EA standards for semiconductor spectrometry showed that there is no substantial difference in the proper half-value thickness between emitters prepared by these two different methods. Correlation was found between self-absorption and alpha-particle deformation, this may be used for the determination of self-absorption corrections in the calibration of alpha-emitting radionuclides (auth)

999 PROPOSED ANSI STANDARD FOR THE SPECIFICATION OF PORTABLE X OR GAMMA RADIATION SURVEY INSTRUMENTS. ANSI N13.4 1970. New York; American National Standards Institute (1970). 11p.

A standard prescribing specifications for portable x or gamma radiation survey instruments is presented (W H K)

1000 TEST PROCEDURES FOR GERMANIUM GAMMA-RAY DETECTORS. IEEE Std 325 1971. New York; Institute of Electrical and Electronics Engineers, Inc. (1971). 19p.

A standard specifying test procedures for measuring germanium

detector characteristics, energy resolution, counting efficiency, and timing is presented. These test procedures are a supplement to the following documents: IEEE Std 300-1969, Test Procedures for Amplifiers and Preamplifiers for Semiconductor Radiation Detectors, (ANSI N42.1-1969) and IEEE Std 301-1969, Test Procedure for Amplifiers and Preamplifiers for Semiconductor Radiation Detectors, (ANSI N42.2-1969) (W H K)

1001 PERFORMANCE SPECIFICATIONS FOR DIRECT READING AND INDIRECT READING POCKET DOSIMETERS FOR X- AND GAMMA RADIATION. ANSI N13.5 1970. New York; American National Standards Institute (1970). 10p.

Performance characteristics of direct and indirect reading pocket ionization dosimeters are defined. These recommendations apply to pocket dosimeters for dosimetry of x or gamma radiation with energies from 30 keV to 3 MeV (W H K)

1002 (RDT-C-15-6-T(7-71)) LOGARITHMIC MEAN SQUARE VOLTAGE (MSV) INTERMEDIATE RANGE NEUTRON FLUX MONITORING SYSTEM. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1971. 116p. LMEC

This standard presents the requirements for the design, performance, fabrication, and testing of a Logarithmic Mean Square Voltage (MSV) Intermediate Range Neutron Flux Monitoring System covering the neutron flux range from $\sim 8 \times 10^3$ to $\sim 2 \times 10^{10}$ nv. The gamma discrimination ratio of the system shall be greater than 4.5 R/h /nv thereby allowing the detector to operate in gamma fluxes of 2×10^6 R/hr at neutron fluxes above approximately 3×10^6 nv. The lowest measurable neutron flux of 8×10^3 nv shall be limited by the allowable alpha plus preamplifier noise signal. The system shall consist of a logarithmic mean square voltage intermediate range electronic chassis, a cabinet enclosure, an interconnecting cable assembly, a remote preamplifier assembly, a fission type neutron detector assembly, and electrostatic shields for the detector-cable and preamplifier assemblies. Buffers, comparators, and bistables will be included in the system as specified by the ordering data. The equipment and services furnished shall include all of the above hardware, the operation and maintenance manuals, the quality assurance documents, the test reports, and all the labor, materials and equipment necessary to design, manufacture, test and deliver the system and documents. The equipment shall be a part of a reactor plant protection system (PPS) and shall meet all of those criteria or requirements of RDT Standards RDT F 2-2T and RDT C 16-1T as set forth in this standard (auth)

1003 (RDT-C-15-7-T(7-71)) GAMMA COMPENSATED IONIZATION CHAMBER ASSEMBLY (FIXED ELECTRICAL COMPENSATION). (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1971. 46p. RSO

This standard presents the requirements for the design, performance, fabrication and testing of a gamma compensated ionization chamber assembly capable of detecting a thermal equivalent neutron flux over the range of $\sim 10^4$ to $\sim 10^{11}$ nv while simultaneously exposed to incident gamma fluxes of up to $\sim 2 \times 10^6$ R/hr. The detector assembly shall consist of a gamma compensated ionization chamber designed to operate with fixed electrical compensation and removable cables or optional integral cables and an optional electrostatic shield can and cable conduit. The equipment and services furnished shall include the complete detector assembly, the test reports, the quality assurance documents and all the labor, materials, equipment and facilities necessary to design, manufacture, test and deliver the detector assembly and documents. The detector assembly shall be part of a reactor plant protection system (PPS) and shall meet all those quality criteria of RDT Standards RDT F 2-2T and RDT C 16-1T as set forth in this standard (auth)

1004 (RDT-C-15-8-T(7-71)) DIRECT CURRENT POWER RANGE NEUTRON FLUX MONITORING SYSTEM. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1971. 92p. LMEC

This standard presents the requirements for the design, performance, fabrication, and testing of a Direct Current Power Range Neutron Flux Monitoring System covering the neutron flux range from $\sim 2 \times 10^4$ to $\sim 2 \times 10^{10}$ nv in the presence of gamma fluxes up to 2×10^6 R/hr. The system shall consist of a direct current power range electronic chassis, a cabinet enclosure, an interconnecting cable assembly, a gamma compensated ionization chamber or fission type neutron detector assembly and an electrostatic shield for the detector-cable assembly. Buffers, comparators, and bistables will be included in the system as specified by the ordering data. The equipment and services furnished shall include all of the above hardware, the operation and maintenance manuals, the quality assurance documents, the test

reports and all the labor materials and equipment necessary to design manufacture test and deliver the system and documents The equipment shall be a part of a reactor plant protection system (PPS) and shall meet all of those criteria or requirements of RDT Standards RDT F 2 2T and RDT C 16 1T as set forth in this standard (auth)

1005 (RDT-C-15-9-T(7-71)) MEAN SQUARE VOLTAGE (MSV) POWER RANGE NEUTRON FLUX MONITORING SYSTEM, (Division of Reactor Development and Technology (AEC), Washington D C) Jul 1971 115p LMEC.

This standard presents the requirements for the design performance fabrication and testing of a Mean Square Voltage (MSV) Power Range Neutron Flux Monitoring System covering the neutron flux range from $\sim 2 \times 10^7$ to $\sim 2 \times 10^{10}$ nv The gamma discrimination ratio of the system shall be greater than 4.5 R/hr/nv thereby allowing the detector to operate in gamma fluxes of 2×10^6 R/hr at neutron fluxes above approximately 3×10^6 nv The lowest measurable neutron flux of 8×10^3 nv shall be limited by the allowable alpha plus preamplifier noise signal The system shall consist of a mean square voltage power range electronic chassis a cabinet enclosure an interconnecting cable assembly a remote preamplifier assembly a fission type neutron detector assembly and electrostatic shields for the detector-cable and preamplifier assemblies Buffers comparators and bistables will be included in the system as specified by the ordering data The equipment and services furnished shall include all of the above hardware the operation and maintenance manuals the quality assurance documents, the test reports and all the labor materials and equipment necessary to design manufacture test and deliver the system and documents The equipment shall be a part of a reactor plant protection system (PPS) and shall meet all of those criteria or requirements of RDT Standards RDT F 2-2T and RDT C 16-1T as set forth in this standard (auth)

1006 (RDT-C-15-10-T(7-71)) LOGARITHMIC COUNT RATE SOURCE RANGE NEUTRON FLUX MONITORING SYSTEM (Division of Reactor Development and Technology (AEC), Washington D C) Jul 1971 103p LMIC

This standard presents the requirements for the design performance fabrication and testing of a Logarithmic Count Rate Source Range Neutron Flux Monitoring System covering the neutron flux range from $\sim 2 \times 10^9$ to $\sim 2 \times 10^{10}$ nv while the detector is in the presence of gamma fluxes up to 2×10^6 R/hr The system shall consist of a logarithmic count rate source range electronic chassis a cabinet enclosure an interconnecting cable assembly a remote preamplifier assembly a fission type neutron detector assembly and electrostatic shields for the detector cable and preamplifier assemblies Buffers comparators and bistables will be included in the system as specified by the ordering data The equipment and services furnished shall include all of the above hardware the operation and maintenance manuals the quality assurance documents the test reports and all the labor materials and equipment necessary to design manufacture test and deliver the system and documents The equipment shall be a part of a reactor plant protection system (PPS) and shall meet all of those criteria or requirements of RDT Standards RDT F 2-2T and RDT C 16 1T as set forth in this standard (auth)

1007 (RDT-F-3-39-T(8-71)) TESTING OF HIGH TEMPERATURE CABLE FOR NUCLEAR DETECTORS, (Division of Reactor Development and Technology (AEC), Washington, D. C.), Aug 1971, 32p, RSO.

This standard expressly relates to the methods procedures and reporting formats for testing of high temperature cable for nuclear detectors For the purposes of this standard high temperature shall mean up to 1600 °F The phrase Cable for Nuclear Detectors shall mean for reactor service with nuclear detectors such as counters ionization chambers self powered and other similar devices operated in pulse statistical current or direct current modes The end seals and connectors where integral shall be considered as part of the cable As presently written this standard related only to the electrical characteristics of the cable The standard may later be expanded to include other related testing such as radiation tolerance electro magnetic interference susceptibility mechanical characteristics insulation compaction etc (auth)

1008 (RDT-C-7-15-T(1-72)) THERMOCOUPLE CONNECTORS AND THERMOCOUPLE CONNECTOR PANELS (Division of Reactor Development and Technology (AEC) Washington, D C) Jan 1972 8p RSO

A standard prescribing requirements for line-to-line thermocouple connectors and assemblies of one or more connectors mounted on a panel forming a rigid mount to line connection is given (W H K)

1009 (RDT-C-10-1-T(11-71)) THERMOCOUPLE SIGNAL TRANSMITTER (Division of Reactor Development and Technology (AEC) Washington D. C.) Nov 1971 17p. RSO

This standard establishes the requirements for design manufacture testing and quality assurance of thermocouple signal transmitters and related services and equipment Sensor signal transmitters convert dc millivolt signals from thermocouples into higher level standardized signals for transmitting to other equipment at locations which are remote from the transmitter (auth)

1010 (RDT-C-10-2-T(11-71)) PERMANENT MAGNET FLOWMETER SIGNAL TRANSMITTER (Division of Reactor Development and Technology (AEC) Washington, D C) Nov 1971 15p RSO

This standard establishes the requirements for design manufacture testing and quality assurance of permanent magnet flow meter signal transmitters and related services and equipment Sensor signal transmitters convert dc millivolt signals from permanent magnet flowmeters into higher level standardized signals for transmitting to other equipment at locations which are remote from the transmitter (auth)

1011 (RDT-C-10-4-T(10-71)) SIGNAL SUMMER (Division of Reactor Development and Technology (AEC) Washington, D C) Oct 1971, 15p RSO

This standard establishes the requirements for design manufacture testing and quality assurance of signal summers and related services and equipment Signal summers receive two or more signals as inputs and provide an output signal proportional to the sum of the inputs (auth)

1012 CALORIMETER FOR STANDARD ENERGY DOSE MEASUREMENTS AND DETERMINATION OF THE AVERAGE ENERGY EXPENDED IN AIR TO FORM ONE ION PAIR, Engelke, B. A Hohlfield K PTB Mitt., 81 No. 5, 336-42 (Oct 1971). (In German).

A quasi adiabatic calorimeter designated for standard measurements of the absorbed dose produced in graphite by photons with energies $E > 0.5$ MeV is described in detail In the dose range above 0.5 J/kg (50 rads) the accuracy is better than 1 Temperature drift rates can be reduced below 10^{-6} K/min By calorimetric measurement of the absorbed dose and measurement of the ionization per unit mass of air under the same conditions the average energy W_{air} expended in air to form one ion pair was determined to be $W_{air} = (33.72 \pm 0.51)$ eV for gamma radiation of ^{137}Cs (auth)

1013 RADIATION-INSENSITIVE VOLTAGE STANDARD MFANS Iesk Israel Arnold (to Motorola Inc) US Patent 3 617 829 2 Nov 1971 Filed 1 Dec 1969

A diode which is used as the forward biased element of a pair of series-connected diodes comprising a zero temperature coefficient voltage standard means is hardened against irradiation by neutrons The diode can take one of several forms These forms include diodes having thin bases and high recombination surfaces, transistors each having a plurality of collectors, each shorted to the base thereof four layer semiconductor elements in which the middle two layers are very thin In each case the excess number of minority carriers is kept constant for a given current through the forward-biased element, resulting in an unchanged voltage drop at a given current after neutron irradiation (auth)

1014 ^{212}Pb (ThB) AS A TIME CALIBRATION STANDARD FOR DELAYED COINCIDENCE MEASUREMENTS Vaelivaara K G Marelus A (Lppsala Univ) Phys Scr 3 No 3-4 111-12 (1971)

Half lives of some excited states in decay products of ThB (^{212}Pb) have been measured by the delayed coincidence technique For ^{212}Pb the results are $3.135 \text{ keV level } 26 \pm 26 \text{ ps}$ $3.475 \text{ keV level } 4 \pm 3 \text{ ps}$ $3.961 \text{ keV level } 13 \text{ ps}$ For ^{212}Bi the results are $2.38 \text{ keV level } 5 \text{ ps}$ $41.5 \text{ keV level } 10 \text{ ps}$ $115 \text{ keV level } (8 \pm 4) \text{ ps}$ The use of ^{137}Ba and ^{137}La as time calibration standards is discussed (auth)

1015 (RDT C 7-16-T(1-72)) THERMOCOUPLE ASSEMBLIES, MAGNESIUM-OXIDE INSULATED, STAINLESS STEEL SHEATHED, (Division of Reactor Development and Technology (AEC), Washington, D. C.), Jan 1972, 18p. RSO.

A standard is presented for the fabrication of thermocouple assemblies consisting of lengths of stainless steel sheathed magnesium oxide insulated thermocouple material terminated at the measuring junction end with a measuring junction inside a welded closure and at the reference junction end with a moisture seal and an optional thermocouple connector The assemblies are

intended for general use in nuclear installations, but are not of sufficient quality to be used in reactor core systems (W H K)

1016 (RDT-C-11-2-T(1-72)) PYROMETER, HIGH SENSITIVITY, INDICATING AND CONTROLLING. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jan 1972. 6p. RSO.

A standard prescribing requirements for a high sensitivity, indicating and controlling millivoltmeter-pyrometer is presented. (W H K)

1017 (RDT-C-16-3-T(10-71)) PPS BUFFERS (Division of Reactor Development and Technology (AEC), Washington, D. C.). Oct 1971. 16p. RSO

A standard prescribing requirements for plant protection instrument buffers for nuclear and associated applications is presented (J R D)

1018 (RDT-M-3-20-T(1-72)) POLYETHYLENE INSTRUMENT TUBING. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jan 1972. 9p. RSO.

A standard prescribing requirements for polyethylene instrument tubing for nuclear and associated applications is presented. (J R D.)

1019 (RDT-C-8-6-T) HYDROGEN METER FOR SERVICE IN LIQUID SODIUM. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jan 1972. 30p. RSO.

The requirements are established for the design, materials, fabrication, quality assurance, examination, and acceptance testing of a hydrogen meter and auxiliary equipment for use in radioactive or nonradioactive liquid sodium service. The meter shall provide a continuous and accurate indication of the hydrogen impurity concentration over the range 0.03 to 10 ppm hydrogen in sodium at temperatures between 800 and 1000°F. The meter may also be used to rapidly monitor changes in hydrogen concentration, over the same concentration range, and, therefore, be used as a sensor for sodium-water reactions in LMFBF steam generators. (auth)

1020 (RDT-C-8-7-T) DIFFUSION CARBON METER FOR SERVICE IN LIQUID SODIUM. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jan 1972. 28p. RSO.

The requirements are established for the design, materials, fabrication, quality assurance, examination, and acceptance testing of a diffusion carbon meter and auxiliary equipment for service in radioactive and nonradioactive liquid sodium. The meter provides a continuous indication of the carbon level and changes in carbon level, through its range of sensitivity, to the chemical activity of carbon in sodium (auth)

1021 (RDT-C-8-8-T) SPECIMEN EQUILIBRATION DEVICE FOR THE ANALYSIS OF NONMETALS IN LIQUID SODIUM. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jan 1972. 26p. RSO.

The requirements are established for the design, materials, fabrication, quality assurance, examination, and acceptance testing of an equilibration device and auxiliary equipment for service in radioactive or nonradioactive liquid sodium. The device can be used alone as a step in the analysis for nonmetallic impurities in sodium, or it can be used, for calibration, in parallel with meters monitoring the activities in sodium of oxygen, hydrogen, and carbon (auth)

1022 (RDT-C-8-5-T) ELECTROCHEMICAL OXYGEN METER FOR SERVICE IN LIQUID SODIUM. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jan 1972. 39p. RSO.

The requirements are established for the design, materials, fabrication, quality assurance, examination, and acceptance testing of an electrochemical oxygen meter and auxiliary equipment for use in radioactive or nonradioactive liquid sodium service. The meter shall provide a continuous indication of the oxygen impurity concentration over the range 0.5 to 20 ppm oxygen in sodium at temperatures between 700 and 800°F. Operation at higher temperatures results in reduced lifetimes of the electrochemical cell. (auth)

1023 (RDT-E-8-13T) OXYGEN-HYDROGEN METER MODULE FOR SERVICE IN LIQUID SODIUM. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jan 1972. 29p. RSO.

The requirements are established for the design, materials, fabrication, quality assurance, examination, and acceptance testing of an Oxygen-Hydrogen Meter Module (O-H Module) for use

in monitoring oxygen and/or hydrogen impurities in radioactive or nonradioactive sodium. The O-H Module includes one or two electrochemical oxygen meters and/or one hydrogen activity meter and the required sodium flow and temperature control accessories for operation of the meters. The Module will provide for proper operation of the oxygen and hydrogen meters for sodium sample temperatures from 400 to 1200°F at a sodium flow rate of 0.25 gpm (auth)

1024 (RDT-E-8-14-T) CARBON METER-EQUILIBRATION MODULE FOR SERVICE IN LIQUID SODIUM. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jan 1972. 29p. RSO.

The requirements are established for the design, materials, fabrication, quality assurance, examination, and acceptance testing of a carbon meter-specimen equilibration module (C-E Module) for use in (a) monitoring the chemical activity of carbon dissolved in radioactive or nonradioactive sodium, or (b) for calibrating meters that monitor the activities of nonmetallic impurities (O, H, C, N) in radioactive or nonradioactive sodium by establishing in metal specimens contents of these impurities that are in equilibrium with their activities in the sodium. The module includes one carbon meter or one equilibration device, it provides for proper operation of the meter or device for sodium sample temperatures in the range 400-1200°F, at a sodium flow rate of 0.1 gpm. (auth)

1025 (RDT-C-10-3-T(3-72)) MULTIPLE INPUT PRE-AMPLIFIER/DISCRIMINATOR FOR USE WITH NEUTRON COUNTERS (Division of Reactor Development and Technology (AEC) Washington, D. C.) Mar 1972. 18p. RSO.

Performance standards and testing procedures for multiple input preamplifier/discriminator for combining the signals of up to three neutron counting tubes are presented (W H K)

1026 DETERMINATION AT THE ILL TWO PROPOSALS FOR OBTAINING A UNIFORM CALCULABLE MAGNETIC FIELD FOR AN ATOMIC STANDARD OF CURRENT Hara, Ko, Nakamura, Hisao (Electrotechnical Lab, Tokyo) Nat Bur Stand (U S), Spec Publ, No 343, 123-30 (Aug 1971)

From International conference on precision measurement and fundamental constants, Gaithersburg, Md (3 Aug 1970)

Two methods for obtaining improved calculable magnetic fields for low field μ_p determinations are discussed. In the first, a single layer solenoid of proper proportion is modified to a solenoid of fourth order uniformity, without any correction coil for uniformity. In the second, a solenoid is confined in a box of high μ material. This gives a calculable uniform field because of imaging effects. A practical arrangement is given for use when μ is not extremely high. In this method, isolation from external fields is achieved (auth)

1027 (CEA-CONF-1952) PRODUCTION OF REFERENCE STANDARDS FOR POLLUTANTS AT VERY LOW LEVELS, APPLICATION TO CALIBRATION OF DETECTION EQUIPMENT FOR TRACES OF GASEOUS FLUORIDE PRODUCTS IN AIR. Perihon, P., Chevallier, J. (Commissariat a l'Energie Atomique, Grenoble (France), Centre d'Etudes Nucleaires), [nd], 19p. (In French). (CONF-711133-3). Dep. NTIS (U. S. Sales Only).

From Conference on antipollution techniques; Grenoble, France (6 Nov 1971).

1028 EFFICIENCY TESTING OF AIR-CLEANING SYSTEMS CONTAINING DEVICES FOR REMOVAL OF PARTICLES. ANSI N101.1-1972. New York; American National Standards Institute, Inc. (1972). 21p.

A standard is presented which provides a method for measuring the particle removal efficiency of a system containing one or more particulate air-cleaning devices by means of an in-place test. The installed air-cleaning device, or devices when more than one is used in a system, is confronted with an aerosol of DOP of proper particle size. The concentration of the aerosol is measured before and after the device by means of light-scattering, photometric techniques, and the overall filtration efficiency is then calculated from the two concentration values. A standard test method is described to provide a uniform basis for assessing the filtration efficiency of a system containing one or more particulate air-cleaning devices. It is the purpose of the in-place test to determine the efficiency of the system in such a manner that any penetration of the test aerosol through the devices, or leakage of the test aerosol around the devices, is included in the results. This standard does not specify performance criteria for the purpose of evaluating systems for specific service conditions. (auth)

1029 FILM BADGE PERFORMANCE CRITERIA. New York; American National Standards Institute ((1970)). 16p.

A set of minimum performance criteria for film badges is given

for exposure under specified conditions to beta neutron photon and mixed radiation fields. Because performance criteria are intimately connected with the methods of testing, a testing procedure is described. Since it is the intention in this standard to consider the performance of film badge dosimetry under the most reproducible conditions, uncertainties introduced by scattering unspecified radiation sources, and nonuniform irradiations are eliminated from the prescribed procedures insofar as possible. The problems related to the use of film badges for personal dosimetry therefore are not considered in this standard. Some "principles of good practice" in film badge dosimetry are included (3 tables) (R W R)

1030 NUCLEAR INSTRUMENT STANDARDS Cook, H L Jr (Ohmart Corp., Cincinnati) Advan Instrum., 25 Pt 2 664 1-5(1970)

From 25th annual conference of the Instrument Society of America, Philadelphia, Pa (26 Oct 1970)

The organizations that write standards that apply to industrial instruments which utilize nuclear or x radiation are reviewed. Organizations active at the present time are ANSI, USAEC, USDOT, ISO, IEC and IAEA. The N42 and N43 committees of ANSI are the most active groups in the US. N43 has written two standards—one on particle accelerators and one on sealed sources—and is actively engaged in writing several others. N42 is serving as the liaison group with the IEC for standards on gage performance (W H K)

1031 (RDT-C-15-4-T(2-72)) SELF-POWERED COBALT-EMITTER NEUTRON DETECTOR. (Division of Reactor Development and Technology (AEC) Washington, D. C.). Feb 1972. 18p. RSO

The requirements for self-powered cobalt emitter neutron detectors for use in core in PWR facilities where the thermal neutron to-gamma (n/γ) ratio is 10^5 n/cm²/sec/R/hr or higher are defined. The standard is written for a detector n/γ signal ratio of 4/1 minimum (auth)

1032 PREPARING UPGD-1 CHECKING EQUIPMENT FOR CERTIFICATION. Artemov, E L., Garapov, E. F., Korshikov, A. V., Klinov, V. V. Meas. Tech. (USSR) (Engl. Transl.), 14 No. 9, 1423-6(Sep 1971).

Translated from Izmer. Tekh., 14 No. 9, 86-8(Sep 1971). The design and specification of collimated standard gamma sources for calibrating dosimetric instruments and for calibrating gamma sources are presented (W H D)

1033 NATIONAL PRIMARY STANDARD FOR THERMAL NEUTRONS Capgras, A (CEN de Saclay, Gif-sur-Yvette, France) Bull Inform Sci Tech (Paris), No 163, 43-7(Oct 1971) (In French)

A primary standard thermal neutron source below the Cd cut off has recently been redefined. It is based on a classical idea the sigma pile involving a single 10^6 n/s 4π intensity Am-Be source in a graphite block, the entire assembly being maintained at a constant temperature of $22 \pm 0.5^\circ\text{C}$. An attempt was made to minimize the correction terms, and to optimize the flux detection measurements. At the reference point $n_{th}V_0 = 3.25 \cdot 10^4 \text{ ns}^{-1} \text{ cm}^2 \pm 1.5\%$ the epithermal flux being about 0.5% of the thermal density (France)

1034 SECONDARY STANDARDS Le Gallic, Y., Thenard, M (CEN de Saclay, Gif-sur-Yvette, France) Bull Inform Sci Tech (Paris), No 163, 53-9(Oct 1971) (In French)

The users of radionuclides require reference standards having well defined activities, fluences and exposure rates. Problems encountered throughout the entire production process are discussed in particular, preparation, radioactive purity determination, activity measurements and accuracy. The uses of these standards in the calibration of 4π γ ionization chambers, low-activity detectors, liquid scintillator spectrometers, γ spectrometers, and radioprotection detectors are outlined (France)

1035 (RDT-E-1-25-T(4-72)) INSTRUMENT VALVES. (Division of Reactor Development and Technology (AEC), Washington D. C.) Apr 1972. 15p. RSO.

This standard covers forged-body manually operated globe valves (1" and smaller) for applications in a nuclear energy system. The other documents that are a part of this standard are listed. Technical requirements, quality assurance requirements, preparation for delivery, and ordering data are included (R W R)

1036 PRIMARY STANDARD PHOTON BEAMS Guibo, J P (CEN de Saclay, Gif-sur-Yvette, France) Bull Inform Sci Tech (Paris), No 163, 33-41(Oct 1971) (In French)

In photon dosimetry it is absolutely necessary to have a coherent system of reference that can be interrelated with national and international intercomparisons, the calibration of secondary standards, and studies and comparisons using different measurement techniques. Beams of suitable energy have been chosen as calibration standards, each of these beams being identified by all the dosimetric parameters characterizing the radiation field. Three beams with different energies have been chosen: ^{241}Am , ^{137}Cs , and ^{60}Co . The beams are characterized by the exposure rate and the energy fluence. The methods used are described, and a critical analysis of the various correction factors is made. The overall accuracy obtained in defining the beam exposure rates varies between 1.1 and 1.4% (France)

1037 CALIBRATION BY COMPARISON WITH PRIMARY STANDARD ACTIVITIES Legrand, J., Perolat, J. P (CEN de Saclay, Gif-sur-Yvette, France) Bull Inform Sci Tech (Paris), No 163, 29-32(Oct 1971) (In French)

The requirement of high-quality secondary standards necessitates comparisons with primary standards (^{241}Am and ^{90}Sr) preferably by nondestructive methods. Calorimetry is the only possible non-destructive technique for pure α and β emitters. In the case of γ emitters, γ spectrometry using Ge(Li) detectors has already been used for indirect absolute measurements of certain complex radionuclide decay schemes. The calibration of such a spectrometer, using one or more multiple wavelength emission primary standards might permit this instrument to be used as a secondary standard in the future. Equipment facilitating the production of multiples or submultiples of the ^{241}Am and ^{90}Sr primary standards by comparison techniques, is described. In order to utilize the methods described, improvements are needed in the fields of calorimetry and the knowledge of decay scheme parameters (mean energies, % γ emissions, etc.) (France)

1038 ABSOLUTE CALIBRATION OF THE BARC THERMAL NEUTRON FLUX STANDARD USING MANGANESE-NICKEL ALLOY Sharma, D., Shahani, M. G (Bhabha Atomic Research Centre, Trombay, India). pp 217-27 of Proceedings of the National Symposium on Radiation Physics Bombay, Bhabha Atomic Research Centre (1971)

From National symposium on radiation physics, Bombay, India (24 Nov 1970). See CONF-701138

The thermal neutron flux density standard maintained at Trombay was absolutely measured in terms of the thermal neutron absorption cross-section of ^{55}Mn by using manganese-nickel alloy foils. A beta-gamma coincidence technique is used for determining ^{55}Mn activity. The value of the flux density obtained is in good agreement with the previous value which was obtained by using thin gold foils. The relevant correction factors and relative accuracies of the manganese and gold measurements are also discussed (auth)

1039 CONSIDERATIONS IN ESTABLISHING A STANDARD FOR NEUTRON DISPLACEMENT ENERGY EFFECTS IN SEMICONDUCTORS Conrad, Edward E (Harry Diamond Labs., Washington, D. C.) IEEE (Inst Elec Electron Eng.), Trans Nucl Sci; NS-18 No 6, 200-5(Dec 1971)

From Annual conference on nuclear and space radiation effects, Durham, N. H. (20 Jul 1971). See CONF-710709

Over the past several years a number of semiempirical or theoretical curves have been generated to represent the neutron-induced displacement effects in silicon as a function of neutron energy. Since the mode of failure for most silicon semiconductor devices is a loss of gain and this is, in turn, proportional to the reduction in carrier lifetime, the same curves are used to express both the neutron energy damage effectiveness for devices as well as the degradation of lifetime. A useful feature of such a curve is that the damage produced in a semiconductor by a neutron fluence of a given energy spectrum may be predicted by folding the spectral information together with the damage curve. Once this is done, the damage may be expressed as that resulting from an equivalent monoenergetic neutron source (the monoenergetic equivalent). This procedure enables the results of an exposure to a source of one spectrum to be used to predict the effects of a different one. In order for this technique to be useful as a means of communication there must be some standardization of the damage curve, the neutron energy to which the damage is referred and the description of the spectrum. Recent interest, throughout the radiation effects community, in establishing such a standard has prompted several proposals each of which contains some shortcomings. The various deficiencies and merits are compared and what constitutes a minimum set of requirements for standardization is decided. These requirements are based upon the state of the art in neutron dosimetry, current understanding of the physics of initial displacement effects, the formation of stable damage, the kinetics of annealing, how these concepts relate to the macroscopic properties of devices and practicability (auth)

1040 (NP-19392) BILNIAL REPORT, 1969-71 (National Standards Lab Sydney (Australia) Div. of Applied Physics. National Standards Lab., Sydney (Australia) Div. of Physics). 1971 92p Dep NTIS (U S Sales Only).

Maintenance of standards of measurement in the fields of thermometry, photometry and radiometry, viscometry and hygrometry as well as the standards of length, mass, time interval and associated quantities, electrical quantities and optical quantities is described. Development and progress in research in solar physics, molecular physics, airglow and aurora, and theoretical astrophysics are reviewed (Australia)

1041 (RDT-C-12-1-T(5-72)) GAS CHROMATOGRAPH SYSTEM FOR SODIUM COVER GAS SERVICE. (Division of Reactor Development and Technology (AEC), Washington, D. C.). May 1972 16p. RSO

The standard establishes the requirements for the design, materials, quality assurance, fabrication, examination, acceptance testing and delivery of a gas chromatograph system (including analyzer section and control and readout section) for the continuous on-line measurement of trace impurities in the inert gas used as a cover for liquid sodium. The cover gas sample delivered to the gas chromatograph system shall not exceed 1 ppM of sodium vapor (auth)

1042 (RDT-C-14-3-T(7-72)) GAMMA-RAY SPECTROMETER-COMPUTER SYSTEM. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Jul 1972. 24p.

A standard specifying the requirements for the design performance, fabrication, quality assurance, examination and acceptance testing of a gamma ray spectrometer-computer system subsystems and components for monitoring radioactivity is given. The system will have the capability of monitoring several radioactive gas streams including the reactor primary cover gas gas from a sodium sparging unit and other fluids (W H K)

1043 (RDT-C-17-4-T(2-72)) GENERAL INSTRUMENTATION (Division of Reactor Development and Technology (AEC), Washington, D. C.). Feb 1972. 47p. RSO.

The general requirements are presented for design, manufacture and testing of instrumentation equipment and related services. This instrumentation, referred to as "equipment" comprises complete readout equipment, wiring internal and external to cabinets, and racks and power supplies necessary to furnish the required electrical power for equipment from a standard power source (auth)

1044 CONSTRUCTION AND CALIBRATION OF A STANDARD THERMAL NEUTRON FLUX FACILITY. Ryves T. B. (National Physical Lab Teddington Eng.). J. Inst Nucl. Eng : 13 No. 3, 74-7(1972)

A thermal neutron flux density standard in excess of $10 \text{ n cm}^{-2} \text{ s}^{-1}$ was produced with high stability and a very small flux gradient at the irradiation position. The standard thermal neutron flux was produced from sources of first neutrons consisting of beryllium targets bombarded by a 1.3-MeV deuteron beam from the Van de Graaff accelerator mounted in a large graphite block. The standard thermal neutron flux density was measured by activation of beryllium and cerium covered thin gold foils. Activation was interpreted by means of the Westcott (1953) method using renormalized expressions for the epithermal flux density to fit the assumed epithermal spectrum. The 2200 ms^{-1} activation neutron capture cross section of about 30 other isotopes were measured relative to gold in the facility. Most accurately measured were ^{241}Am , ^{243}Am , ^{244}Am and ^{245}Am with random plus systematic errors of 1 to 2%. The main experimental difficulty was in determining the absolute foil activities. Where possible coincidence counting was used (UK)

1045 (RDT-C-15-11-T(8-72)) BF_3 GAMMA TOLERANT NEUTRON DETECTOR TUBES. (Division of Reactor Development and Technology (AEC), Washington, D. C.). Aug 1972. 19p. RSO.

This tentative standard describes the requirements for a high-gamma-tolerant, BF_3 -filled proportional counter for use in neutron detection systems requiring operation in gamma flux environments to 10^5 R/h . Specifically, this detector will be used to detect thermal neutrons in a neutron monitoring system and will be installed in the vicinity of primary sodium piping system. This standard applied only to the detector. Required performance characteristics are given in detail, and the tests to assure this performance are described. Six test report certificates are included in the appendix (1 table) (R W R)

1046 HUMAN ENGINEERING STANDARDS FOR HEALTH PHYSICS INSTRUMENTATION. Erickson, G. L. (Douglas

United Nuclear, Inc., Richland, Wash.) pp 257-70 of Radiation Protection Standards Quo Vadis Vol II. Howell, Wallace P. (ed.) Richland, Wash., Health Physics Society (1972)

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971)

The pressing need for developing improved health physics instrumentation over the past 25 years has been greatly assisted by technological advances in instrument components. However, while measurement capability has improved significantly, the human engineering elements have not. Health physicists have complained loudly that instruments are bulky, too sensitive to environmental influences, hard to decontaminate and do not operate effectively under the adverse conditions they sometimes are subjected to. The instrument-developer on the other hand, responds, some times quietly, what do you want? If the questions and answers are properly pursued, the needed elements of human engineering emerge and are built into the instrument. If not, partly useful instruments may remain in service or be discarded while people "get along with the 'old stuff'". This paper identifies some of the human engineering elements, points out how they are applied in radioactive environments and suggests that human engineering standards be developed (4 figures) (auth)

1047 CRITIQUE OF STANDARD TESTING METHODS FOR PERSONNEL DOSIMETRIC DEVICES. Pittingrud, H. V., Love, P. E. (Radiological Health Lab., Wright-Patterson AFB, Ohio) pp 271-81 of Radiation Protection Standards Quo Vadis Vol. II Howell, Wallace P. (ed.) Richland, Wash., Health Physics Society (1972)

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971).

Commonly recommended procedures for evaluating ionizing radiation responses of personnel radiation dosimetric devices or systems are usually centered around measuring responses of the devices with the incident radiation beam oriented to some favored surface of the dosimetric device. Included in this presentation are comments concerning the utility of this approach to dosimeter testing based on experience of the authors in evaluating angular and energy responses of several personnel dosimetric devices including several types of pocket ion chamber dosimeters, a film badge dosimeter system, thermoluminescent dosimeter (TLD) badge systems, and a neutron TLD badge system (3 figures) (auth)

1048 MANUFACTURER'S VIEWS ON INSTRUMENT STANDARDS. Bellian, Joseph G. (Victoreen Instrument Div., Cleveland). pp 282-5 of Radiation Protection Standards Quo Vadis Vol. II. /Howell, Wallace P. (ed.) Richland, Wash., Health Physics Society (1972).

From 6th annual topical symposium on radiation protection standards quo vadis; Richland, Wash. (2 Nov 1971).

Instrument standards are needed by both manufacturers and users. There are definite advantages and some disadvantages to the user and manufacturer. Action should be taken to insure that standards do not create unnecessary problems. Proper procedures in developing standards and accurate methods of writing standards must be derived. In addition, realistic limits should be placed on organization with the authority to write standards. A proliferation of standards by several organizations will definitely reduce the effectiveness of all standards. In conclusion, what standards would the instrument manufacturers like to see written, if any? (auth)

1049 (EUR-4807) MANUFACTURING SPECIFICATION FOR HIGH TEMPERATURE THERMOCOUPLES FOR USE IN NUCLEAR IRRADIATION EXPERIMENTS. Mason, F. (European Atomic Energy Community, Petten (Netherlands) Joint Nuclear Research Center) 1972 42p Dep NTIS (U S Sales Only) EUR B, Fr 50 -

This specification details the requirements for materials of construction, methods of manufacture, test procedures, certification, and packing, together with acceptable standards of ancillary processes, which are to be employed in the production of high-temperature mineral-insulated thermocouple units for irradiation experiments (8 figures, 10 tables) (auth)

1050 METHOD OF STANDARD SPECTRUM FITTING FOR THE ANALYSIS OF GAMMA-RAY SPECTRA FROM SEMICONDUCTOR DETECTORS. Tasaka, Kanji. (Japan Atomic Energy Research Inst., Tokai). J Nucl. Sci. Technol. (Tokyo); 9. No. 7, 430-2(Jul 1972).

A method is described which makes use of a standard spectrum representing a single photopeak to serve as the shape function. The method expresses the line shape accurately and simply, requires only a small number of fitting parameters, and permits the analysis of several overlapping peaks by adjusting the width of the standard spectrum through the method of least squares.

The fitting function and the method of setting the initial values of the fitting parameters, the principal problems encountered in the analysis of γ -ray spectra, are discussed. It is concluded that complicated gamma spectra with multiple photopeaks can be fitted accurately to a composite curve made up of superimposed peaks modeled on a standard spectrum and combined with the linear background continuum by using the least-squares method. The procedure described can also be applied to the fitting of spectra that cannot be expressed by an analytical function. (2 figures) (R.W.R.)

1051 EXTENSION OF THE RANGE OF GAMMA MEASUREMENTS OF THE FARMER SECONDARY STANDARD DOSIMETER Dardenne, J. C.; Wambersie, A. (Inst. du Cancer, Louvain, Belgium). *J. Beige Radiol.* 55 No. 3, 361-4(1972). (In French).

The range of 0 to 60 R for the old models can be extended to about 0 to 600 R by the simple addition of a condenser. The technical precautions to be taken to perform this modification are described (auth)

1052 NATIONAL PHYSICAL LABORATORY SECONDARY STANDARD THERAPY-LEVEL X-RAY EXPOSURE METER. Kemp L. A. W. (National Physical Lab. Teddington Eng.). *Brit. J. Radiol.* 45 No. 538, 775-8(Oct 1972).

A preliminary outline account is given of the development of a secondary standard exposure meter around which a calibration service could be planned from the National Physical Laboratory. The arrangement of the ionization chamber, measuring circuit and ^{90}Sr stability check source is briefly described, and tabulated

calibration factors (R/coulomb) are presented for the N P L chamber over a 2 year study (UK)

1053 METHOD FOR PRODUCING STANDARD γ AND β - γ ACTIVE SOURCES IN EPOXY RESIN FOR THE CALIBRATION OF SCINTILLATION COUNTERS Chylinski, Andrzej, Gryglas, Hanna (Inst. of Nuclear Research, Swierk, Poland) *Nukleonika*, 17 No. 2-3, 199-203(1972). (In Polish)

Radioactive ^{137}Cs , ^{60}Co , and $^{90}\text{Sr} + ^{90}\text{Y}$ sources were prepared by introducing the chlorides of these isotopes into an epoxy resin. The optimum specific activity was found to lie between 100 and 300 $\mu\text{Ci/g}$. The required polymerization conditions were determined. The sources thus prepared had precise geometric dimensions, a good thermal stability up to 70°C and were chemically inert, they functioned better than liquid sources. One of their most important characteristics was the uniform distribution of the radioactive material throughout the mass of the source. The source intensity was found to be accurate within 1% (TTT)

1054 CHANGE OF GAMMA-RAY EXPOSURE-RATE STANDARDS BY THE NATIONAL BUREAU OF STANDARDS. Loevinger R. (National Bureau of Standards, Washington, D. C.). *Phys. Med. Biol.* 17 No. 5 665(Sep 1972).

A brief announcement by the U S National Bureau of Standards is made to the effect that after 1 May 1972, all calibrations of instruments for ^{60}Co and ^{137}Cs γ rays will be carried out with reference to exposure-rate standards that are 0.7% lower and 0.6% lower, respectively, than those used previously (UK)

RADIATION AND RADIATION PROTECTION

1055 PRINCIPAL PROVISIONS, REQUIREMENTS AND STANDARDS OF THE NEW REGULATIONS FOR TRANSPORTATION OF RADIOACTIVE SUBSTANCES P I Moiseitsev Med Radiol, 6 No 9, 3-5 (Sept 1961) (In Russian)

1056 (DC-58-9-84(p 1-13)) COMMENTS ON THE PROBLEM OF THE NEW DEFINITION FOR THE UNITS OF X AND GAMMA-RADIATIONS AND RADIOACTIVITY M I Yudin Translated from Izmeritel'naya Tekhn, No 1, 31-3 (1956)

An analysis of various roentgen definitions is presented along with recommendations that this unit be regarded as a unit of x and gamma radiation defined as a dose in air at which ions are being formed with a total charge of 1 esu of electricity per 0.001293 gm. A roentgen sec is the dose rate in air at which the dose evenly increases by 1 roentgen in 1 sec. (J R D)

1057 (DC-58-9-84(p 14-16)) ON THE DEFINITION OF THE ROENTGEN P M Ikhodcev (Ikhodcev) Translated from Izmeritel'naya Tekhn, No 1, 10-11 (1956)
A review and analysis of Comments on the Problem of the New Definition for Units of X and Gamma Radiations and Radioactivity (DC-58-9-84(p 1-13)) is presented. (J R D)

1058 (DC-58-9-84(p 17-22)) ON THE SHORTCOMINGS OF THE NEW DEFINITION OF THE ROENTGEN V I Ivanov Translated from Izmeritel'naya Tekhn, No 1, 16-18 (1956)

In an analysis of the definition of the roentgen it is noted that the conditions of absorbed energy transformation are not stipulated. Other defects in the definition are analyzed and it is concluded that the definition is impracticable for very hard radiation dose assessment and that correction factors should be introduced in determining tissue doses for very soft rays. (J R D)

1059 (DC-58-9-84(p 23-27)) MORAL OF THE PROBLEM OF ROENTGEN DEFINITION M F Yudin Translated from Izmeritel'naya Tekhn, No 1, 18-19 (1956)

A further substantiation is presented of the proposal found in Comments on the Problem of the New Definition for the Units of X- and Gamma-Radiations and Radioactivity (DC-58-9-84(p 1-13)) that the roentgen can be applied for doses produced by radiation for which the average work of ionization can be estimated as equal to 33 eV. (J R D)

1060 (DC-58-9-84(p 28-38)) DEFINITION OF THE ROENTGEN IN CONNECTION WITH THIS UNIT'S APPLICATION FOR ALL IONIZING RADIATIONS I V Poroikov Translated from Izmeritel'naya Tekhn, No 1, 20-3 (1956)

Revision of the All-union State Standard for the roentgen is discussed. It is recommended that the roentgen be considered a unit of ionization and roentgen sec should be called increment of ionization instead of dose rate. (J R D)

1061 SAFETY AND HEALTH IS SAFER THAN SAFE? A S McLean (United Kingdom Atomic Energy Authority, [Harwell, Berks, Eng.]) J Brit Nuclear Energy Soc, 1, 93-7 (Apr 1962)

The standards now followed in radiological protection are based upon exceedingly pessimistic predictions of the possible effects of exposure at very low rates to small doses of ionizing radiation. There are no grounds for collective or individual concern about the immediate or long-term effects of exposure within the present permissible limits. No further reduction in these limits should therefore be contemplated in the absence of adequate biological justification. The effects of radiation in inducing leukemia is analyzed in order to prove the effectiveness of the current recommendations of safety limits. (N W R)

1062 SAFER THAN SAFE? Atom, No 68, 116-22 (June 1962)

Data are reviewed from studies on the biological effects of radiation on human populations. Radiological protection standards currently in use are discussed. It is concluded that the standards now followed in radiological protection are based upon exceedingly pessimistic predictions of the possible effects of exposure at very low rates to small doses of ionizing radiation and that no further reduction in these limits should be contemplated in the absence of adequate biological data. (C H)

1063 (JPRS-13691(p 13-19)) SANITARY-HYGIENIC REQUIREMENTS OF CENTERS AND STOREHOUSES OF RADIOACTIVE ISOTOPLS A V Terman and I P Korenkov Translated from Gigiena i Sanit, 27 No 2, 67-71 (1962)

An attempt was made to develop hygienic and safety standards for storehouses and shipping centers for radioisotopes. (M C G)

1064 (JPRS-14621) BASIC COMPULSORY SANITARY-PROPHYLACTIC STANDARDS NECESSARY FOR THE APPRAISAL OF ENVIRONMENT DURING THE WORK OF ACCELERATORS L V Kuznetsova Translated from p 62-7 of "Gigiena Truda pri Rabote na Nekotorykh Vidakh Uskornitel'nykh Ustanovok" Moscow, 1960 10p

Standards concerning maximum allowable radiation dosage in the USSR are presented. These values are primarily associated with accelerator environments. Other information is included on noise loudness and ozone concentration. (J R D)

1065 (DPR/INF/269) SAFER THAN SAFE A COMMENTARY ON STANDARDS OF RADIOLOGICAL PROTECTION A S McLean (United Kingdom Atomic Energy Authority, Health and Safety Branch, Radiological Protection Div, Harwell, Berks, Eng.) July 1962 9p

Data are summarized on the incidence of leukemia following radiation exposure. Standards of radiological pro-

tection are reviewed. The author concludes that the harm done by a few rems of exposure exists only in the minds of statisticians. The standards now followed in radiological protection are based upon exceedingly pessimistic predictions of the possible effects of exposure at very low rates to small doses of ionizing radiation. There are no grounds for collective or individual concern about the immediate or long-term effects of exposure within the present permissible limits. No further reduction in these limits should therefore be contemplated in the absence of adequate biological justification. (C.H.)

1066 (JPRS-14974(p 10-15)) **HYGIENIC STANDARDS FOR WORK WITH RADIOACTIVE SUBSTANCES IN PUBLIC HEALTH INSTITUTIONS**. L. (Ye.) I. Vorob'ev (Vorob'yev) and P. I. Moiseyev (Moiseyev). Translated from *Gigiena i Sanit.*, 27, No. 4, 56-60 (1962).

New safety standards for radiology departments and laboratories using radiation in the U.S.S.R. were approved in 1961. The standards are obligatory in the planning and construction of all new facilities as well as in remodeling and using those already in existence. The new standards are discussed. (C.H.)

1067 **AN EVALUATION OF RADIATION PROTECTION STANDARDS FOR INDIAN CONDITIONS**. K. Venkataraman, S. Somasundaram, and S. D. Soman (Atomic Energy Establishment, Trombay, India). Prepublication Copy. 13p.

Standards for protection against external and internal exposures to ionizing radiation recommended by the International Commission on Radiological Protection were tentatively adopted by Atomic Energy Establishment Trombay. Since no generally acceptable limits were prescribed for contamination of surfaces, attempts were made to develop such standards in the light of Indian conditions. This work has shown that in view of Indian food and eating habits, surface contamination limits will have to be much more rigorous than those used in establishments in UK and USA. Work was then undertaken to determine the characteristics of a normal Indian adult such as total body weight, weights of individual body organs, and daily water and air intake in order to compare these values with those of the ICRP Standard Man. From data obtained so far, it is indicated that maximum permissible body burden values may require a downward revision for some radionuclides by a factor of about 1.5 and that MPC_w values may have to be lowered by a factor of about 3. Further studies are in progress. (auth)

1068 (TID-16741) **SAFE DOSES AND DOSE-RATES AND THERAPEUTIC OR PROTECTIVE MEASURES**. Shields Warren (New England Deaconess Hospital, Cancer Research Inst., Boston). [Apr. 28, 1962]. Contract AT (30-1)-901. 7p.

The history of the development of standards for radiation safety is reviewed. The current rule of thumb for occupational exposure is that it shall not exceed 5 rems/yr times the number of years of age of the worker beyond 18. Those under 18 years of age are excluded from occupational exposure. This level is often considerably reduced in hospitals and atomic energy installations without sacrificing satisfactory operations. It is postulated that any radiation is harmful, and the benefit to be obtained by the useful aspects of ionizing radiation and its application to the needs of man must be weighed against the potentially harmful genetic and somatic effects. The exposure of populations throughout the world to various doses of natural background radiation and to fall-out radiation is discussed. It is pointed out that the leukemia rate in man began to rise rapidly in 1930 before there was any appreciable rise in environmental radiation, while the rate of bone sarcoma has been decreasing rapidly. No explanation of this has been presented except the improvement in diagnosis and treatment of bone sarcoma. It is emphasized that there is no remedy that can be practically used to

protect man against radiation, but that once radiation damage has been entailed, the acute damage can be modified to some extent by supportive treatment. The nature of fall-out and the role of shelters in protection of the population is discussed briefly. (C.H.)

1069 (TID-7635(p 122-4)) **DISCUSSION OF AEC TECHNICAL TRANSPORT PROBLEMS**. L. R. Rogers (Atomic Energy Commission, Washington, D.C.).

Present and proposed regulatory standards for the transport of radioactive materials are discussed. Emphasis is placed on proposed standards to be used by all federal agencies to amend and revise existing transport regulations. The Part 71 standard dealing with criticality safety in shipping fissile material and the proposed Part 72 standard for the regulation of shipping of irradiated fuel elements. (C.H.)

1070 **SANITATION RULES IN HANDLING RADIOACTIVE MATERIALS AND IONIZING RADIATION SOURCES**. p. 79-143 of "Sbornik Vazhneishikh Ofitsial'nykh Materialov po Voprosam Gigeny Truda i Proizvodstvennoi Sanitarii." Moscow, Medgiz, 1962.

Sanitation rules and standards are given for all laboratories and establishments handling or transporting radioactive materials. The regulations cover the general conditions and location of laboratories and installations, storage and transportation rules, dosimetric devices, ventilation, heating, plumbing, emergency measures, waste disposal, and personal hygiene and sanitation. Permissible doses for various radioisotopes and symptoms of radiation injuries are enumerated. Invoices and official forms are included. (R.V.J.)

1071 **TRANSPORTATION RULES FOR RADIOACTIVE MATERIALS**. p. 144-74 of "Sbornik Vazhneishikh Ofitsial'nykh Materialov po Voprosam Gigeny Truda i Proizvodstvennoi Sanitarii." Moscow, Medgiz, 1962.

Rules and regulations are given for packing and transporting radioactive materials. The classification of materials, containers, loading, and standards for various means of transportation are described. Permissible contamination and safety and warning signs are discussed. (R.V.J.)

1072 **RADIATION STANDARDS, INCLUDING FALL-OUT. SUMMARY-ANALYSIS OF HEARINGS HELD ON JUNE 4, 5, 6, AND 7, 1962, BEFORE THE SUBCOMMITTEE ON RESEARCH, DEVELOPMENT, AND RADIATION OF THE JOINT COMMITTEE ON ATOMIC ENERGY, CONGRESS OF THE UNITED STATES**. (United States Congress Joint Committee on Atomic Energy). Sept. 1962. 64p. (GPO).

The Subcommittee on Research, Development and Radiation of the Joint Committee on Atomic Energy, Congress of the United States, held hearings June 4 through 7, 1962, on radiation standards and fallout. Prospective witnesses and panel members from government, industry, universities and other affiliations were asked to prepare statements for these hearings and a similar cross section of individuals were requested to submit statements for the record. The major highlights of these hearings are summarized and their significance is discussed. (C.H.)

1073 **RADIATION STANDARDS, INCLUDING FALL-OUT. HEARINGS BEFORE THE SUBCOMMITTEE ON RESEARCH, DEVELOPMENT, AND RADIATION OF THE JOINT COMMITTEE ON ATOMIC ENERGY, CONGRESS OF THE UNITED STATES, EIGHTY-SEVENTH CONGRESS, SECOND SESSION, JUNE 4, 5, 6 AND 7, 1962. PART 1. PART 2, APPENDIX**. (United States Congress Joint Committee on Atomic Energy). 1962. 1040p. (GPO).

Hearings on radiation standards including fallout, were held before the subcommittee on Research, Development and Radiation of the Joint Committee on Atomic Energy of

the Congress of the United States on June 4 through 7 1962. A number of scientists presented information orally and in detailed written statements on various aspects of the subject. Information previously developed on fallout and radiation standards was updated. An attempt was made to identify and clarify the policy problems and organizational responsibilities associated with the establishment and administration of radiation standards. The somatic and genetic effects of man made radiation were reviewed from the standpoint of permissible levels of radiation exposure. Pertinent written statements are appended (C H)

1074 (COO-226(p 66 70)) MEASUREMENT OF Sr^{90} INTERLABORATORY AND INTERSTANDARD COMPARISONS. David R Atherton, Betsy J Stover, C W Mays and R J Della Rosa (Utah Univ Salt Lake City Coll of Medicine)

Measurements made on the same solutions of Sr^{90} by the AEC Project No 6 laboratory at Davis California and this laboratory yield values which for all practical purposes are identical. Comparison of standard solutions of Sr^{90} supplied by the U S National Bureau of Standards and the Radiochemical Centre of the United Kingdom shows their certified values to be in excellent agreement (auth)

1075 THE SWEDISH GAMMA RADIATION STANDARD LABORATORY. R Thoraues (Inst of Radiophysics Stockholm) Acta Radiol, 58 445-58 (Dec 1962) (In English)

The constructional arrangements of a national standard gamma radiation laboratory embodying two Co^{60} sources, two Cs^{137} sources and two radium sources are described. Radiation measurements are made by cavity chambers, one of which used as a standard was calibrated against four national free air standard chambers. A special condenser dosimeter which is used as a reference instrument that can be sent to the radiotherapy centers in Sweden is also described (P C H)

1076 RADIATION EFFECTS ON MAN. RADIATION-PROTECTION STANDARDS. Lauriston S Taylor (National Bureau of Standards, Washington, D C) Nucleonics, 21 No 3, 58-60 (Mar 1963)

The bases of radiation dose standards are explained, and problems met in determining and applying them are discussed. The reasons for changes in standards are also clarified and it is noted that no radiation worker has received a demonstrable injury from a permissible exposure (D C W)

1077 THE DEVELOPMENT OF REGULATORY STANDARDS. Lester R Rogers (U S Atomic Energy Commission, Washington D C) Health Phys 9 1-5 (Jan 1963)

A discussion is presented of the development of regulatory safety standards and criteria by AEC. The needs for such standards, their basis and some of the work now going on these standards are discussed (D L C)

1078 COMITÉ CONSULTATIF POUR LES ÉTALONS DE MESURE DES RADIATIONS IONISANTES. COMITÉ INTERNATIONAL DES POIDS ET MESURES (Advisory Committee for Standards of Measurement for Ionizing Radiation in the Service of the International Committee on Weights and Measures) Paris, Gauthier-Villars & Cie, 1961 35p

The agenda of the 1961 meeting of the Advisory Committee is summarized briefly. In the annex, the reports of the four working groups—exposure dose, standard radionuclides, neutron standard sources and radium standards—are given. The activity of the Ionizing Radiation Section for the period from March 1 to July 15, 1961 is also indicated. A letter requesting the investigation of reported irregularities in the use of symbols and definitions is also attached (J S R)

1079 BASIC SAFETY STANDARDS FOR RADIATION PROTECTION (International Atomic Energy Agency, Vienna) Safety Series No 9 1962 59p (STI/PUB/26) \$1 50, Sch 31 50 NF 6, DM 4 80 (IAEA)

The standards of safety for protection of health and minimization of danger to life and property are presented in sections on maximum permissible doses, practical control of radiation doses, and fundamental principles. The standards are intended for application to production, processing, handling, use, storage, and transport of natural and artificially produced sources and to the disposal of radioactive substances (J R D)

1080 (TID 7651) AEC SYMPOSIUM ON PACKAGING AND REGULATORY STANDARDS FOR SHIPPING RADIOACTIVE MATERIALS [HELD IN GERMANTOWN, MARYLAND], DECEMBER 3-5 1962 (Division of Technical Information AEC) Dec 1962

A total of twenty papers and one roundtable discussion were presented. Separate abstracts were prepared for eighteen of the papers. The papers for which no abstracts were prepared are concerned with impact energy sorption by large shipping casks, design of a Pu and enriched U shipping container, and the roundtable discussion on regulatory standards (J R D)

1081 (TID-7651(p 126 31)) METHODS AND PROBLEMS IN EVALUATING APPROVING CASKS USING SAFETY STANDARDS. Alexander E Aikens Jr (Division of Licensing and Regulation AEC)

It is noted that results of evaluations of various shipping cask designs indicate that it is difficult to show conformance with several criteria contained in A E C CFR72 (proposed) because of a lack of sufficient data or lack of adequate analytical techniques. Some of the criteria against which it has been consistently difficult to assess cask design are discussed. The criteria considered include those which require data from major testing to permit better analysis, those which could be determined by relatively simple experiments and those requiring proof of conformance by performance testing (J R D)

1082 (TID-7651(p 304 14)) FIRE TESTING OF RADIOISOTOPE SHIPPING CONTAINERS AND COBALT 60 THERAPY HEAD. Leonard Horn (Underwriters Labs Inc Chicago)

Standard 1-hr fire tests in which 1000°F is reached after 5 min from start, 1300 after 10 min, 1550 after 30 min and 1700 after 1 hr were performed on a type 2R radioactive shipping container, a type 55 radioactive shipping container and a Co^{60} teletherapy head. Only the type 2R container constructed of stainless steel withstood the test. The other two items lost shielding or cracked. Data and discussion concerning the tests are included (J R D)

1083 (TID 7651(p 331-93)) THE DESIGN OF SHIELDED CONTAINERS TO I A E A STANDARDS. F E Dixon (United Kingdom Atomic Energy Authority Research Group Atomic Energy Research Establishment Harwell Berks, England) (TCAP/P 64)

1084 TEKHNIKA BEZOPASNOSTI PRI RABOTE S RADIOAKTIVNYMI VESHCHESTVAMI (Safety Techniques in Handling Radioactive Materials) V N Shikhov Moscow, Mashgiz, 1962 88p

Protective measures in handling radioisotopes, considering the up-to-date safety requirements, are considered. Radiation effects on human organism, permissible doses, dosimetric control, personal hygiene, and working clothes are discussed. 36 references are included (R V J)

1085 COMPARATIVE STUDY OF METHODS FOR CONTROLLING RADIOACTIVE PREPARATIONS. A Heyndrickx (Inst of Nuclear Studies Oak Ridge Tenn) J Pharm Belg 17 267 92 (Sept-Oct 1962)

Techniques employed in maintaining standards for radioisotope preparations for diagnostic and therapeutic use are described for P^{32} , Fe^{59} , Au^{198} , Y^{90} , S^{35} , Na^{22} , Na^{24} , K^{42} , I^{131} , I^{133} , Cr^{51} , and Co^{60} (H H D)

1086 INTERCOMPARISON OF NATIONAL ROENTGEN AND GAMMA RAY EXPOSURE-DOSE STANDARDS H O Wickoff A Allisy G H Aston G P Barnard W Huebner T Loftus and G Taupin (National Bureau of Standards Washington D C Laboratoire de Dosimetrie Paris, Physikalisch-Technische Bundesanstalt Braunschweig Ger, and National Physical Lab Teddington Eng) *Acta Radiol* 1 57-78(Feb 1963) (In English)

A pair of cavity ionization chambers was circulated to the national laboratories of France Germany U K and U S A for calibration with roentgen and gamma rays The difference of their calibrations with a given quality of radiation is taken as a measure of the disagreement of the national standards The results obtained agree with some earlier direct comparisons to within the expected uncertainty of these measurements or about 0.5 per cent (auth)

1087 RADIATION STANDARDS AVAILABLE FOR THE PROTECTION OF HIGH ENERGY ACCELERATORS H Jammet (CEN, Fontenay-aux-Roses, France) p 15-20 of "Premier Colloque International sur la Protection Auprès des Grands Accélérateurs" Paris, Presses Universitaires de France, 1962 (In French)

Shielding standards for high energy accelerators require the use of Relative Biological Effectiveness (RBE) to convert values in rads given by instruments to values in rems This factor is related to Linear Energy Transfer (LET) The RBE values presently used, particularly those based on the International Commission of Radiological Protection are not an adequate approximation of the reality Some recommendations are given here to approach the true values In addition to LET and LET-RBE relations complexity, physical factors, particularly delivered dose, dose distribution in tissues space and time, and biological factors such as the selection of a biological test and the extrapolation from one biological factor to another must be taken into account It is concluded that RBE must be divided into two parts the experimental RBE takes into account all the protection factors, the protection RBE uses the criticality concept and is based on the most sensible radiation effect (auth)

1088 (KY-400) UNION CARBIDE NUCLEAR COMPANY RADIATION STANDARDS AND PRACTICES Recommendations of the Committee on Radiation and Standards and Practices R W Levin comp (Paducah Gaseous Diffusion Plant Ky) Nov 1962 Contract W-7405-eng-26 10p

Radiation practices among the 4 Carbide Plants at Oak Ridge, Tennessee and Paducah Kentucky, were evaluated and uniform standards and criteria for handling U, Th, Np, and Pu were developed Values for the permissible limits of internal and external radiation exposure published in the most current NCRP handbooks and FRC publications were adopted as the basic standards for all 4 plants On the basis of these standards, the maximum permissible concentrations of U, Th, Np and Pu in air and action limits for the presence of the 4 isotopes in urine were also established Also, consideration was given to whether clothing should be furnished by the company for health protection purposes and whether surface contamination standards should be established (P C H)

1089 JCAE HEARINGS ON RADIATION STANDARDS, INCLUDING FALLOUT - William B Cottrell p 28-31 of "Nuclear Safety Vol 4, No 3"

On June 4 to 7, 1962 the Joint Committee on Atomic Energy held public hearings on radiation hazards and standards for protection against them Some of the highlights and trends presented in testimony at the hearings are discussed These highlights include industrial radiation pro-

tection standards, I^{131} in milk, and prediction of exposure from fallout (D L C)

1090 SOME CONSIDERATIONS IN THE ESTABLISHMENT OF RADIATION PROTECTION STANDARDS FOR RADIOACTIVITY IN THE ENVIRONMENT Donald R Chadwick (U S Public Health Service, Washington D C) and Conrad P Straub p 65-72 of "4th Inter-American Symposium on the Peaceful Application of Nuclear Energy Vol II" Washington, D C, Pan American Union 1962 (In English)

Guidance on total daily intakes of specific radionuclides from all sources averaged over a period of one year, based upon Radiation Protection Guides (RPG), is recommended by the Federal Radiation Council and is given in terms of three ranges of intake Ranges are specified particularly because of the very wide fluctuation of actual intakes of radioactive materials that would be possible without exceeding the annual dose specified in the RPG From these daily intakes concentration values in air, water, or food may be calculated for source control where controlled release occurs, but they have limited applicability in environmental controls Categorization by nuclide and level determines the kinds of action required to provide appropriate protection on the basis of the range in which they fall Thus, levels falling in Range I may be verified by infrequent sampling, and those in Range II by sufficient monitoring to show that these levels are not exceeded Where levels fall in Range III extensive monitoring is needed to demonstrate the efficacy of the instituted control measures, thus providing assurance that the levels are reduced to at least Range II Data are provided indicating the levels that have occurred Although these have not exceeded the formulated RPG's on the average, possible control measures are discussed with some indication of their potential effectiveness (auth)

1091 RADIOACTIVITY STANDARDS FOR WATER Ernest C Tsivoglou and George W Burke, Jr (Robert A Taft Engineering Center, Cincinnati). *J Am Water Works Assoc.*, 55 668-76(June 1963)

No conflict appears among the most recent numerical recommendations of the International Commission on Radiological Protection (ICRP), the National Committee on Radiation Protection of the National Bureau of Standards (NCRP), the Federal Radiation Council (FRC), and the U S Public Health Service (USPHS) in regard to standards for the protection of water quality from radioactive contamination. The unanimous recommendation of all of the above advisory groups is that all human radiation exposure should be reduced and minimized to whatever extent this is reasonable and practical In any particular case, radioactive water quality protection should be based primarily upon a determination of the exposure of those individual persons most likely to ingest the largest quantities of radioactivity This approach should greatly facilitate and expedite control in specific situations, and should encourage regulatory agencies to assume full responsibility in this area The principles of pollution control that are outlined may be applied in the control of other kinds of pollutant as well. A period exists in which the greatest concern must be for chronic exposure to trace quantities of a variety of agents, the effects of which will be years in appearing and, even then, difficult to perceive Hence, the principles and methods developed to control radioactive pollution, which occurs in trace quantities, will prove directly applicable to other pollutants as well, especially the primary principle of minimum exposure. (auth)

1092 NEW ICRU RECOMMENDATIONS ON RADIATION QUANTITIES AND UNITS Harold H Rossi (Columbia Univ, New York) *Nucleonics*, 21 No 7, 75-8(July 1963)

Sources of confusion in the terminology of radiological

physics and radiation protection are discussed, and recent recommendations by the International Commission on Radiological Units and Measurements are presented and explained. (D.C.W.)

1093 TRANSPORTATION OF RADIOACTIVE POLLUTION BY WATER TO GREAT DISTANCES. A. Van de Vloed (Intercommunal Water Co., Antwerp). Tech. Sci. Munic., 58: No. 2, 55-68 (Feb. 1963).

Consideration is given to steps taken to reduce radio-pollution from the atomic energy installations at Oak Ridge, Tennessee, and Harwell, England. Standards of safe radionuclide accumulation in water established by the Harwell plant are given, as well as standards proposed by Euratom. The physical, chemical, and biological factors affecting both the accumulation and dispersal of radioactive materials in water are listed. (TCO)

1094 INTERNATIONAL COMPARISON OF RADIOACTIVE STANDARDS. Masashi Naito (Tokyo Inst. of Tech.), Yajiro Inoue, Osamu Yura, Kogoro Maeda, Yasushi Kawada, and Tsutomu Noguchi. Proc. Japan Conf. Radioisotopes, 5th, No. 3, 69-71 (1963). (In Japanese)

A series of international comparisons of radioactivity standards have been carried out since February 1961 by the simultaneous measurements of the distributed standard samples by the participating laboratories under the auspices of "Bureau International des Poids et Mesures." The nuclear species used for the comparison-measurements are ^{131}I , Au^{198} , Co^{60} , and S^{35} . The measuring methods and the results on the four nuclides obtained in the Electrotechnical Laboratory are described and compared with those from the other participating laboratories. The values obtained from the measurements are in satisfactory agreement with those from the other laboratories participating in the comparison program. (A.G.W.)

1095 BRITISH STANDARD OF RADIOACTIVE IODINE-131. W. J. Callow (National Physical Lab., Teddington, Middx., Eng.). Nature, 199: 898 (Aug. 31, 1963)

Previously, the British Standard of iodine-131 was in terms of the γ dose in air at 1 cm from a 1 mCi point source. Recently, certificates giving disintegration rate values both from ionization chamber values and from 4π β - γ coincidence counting have been issued. Henceforth standards will be based on the 4π β - γ coincidence method. (H.M.G.)

1096 THE EVOLUTION OF HEALTH STANDARDS AND OF METHODS OF THEIR ENFORCEMENT IN AUSTRALIAN URANIUM MINING AND MILLING. G. F. Mead (Bureau of Mineral Resources, Canberra City, Australia). Vienna, International Atomic Energy Agency, 1963, Preprint SM-41/66, 22p. (CONF-104-49)

From International Atomic Energy Agency Symposium on Radiological Health and Safety in Nuclear Materials, Mining and Milling, Vienna, Aug. 1963.

The changes in health standards between 1950, the commencement of U mining in Australia, and 1957, when agreement on satisfactory standards was reached, are discussed. The changes made were partly due to local experience and partly to investigations of practice in other countries. Methods of testing working places for radioactivity and means used for enforcement of the standard are also discussed. (auth)

1097 (EUR-359.f) L'ACTION INTERNATIONALE DANS LE DOMAINE DU CONTROLE MEDICAL. (International Activities in the Field of Medical Inspection). P. Recht (European Atomic Energy Community). 1963. 19p (CONF-257-1)

From Medical Supervision Workers Exposed to Ionizing Radiation, Stresa-Ispra, Italy, May 1961.

The basic standards of radiological protection established by Euratom in Feb. 1959 are examined in detail

with respect to their content and consequences for the organization of community medical services for dealing with the hazard of ionizing radiations. The sphere of application, means whereby medical control may be exercised, training and certification of physicians, training of other workers, the standardization of medical files, and research work on radiological protection are discussed. (C.H.)

1098 (TID-19754) PROTECTIVE CLOTHING STANDARDS. (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). 1963. Contract AT(45-1)-1350. 57p. (HWS-10007)

Hanford Atomic Production Operation specification guides for protective clothing are presented. Details of this manual are given in TID-4100 (Suppl.). (N.W.R.)

1099 HEALTH PHYSICS AND CONTROL OF RADIATION EXPOSURE. Atomics, 16 No. 6, 28-30 (Nov.-Dec 1963).

Health physics is concerned with an understanding of the mechanisms of radiation damage with the development and implementation of methods and proceedings necessary to evaluate radiation hazards, and with providing protection to man and his environment from unwarranted radiation exposure. Duties and responsibilities of the health physicist are described. Since 1928 a variety of national and state agencies concerned with problems of radiation protection have endeavored to establish and enforce standards of radiation exposure. It is pointed out that the task of these agencies is complicated by the fact that numerical application in radiation protection is largely a matter of judgment and cannot be proven conclusively. (H.M.G.)

1100 (DPSPU-63-30-42) RADIOACTIVE WASTE: RADIATION-PROTECTION STANDARDS AND CATEGORIZATION. W. C. Reing (Du Pont de Nemours (E. I.) & Co. Savannah River Plant, Aiken, S. C.). Dec 1963. Contract AT(07-2)-1. 11p. (CONF-367-1)

From Annual Meeting of the National Technical Task Committee on Industrial Wastes, St. Louis, Mo., Dec. 1963.

Hazards from the discharge of radioactive wastes to the environment are reviewed. It is pointed out that more is known today about the effects of ionizing radiation than about many other noxious materials that man has introduced into his environment. The formulation of radiation protection standards is reviewed. It is postulated that these standards will be relaxed or tightened as more knowledge becomes available about the behavior of radionuclides in the environment and the biological effects of low levels of long-continued irradiation. (C.H.)

1101 MEDICAL STANDARDS FOR RADIATION WORKERS. T. E. Graham (United Kingdom Atomic Energy Authority, Windscale, Sellafield, Cumb., Eng.). p.75-100; 447-63 of "Medical Supervision of Workers Exposed to Ionizing Radiations." [Brussels], Euratom, 1963.

Criteria upon which acceptance or rejection for jobs as radiation workers are based are discussed. Reasons for rejections in certain cases are explained. (P.C.H.)

1102 AVAILABILITY AND USE OF RADIOACTIVITY STANDARDS. W. S. Lyon (Oak Ridge National Lab., Tenn.). Anal. Chem., 36: 31A-3; 35A; 37A-9 (Feb. 1964)

A review on the availability and use of radioactivity standards includes discussions on the usefulness and accuracy of nuclear data as presently compiled and the distribution of standards. It was concluded that a need for better nuclear data exists. Information and instruction are needed to aid the non-specialist in deciding when absolute standards are really needed and how to use them. Standards producers should supply more information concerning the method of assay, errors, and chemical form of the standard. (P.C.H.)

1103 LABORATORII DLYA RABOT S RADIOAKTIVNYMI VESHCHESTVAMI. (Laboratory for Working with Radioactive Materials). I. A. Reformatskii. Moscow, Gosatomizdat, 1963. 128p.

A general review is given of the rules and requirements for operating a laboratory handling radioactive materials. Descriptions are given of standard, special, and remote-control equipment used in hot laboratory cells. Means of protection, shielding, sanitation, and hygiene are discussed. (R.V.J.)

1104 BIOLOGICAL ASPECTS OF THE APPLICATION OF RADIATION PROTECTION NORMS IN NUCLEAR INSTALLATIONS. H. Jammet (Commissariat à l'Energie Atomique, Fontenay-aux-Roses, France). p. 25-34 of "Personnel Dosimetry Techniques for External Radiation, Their Application in Nuclear Installations." Paris, European Nuclear Energy Agency, 1963. (In French)

The biological aspects of the application of radiation protection norms in nuclear installations correspond in fact to the health requirements for protection against occupational diseases. These are based on the principle that workers should not be exposed to radiation in excess of a certain level, (Maximum Permissible Dose). The form of irradiation, the nature of the radiation and the various classes of workers must all be taken into account. As regards the form of irradiation a distinction must be drawn between irradiation of the whole body and irradiation of parts of the body. More detailed regulations are laid down governing ordinary working conditions and exceptional conditions of accumulated or accidental exposure. For certain parts of the body, the nature of the radiation is the preponderant factor. Specific maximum permissible levels are laid down for neutrons, as a function of their energy. An especially important problem is that of determining such levels for very-high-energy radiation and especially for protons generated by particle accelerators. From the biological viewpoint, all the foregoing considerations apply to male workers over the age of 18. Two special types of problems arise in the case of adolescents under 18 years of age, and of women of child-bearing age and pregnant women. All biological considerations lead to the fixing of levels which individual dosimetry should be capable of controlling as precisely as possible. (auth)

1105 PROBLEMS IN THE APPLICATION OF NORMS OF EXTERNAL RADIATION. Lauriston S. Taylor (National Bureau of Standards, Washington, D. C.). p. 35-47 of "Personnel Dosimetry Techniques for External Radiation, Their Application in Nuclear Installations." Paris, European Nuclear Energy Agency, 1963.

Radiation protection norms or standards have evolved over the past three decades to the point where there is general acceptance of the principles involved. Within the past few years such standards have become embodied in laws and regulations, with the result of introducing a kind of rigidity never intended by those groups that developed them. This rigidity tends to hamper further developments of norms, through fear of necessitating changes in existing codes and regulations. At the same time the sensitivity of the public to radiation hazards has grown sharply, so that whereas in the early days only a relatively few workers in the field were concerned, now the entire public seems concerned. It has been recognized for many years that the establishment of protection norms for radiation, as for other fields, involves many subjective considerations and judgment values. More recently it has become appreciated that they may involve social, political and economic considerations. Furthermore, all existing norms are developed within a framework of no observable effect. The influence of these considerations on the understanding and acceptance of norms, by the public as well as governmental bodies, is discussed, and an endeavor is made to bring these various facets of the problem into suitable perspective. (auth)

1106 ROENTGENPOLYPRAGMASIA AND MEDICAL PRACTICE. Janos Barany. Orv. Hetilap, 102: 1084-6 (June 1961). (In Hungarian)

Government regulations relating to x-ray examination procedures and radioprotection are discussed. (BBB)

1107 STATE REGULATION OF RADIOACTIVE MATERIALS. John M. Heslep (California State Dept. of Public Health). Public Health Rept. (U. S.), 79: 308-12 (Apr. 1964).

Regulation of radioactive materials at the state level was instigated by Public Law 86-373 enacted by Congress in 1959. Justification of the assumption of responsibility by the state is based on the traditional role of the state in matters of health and safety, to which radiation may now be added. The narrow scope of radiation regulation is evaluated, and it is concluded that regulation should include all types of radioactivity. The establishment and function of the California regulatory body is discussed and evaluated. Problems arising from the AEC's relations with the Agreement States provided in the aforementioned law are considered. (H.M.G.)

1108 PROBLEMS IN RADIUM CONTROL. John C. Villforth. Public Health Rept. (U. S.), 79: 337-42 (Apr. 1964).

Of all the more commonly used radionuclides, Ra has the longest and most dramatic history. Certain of its inherent characteristics make it a potential radiological health problem—its radiotoxicity, its series decay through alpha-, beta-, and gamma-emitting daughters including its first daughter product, Rn, which is a noble gas, its chemical and physical form, its ability to build up pressure in a sealed source, and its depreciation. These qualities and the fact that Ra was not systematically and generally under regulatory control contribute to its potential hazard. Radium continues to be used at approximately 4,500 facilities throughout the country, although cheaper, more adaptable AEC-licensed radionuclides are more readily available. Incidents and accidents are not uncommon, and contamination from leaking and ruptured sources has resulted in costly damage and required expensive decontamination. Most of these incidents could have been avoided by following accepted radiological health procedures. States are developing programs for the licensing, registration, and inspection of radium users, and the Public Health Service has established a program to assist the States in these activities. But the assistance of other agencies and professional groups is required to educate users to the potential hazards of improper handling and the use of antiquated sources and to investigate less hazardous substitutes for radium. (auth)

1109 RADIATION CONTROL: STANDARDIZATION VERSUS FREEDOM. Reynold F. Brown (Univ. of California, San Francisco). Radiology, 82: 972-6 (June 1964)

The present status of radiation control of the physical standards of x-ray equipment and accessories used in the practice of medicine in the U. S. is reviewed. Proposals for state regulation of x-ray equipment and operators of such equipment are discussed. (C.H.)

1110 CURRENT STATUS OF ATOMIC ENERGY COMMISSION-STATE COOPERATIVE PROGRAM. G. W. Morgan (Atomic Energy Commission, Washington, D. C.). Am. J. Public Health, 53: 878-81 (June 1963)

Assumption of broader responsibilities for radiation protection by the states through agreements between the states and the Atomic Energy Commission is discussed. Each agreement between the Commission and a state contains provisions under which both the state and the Commission commit themselves to cooperate in maintaining continuing compatibility of regulatory programs for the regulation of like materials. The agreements also provide for exchange

of information and comments on proposed changes in their respective rules and regulations and in their licensing inspection, and enforcement policies and criteria. The State-AEC Relations Branch, Division of Radiation Protection Standards, serves as the focal point in dealing with the states in developing enabling legislation in developing and submitting regulations and in the development and implementation of complete regulatory programs. The additional staff for increased regulatory responsibilities by the agreement states has increased their competence in the field of radiation protection. To assist the state and local officials in increasing their competence in the field of radiation protection, the AEC provides two types of training courses. Cooperation of municipal and local authorities with the AEC, particularly on regulations involving the transport of radioactive materials is also considered (BBB)

1111 UNIFORM RADIATION PROTECTION AT LAST W Baeck Zentr Arbeitsmed Arbeitsschutz, 11 77-81 (Apr 1961) (In German)

A new uniform law for the peaceful uses of atomic energy and protection against its hazards has become effective recently. According to this law, the annual radiation dose should not exceed 1.5 r/yr for persons who are engaged in radiation work. The maximum permissible dose should not exceed 5 r/yr for persons between the ages of 18 and 38 yr, so that the total dose should not exceed 100 r for this period of time. The total dose for any 13 consecutive weeks must not exceed 3 r, but the annual limit of 5 r should not be exceeded in any case. The law permits greater doses for the hands, arms, feet, and ankles, and for persons whose occupations do not require exposure to radiation. Maximum permissible concentrations of radioisotopes in air, water, and soil are prescribed. For example, in water the concentration of ^{60}Co should not exceed $3 \times 10^{-4} \mu\text{C}/\text{cm}^3$. Radioactive wastes must be disposed of as designated by appropriate authority. Before a radioactive material can be used, the user must be investigated. The initial investigation must be followed up after 6 months with a second investigation. Special permission is required for studies where the single radiation dose amounts to as much as 25 r, or where the incorporation of radioactive materials into the body is planned. These investigations are to be carried out by physicians. Applications for authorization to use radioisotopes or radiation must be filed with the proper authorities under this new law even though the user had been authorized previously under another law. The previous authorization may be used until confirmed again. Violations of the new law are punishable by fines or imprisonment or both (BBB)

1112 PROCUREMENT AND DISTRIBUTION OF RADIOISOTOPES D J Stevens (Commonwealth X-Ray and Radium Lab., Melbourne). J Coll Radiol Australasia 5 55-6 (June 1961)

Regulations governing the use of radioisotopes in Australia are reviewed, with special reference to recent changes in the regulations. Advisory services available through the Laboratory and the Commission, and the Customs Regulations pertaining to radioisotopes, are discussed. (BBB)

1113 IL RISCHIO DA RADIAZIONI NELL'ERA NUCLEARE (The Risk of Radiations in the Nuclear Age). E. Jacchia Milan, Ed. A. Guiffre, 1963. 607p 4600L

The hazards of ionizing radiations to humans and possible radioprotective countermeasures are discussed, with emphasis on the known biological effects of radiation, recommendations of international bodies relating to acceptable levels, legislation for regulation of medical and occupational exposure, and the transport and handling of radioisotopes. (BBB)

1114 RADIATION PROTECTION IN CANADA PART I P M Bird (Dept of National Health and Welfare, Ottawa) Can Med Assoc J, 90 1024-30 (Apr 2, 1964)

The current status of radiation protection in Canada is summarized, with particular emphasis on the role of the Radiation Protection Division of the Department of National Health and Welfare. Somatic and hereditary effects of radiation exposure are discussed as a basis for interpretation of the radiation protection standards developed at national and international levels. Development of the Department's program is traced back to 1949. A chart is provided to show the activities of the Radiation Protection Division and its lines of contact with other departments and agencies at both federal and provincial levels. Another chart summarizes the legislative action taken at provincial level to provide control of radiation hazards which are concerned with the control of mostly industrial uses of x-rays and radioisotopes (BBB)

1115 RADIATION PROTECTION IN CANADA PART II THE ROLE OF THE RADIATION PROTECTION DIVISION IN SAFEGUARDING THE HEALTH OF RADIATION WORKERS P M Bird (Dept of National Health and Welfare Ottawa) Can Med Assoc J, 90 1075-80 (May 2, 1964)

The current status of radiation protection in Canada is discussed with particular emphasis on the role of the Radiation Protection Division of the Department of National Health and Welfare (BBB)

1116 A REVIEW OF THE AMENDMENTS TO THE REGULATIONS FOR THE MEDICAL USE OF RADIATION AND CONSTRUCTION AND INSTALLATION IN HOSPITALS K Takeshita (Kyushu Univ, Fukuoka, Japan) Fukuoka Igaku Zasshi, 54 126-34 (Feb 1963) (In Japanese)

The recommendations of the International Commission for Radiological Protection (ICRP) and the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) relating to hazards in clinical applications of ionizing radiations are discussed (BBB)

1117 A RECALIBRATION OF THE NATIONAL BUREAU OF STANDARDS TRITIATED WATER STANDARDS BY GAS COUNTING W B Mann, R W Medlock, and O Yura (National Bureau of Standards Washington, D C) Intern J Appl Radiation Isotopes, 15 351-61 (June 1964)

The National Bureau of Standards ^3H standards were prepared in the winter of 1954-55 using microcalorimetric measurements. They were re-calibrated by means of the National Bureau of Standards length-compensated internal gas counters. The new value for their activity was 1.96% lower than that previously measured, but this difference also involves uncertainties in the half life and the average beta energy for ^3H . A value for the ratio of the combined evaporation and reaction rates with zinc, for HTO and H_2O , equal to 0.92 was obtained (auth)

1118 (AD-427279) EVALUATION OF RADIOPROTECTIVE AGENTS Annual Progress Report August 1 1962-July 31 1963 John B Storei (Roscoe B Jackson Memorial Lab Bar Harbor Me) Contract DA-49-193-MD-2289 13p

Results are reported from a study to determine whether standard radioprotective agents (β -mercaptoethylamine, p-aminopropiophenone, 2-aminoethylisothiouonium bromide and serotonin) will protect mice against the late deleterious effect of x-ray exposure. A total of 7200 treated and control mice were exposed to four dosage levels of x-rays and set aside for longevity and histopathology studies. Both sexes from strains A/J and C57BL/6J were included. Seven radioprotective agents provided by the Walter Reed Army Institute for Research were evaluated in terms of chemical toxicity and radioprotec-

tive effect. The ratios of x-ray LD₅₀ values for treated mice to the control LD₅₀ values ranged from 1.2 to 1.6. The comparable values for the standard agents listed above were 1.5 and 1.8 (auth).

1119 (NP-tr 1161) DIRECTIVE REVISING ANNEXES 1 AND 3 OF DIRECTIVES FIXING THE BASIC STANDARDS OF HEALTH PROTECTION, AND DIRECTIVE ON FREE ENTRY TO QUALIFIED POSTS IN THE NUCLEAR FIELD. Translated by L. C. Hickman (U.K.A.E.A., Atomic Energy Research Establishment, Harwell, Berks, Eng.), from J. Officiel Communautés Européennes 5 No 57, 1962 34p.

Recent revisions in directives of the Council of the European Atomic Energy Community concerning basic standards of radiation protection for the population and workers in the atomic energy industry are reviewed. The directive concerning the free movement of qualified workers with specific training and education within the European Atomic Energy Community is also reviewed. A list of qualifications for employment in various positions is appended. (C.H.)

1120 SHIPPING OF RADIOACTIVE MATERIALS. Jürgen Nesselmann (Kernreaktor Bau und Betriebs GmbH, Karlsruhe, Ger.) p 372-5 of "Atomstrahlung in Medizin und Technik". Munich: Verlag Karl Thieme KG, 1964. (In German.)

The legal specifications for the shipping of radioactive materials in Germany are briefly indicated. The practical consequences that arise from conformity to these regulations are reported. The transportation costs for radioactive materials are compared with such costs for non-radioactive materials. (J.S.R.)

1121 DIRECTIVES OF EURATOM FIXING BASE NORMS RELATIVE TO SANITARY PROTECTION. Concours Med 85 3263-6 (May 18 1963). (In French.)

Chapters of the Euratom directives pertaining to sanitary protection are reproduced with some comment. (TCO)

1122 THE RADIATION PROTECTION REGULATIONS AND THEIR EXECUTION. Heinz Kuehn (Max Planck-Institut für Biophysik, Frankfurt am Main) Radiologie, 2 384-9 (Oct 1962). (In German.)

Maximal permissible limits for radiation exposure established by the ICRP are discussed. Procedures for collection, measurement, and disposal of radioactive wastes are described. Standards for ventilation of radioactive areas are presented, and simplified methods for disposal of solid or liquid wastes are detailed in the regulations. Measures adopted for carrying out the regulations are pointed out. (TCO)

1123 INSTRUCTIONS FOR HANDLING ENCLOSED RADIOACTIVE SUBSTANCES. H. Muth, A. Kuhlmann, K. Aurand, A. Cantzler, W. Glwitzky, and W. Jacobi (Deutsche Gesellschaft für Arbeitsschutz e.V., Frankfurt am Main) Zentr. Arbeitsmed. Arbeitsschutz 12 36-9 (Feb 1962). (In German.)

The most important legal controls for handling enclosed radioactive materials are collected and combined with practical advice. The general requisites for handling and transport of enclosed radioactive substances are discussed, including the requirements for granting a license for handling or for transport. Maximum permissible concentrations for exposed personnel are discussed, with a section on medical supervision. The legal requirements for instruction and display of radiation protection regulations are outlined. Management, transport, storage, labeling, and bookkeeping requirements and suggestions are outlined. The area of control and supervision is outlined. Radiation protection control, including personnel and samples, is discussed. Handling and sealing of enclosed emitters and measurements in case of accidents are discussed. A table

of decay factors for ⁶⁰Co, ¹⁷⁰Er, ¹⁴⁷Pm, ¹⁹²Ir, ²⁰⁴Tl, ⁸⁵Kr, ⁹⁰Sr, and ¹³⁷Cs is given as percent activity remaining after 0.25 to 10 yr. The laws pertain to the Federal Republic of Germany. (BBB)

1124 COMITÉ CONSULTATIF POUR LES ÉTALONS DE MESURE DES RADIATIONS IONISANTES. 4th SESSION—13th (6th MAI) (Fourth Session of the Consultative Committee for Standards of Measurement of Ionizing Radiations May 6-7 1963). Paris: Cauthier Villars and Cie 1963 31p.

The minutes of the fourth session are presented together with seven appendices on the reports of the study groups, the results of international comparisons of the radioisotopes ³²P, ¹³¹I, ²⁰⁴Tl, ¹⁹⁸Au, and ⁶⁰Co, and the definition of dimensions. Separate abstracts were prepared. (J.S.R.)

1125 ZAKŁADY RENTGENOWSKIE — WYMAGANIA OCHRONY PRZED PROMIENIOWANIEM JONIZUJĄCYM. PN-62 J-80101 (X-ray Laboratories—Regulations for Protection Against Ionizing Radiation). Warsaw: Polish Standards Committee, 1962. 4p. 2.40 Złoty.

This Polish standard regulation refers particularly to the planning and design of x-ray laboratories for 25 to 400 kv equipment for medical, industrial, scientific, and other purposes. It contains regulations regarding the following: the factors to be considered when planning x-ray laboratories, the requirements to be met by such laboratories (for diagnostic and therapeutic purposes, non-destructive materials testing, scientific research, etc.), and conditions for approving projects and completed laboratories. (Occupational Safety Health Abstr. 2 No 7, 1964)

1126 RADIOIODINE—ITS UPS AND DOWNS. Robert Wurtz. Scientist Citizen 6 Nos 9-10 34-7 (Sept-Oct 1964).

Fluctuations of ¹³¹I levels in fallout are considered in terms of testing and the test ban treaty. Advantages of the FRC's new Protective Action Guide are compared to the older FRC publication Radiation Protection Guide. (H.M.G.)

1127 RÉGLEMENTATION RELATIVE AUX RADIOÉLÉMENTS ARTIFICIELS (EXTRAITS SÉLECTIONNÉS) (Statutory Provisions Relating to Artificial Radioelements (Selected Extracts)). 2nd Edition. Gif-sur-Yvette, France: Commission Interministérielle des Radioéléments Artificiels 1963. 24p.

Topics included are: the special statutory provisions relating to artificial radioelements which are in force in France, as contained in the Public Health Code, and the specific conditions under which artificial radioelements approved by the French Interministerial Committee on Artificial Radioelements may be employed, and the general French statutory provisions on radioactive substances governing artificial radioelements (safeguarding of public health, environmental protection, protection of workers, transport of artificial radioelements). (Occupational Safety Health Abstr. 2 No 7 1964)

1128 (SC-DC-3550) SUGGESTED DESIGN CRITERIA FOR STANDARDS LABORATORIES. H. H. Baxter Jr. (Sandia Corp., Albuquerque, N. Mex.) [Nov 1963]. Contract AT(29-1)-789. 37p.

A discussion is presented of what the ever increasing demand for accuracy requires in standards-laboratory planning and design. The location, room arrangements and dimensions, structural shell, entrances and windows, utilities and environments are treated. Clean rooms are also discussed. (D.L.C.)

1129 (AHSB(A) R 8(p 113-21)) DEVELOPMENT OF RADIOLOGICAL PROTECTION STANDARDS—THE HISTORICAL PERSPECTIVE. Brian Windyer (Middlesex Hospital, Meyerstein Inst. of Radiotherapy, London).

Safety aspects of the uses of ionizing radiations are discussed and the development of radiological protection standards is reviewed. It is pointed out that the health and safety record of the atomic energy industry is extremely good (C H)

1130 MANUAL OF INDUSTRIAL RADIATION PROTECTION. PART II. MODEL CODE OF SAFETY REGULATIONS (IONISING RADIATIONS). Geneva International Labour Office 1959. 58p. \$0.75 4s 6d.

Revisions of section 2 Chapter XI of the Model Code of Safety Regulations for Industrial Establishments for the Guidance of Governments and Industry are presented. A model code of safety regulations (ionizing radiation) includes maximum permissible doses, general provisions relating to all processes involving a radiation hazard, sealed sources and equipment generating ionizing radiations and unsealed radiation sources (H M G)

1131 STATUS OF PROPOSED TRANSPORTATION REGULATION. Robert Baker. 14p. (CONF-620-3)

From Institute of Nuclear Materials Management 5th Annual Meeting, Pittsburgh, May 1964

Most international shipments of radioactive material, particularly those to Europe, Great Britain and Australia, are subject to rules based on regulations developed by the IAEA. The IAEA rules and many of the rules of those countries mentioned are undergoing some revision at present. The revision of the IAEA rules was proposed to their Board of Governors and will likely be considered by them in time. The International Air Transport Association also is revising their rules based on the latest IAEA proposals. The AEC's 10 CFR Part 71, applicable to the shipment of special nuclear material, has been in effect since 1958. A proposed revision was issued in March 1963 and a redraft of that proposal is being developed. For irradiated fuel shipping containers, the AEC issued 10 CFR Part 72 proposed in September 1961 and the criteria in that proposal are being used for licensing. The ICC regulations have been in effect since 1948. Major changes, proposed in 1963, are currently being redrafted, taking into account a number of comments and the further work of the IAEA. A proposed revision, applicable only to fissile material, was issued in January 1964. (auth)

1132 DEVELOPING RADIATION PROTECTION STANDARDS. THE ROLE OF THE ATOMIC ENERGY COMMISSION. Forrest Western (U. S. Atomic Energy Commission, Washington, D. C.). Arch. Environ. Health, 9: 654-8 (Nov. 1964).

The role of the AEC in developing radiation protection standards is considered from an historical standpoint. Summarily, the AEC has not only contributed to development of current standards of radiation protection, but in the operation of its regulatory program it has been necessary to develop practices, criteria and regulations that go beyond the specific recommendations of the NCRP and FRC (H M G)

1133 NEW GOST [STATE STANDARDS] 8848-63—UNITS OF RADIOACTIVITY AND IONIZING RADIATION. F. M. Karavaev and M. F. Yudin. Izmeritel. Tekhn. No. 6: 51-3 (June 1964).

Standard units were established for the following values: activities of isotopes in radioactive source; density of flux of ionizing particles or quanta; radiation intensity; absorbed radiation dose; power of absorbed radiation dose; exposure dose of x and gamma radiation; and power of exposure dose of x and gamma radiation. Taken as the unit of activity of the International System must be one decay per second. Use of the extra system unit of the Curie is also permitted (one Curie = 3.700×10^{10} decays/second). As for unit of measurement density of flux of any kind of particle or quanta the standard sets one particle of a given species (or quanta) per second per square meter (particle/(second-meter²)) or quanta/(second-meter²). In abbreviated form the units of density of flux of ionizing particles—alpha-particles/(second-meter²), beta-particles/(second-meter²), neutrons/(second-meter²), gamma-quanta/(second-meter²), the use of letters of the Greek and Latin alphabets is permitted as commonly accepted. The third variable for which the standard sets units of measurements is the intensity of radiation, here the measurement must be watts per square meter.

For measurement of power of absorbed dose of radiation, the unit watt per kilogram is established. Permitted is the use of the extra-system unit decay per second equal to 0.01 watt/kg. The new standard also sets the unit of measurement of exposure dose of x and gamma radiation as the sum of electrical charges Δq of all ions of the same sign per some mass of air Δm . The unit of exposure dose of x and gamma radiation in the system is taken as coulombs per kilogram (of air) (coulomb/kg). Also permitted is the use of the extra-system unit of the Roentgen (R) equal to 5.776×10^{-4} coulomb/kg (approximately 2.58×10^{-4} coulomb/kg). A new unit of power of exposure dose of x and gamma radiation in the new standard is set as amperes per kilogram (of air) (T/C).

1134 NORMAL CALCIUM KINETICS. APPLICATION OF A NEWLY DERIVED COMPOSITE REFERENCE STANDARD. R. P. Heaney. p. 57-61 of STI/DOC/10/32.

Radiocalcium studies in 30 normal adults were used to construct a composite reference standard for radiocalcium plasma decay and excretion. Recent studies of human tissue Ca equilibrium and exchange permitted construction of a reasonable two-compartment open system that precisely fits the data of this reference standard. Plasma specific activity from 5 to 150 hr after isotope injection exhibited a highly significant inverse correlation with body size, but could not be correlated with age or sex (H M G)

1135 THE NATIONAL BUREAU OF STANDARDS TRITIATED WATER STANDARDS. W. B. Mann (National Bureau of Standards, Washington, D. C.) and A. Spennol. Intern. J. Appl. Radiation Isotopes, 15: 628 (Oct. 1964).

Two independent measurements, using gas counting of the National Bureau of Standards 1954 tritiated water standards, are compared. The agreement was about 0.25% which was within their stated precisions (M C G)

1136 CIVIL LIABILITY FOR NUCLEAR DAMAGE. Conference held by the International Atomic Energy Agency, Vienna, April 29-May 19, 1963. Legal Series No. 2 (International Atomic Energy Agency, Vienna) 1964. 536p. STI/PUB/54. \$10.00, Sch. 210, 60s. std., Ffr. 40, DM 35 (IAEA).

A conference was held to draft a Convention on Minimum International Standards Regarding Civil Liability for Nuclear Damage. Summary records of the plenary meetings and of the meetings of the Committee of the Whole are also given (D L C)

1137 RADIATION PROTECTION AND THE USE OF RADIOISOTOPE CALIBRATION EQUIPMENT IN THE PULP AND PAPER INDUSTRY. R. Lehner. Sichere Arbeit, 16: 5-10 (1963).

In the manufacture of paper webs, beta radiation is used to measure basic weight, thus necessitating measures of protection against radiation. Following a description of measuring procedure and of the various isotopes employed, a survey of the Austrian regulations on radiological protection is given, together with the recommendations of the International Commission on Radiological Protection (ICRP) (maximum permissible body burden, equipment standards, and staff training and supervision). Improper work methods, shielding, and identification of radioactive sources, as well as responsibility for protective measures are also discussed (Occupational Safety Health Abstr. 2: No. 5, 1964).

1138 IONISING RADIATIONS (SEALED SOURCES) (LEAKAGE TEST) ORDER (NORTHERN IRELAND) 1963. "Statutory Rules and Orders of Northern Ireland," 1963. No. 13. Belfast: Ministry of Labour and National Insurance for Northern Ireland, 1963. 2p. 3d (HMSO, Belfast).

The test for leakage of radioactive substances to be made of sealed sources and the particulars to be contained in the registers of every such test required under Regulation 15 of the Ionizing Radiations (Sealed Sources) Regulations (Northern Ireland) 1962 (CIS 1553-1963. Boq. Shz. (627)) are prescribed. This Order also prescribes for purposes of paragraph (4) of the said Regulation 15 the extent of leakage of radioactive substance from a sealed source beyond which the sealed source may not be brought into use until repairs have been effected (Occupational Safety Health Abstr. 2: No. 1, 1964).

1139 GUIDES, STANDARDS AND REGULATIONS FROM THE FEDERAL RADIATION COUNCIL POINT OF VIEW C C Palmiter and P. C. Tompkins (Federal Radiation Council, Washington D C) 15p (CONF 642-14)

From Health Physics Society Cincinnati June 1964

The Federal Radiation Council established in 1959 advises the President with respect to problems in which radiation is a factor and recommends to the President guidance for Federal agencies in their radiation protection programs. Criteria for the development of radiation protection guidance is discussed. Guidance for protective programs to reduce exposure from radioactive materials after they are in the environment must consider any health benefit associated with the available reduction in exposure and the overall impact on the program. The decision to take a protective action program must consider such factors as the resulting exposure if no action is taken, how much exposure can be reduced by taking the action, the difficulty of making the action effective, and possible risks to health direct or indirect, that may be associated with the action itself (P C H)

1140 PHILOSOPHICAL INFLUENCES ON RADIATION PROTECTION STANDARDS, SYMPOSIUM ON GUIDES, STANDARDS, AND REGULATIONS Lauriston S Taylor (National Bureau of Standards, Washington D C) 17p (CONF-642-12)

From Health Physics Society Cincinnati June 1964

Changes and influences leading to changes in the philosophical approach to the general problem of developing radiation protection standards are discussed. (P C H)

1141 NEW MEASUREMENTS OF COMPARISON OF A CERTAIN NUMBER OF RADIUM STANDARDS M Lecom and J Robert (Universite, Paris) J Phys, Phys Appl (Paris), 25 159A-62A (Nov 1964) (In French)

Measurements were made on the radium standard Honigschmid 5427, which belongs to Russia. The mass defect of the international standard 5430 is confirmed (auth)

1142 SAFETY STANDARD FOR NON-MEDICAL X-RAY AND SEALED GAMMA-RAY SOURCES. PART I GENERAL National Bureau of Standards Handbook 93 (National Bureau of Standards, Washington, D C) Jan. 3, 1964. 68p \$0.30(GPO)

Information is included on classification of protective installations, selection of class of protective installation, plans for radiation installations, structural details of protective barriers, radiation protection surveys, and operating procedures. Various data and other information are appended (P C H)

1143 UNIQUENESS OF THE MASS-SURFACE RELATIVE TO IRON-56 A M I A W Durnford (Univ of Western Ontario London) Nature 205 789-90 (Feb 20 1965)

The nature of the dependence of the mass fraction on the choice of primary standard was examined and a criterion for the nuclide that would have the least mass fraction when employed as the primary standard was thereby established. Results of calculations showed that use of the nuclide ^{56}Fe as the primary standard would retain the conventional mass numbers, ^{56}Fe is the only primary standard nuclide that would render all mass excesses positive, in this respect it would therefore constitute a unique primary standard (P C H)

1144 THE USE OF SPECIAL UNITS IN IONIZING RADIATION MEASUREMENTS H Rothe (Deutsche Amt für Messwesen und Warenprüfung, Berlin) Kernenergie, 7 828-31 (Dec 1964) (In German)

Recommendations of the Office for Measuring and Materials Testing, Berlin G D R, for defining the units Roentgen, rad, and Curie are given (R E U)

1145 RADIATION PROTECTION IN CANADA PART VII SETTING STANDARDS FOR RADIATION PROTECTION F D Sowby Can Med Assoc J 92 505-7 (Mar 1965)

The recommendations of the International Commission on Radiological Protection have as a basic objective the limitation of radiation dose to "that which involves a risk that is not unacceptable to the individual and to the population at large." The problem is to decide what degree of risk is acceptable in relation to the benefits of a practice that

necessitates radiation exposure. Rough estimates of some of the risks of exposure to radiation were made and compared with some of the other risks tolerated by society. On the assumption that it would be possible to make quantitative assessments of both the benefits and the risks the question is raised as to how and by whom an appropriate balance should be made (auth)

1146 RADIATION PROBLEMS Charles E Roessler (State Board of Health, Jacksonville, Fla.) J Florida Med Assoc 51 300 (May 1964)

Measures taken by the Florida State Board of Health for controlling population radiation exposure are discussed. Included in the program are consultations with users of x-ray machines to assist them in reducing exposure and surveillance of radioactivity in air, precipitation, milk water, and other environmental materials (H G D)

1147 INTERNAL CONTAMINATION STANDARDS H Jammet (French Atomic Energy Commission Fontenay-aux-Roses, France) p 591-611 of "EUR-2210" (In English and French)

The actual establishment of internal contamination standards and their practical application are discussed. The normal procedure for the maximum permissible doses fixed very generally for all types of irradiation for deriving the maximum permissible concentrations and also the obstacles to be overcome in the field of either dosimetry mathematical models or the biological factors to be chosen are described (P C H)

1148 REGULATORY STANDARDS FOR IRRADIATED FUEL SHIPMENTS A E Aikens and B G Lindberg 12p (CONF-650103-11)

From International Symposium on Packaging and Transportation of Radioactive Material Albuquerque N Mex

The design and performance standards for containers for shipping irradiated fuels as set out in the AEC's transportation regulations are considered. The design standards specify minimum numerical limits or factors of safety which must be observed during the design of the package. The performance standards essentially specify safety requirements which must be met during postulated normal or accident test conditions. The things an application for license should contain in order to show that the regulatory requirements are met are listed. The regulatory safety assessment is discussed. Three repetitive problem areas were: an adequate determination of failure temperature of the cask's contents, the extent of cask damage due to impact and the extent of cask damage in a severe thermal environment (M C G)

1149 ISTHMIAN CANAL—THE POTENTIAL HAZARDS OF NUCLEAR EXCAVATION John Hurd Nucl News, 8 No 5, 14 17 (May 1965)

Nuclear excavation of a sea level Isthmian canal would be accompanied by three potential hazards: radioactivity, air blast and ground shock. The nature of the hazard, safety standards selected and measures taken to meet the standards are outlined (H G D)

1150 RADIATION PROTECTION IN CANADA PART VII THE ROLE OF INDUSTRIAL HYGIENE IN THE FIELD OF RADIATION PROTECTION N Williams (Dept of Public Health Regina Saskatchewan) Can Med Assoc J 92 993 1001 (May 8 1965)

The main emphasis of a provincial radiation protection program is on ionizing radiation produced by machines although assistance is given to the Federal Radiation Protection Division in its program relating to radioactive substances. The basis for the Saskatchewan program of radiation protection is the Radiological Health Act 1961. An important provision of the Act is annual registration of radiation equipment. The design of the registration form encourages a do-it-yourself radiation and electrical safety inspection. Installations are inspected every two years by a radiation health officer. Two hundred and twenty-one deficiencies were found during inspection of 224 items of radiation equipment, the commonest being failure to use personal film badges. Insufficient filtration of the beam, inadequate limitation of the beam and unnecessary exposure of operators were other common faults. Physicians have a responsibility to weigh the

potential advantages against the hazards when requesting radiographic or fluoroscopic procedures (auth)

1151 THE ROLE OF THE ATOMIC ENERGY COMMISSION IN DEVELOPING RADIATION PROTECTION STANDARDS Forrest Western (Atomic Energy Commission Washington, D C) p 73-5 of "Proceedings of the American Medical Association Congress on Environment Health Problems" Chicago, American Medical Association 1964

The Atomic Energy Act specifications for radiation protection were interpreted by the USAEC as including broad responsibilities in all phases of radiation protection including the development of the various kinds of information used in the formulation of standards. In addition, the AEC required radiation protection standards directly applicable to its own activities including the operation of nuclear energy facilities and the regulation of the private use of nuclear materials and their radioactive byproducts. Biological research programs were started to study the effects of radiation on living tissue and to establish the relative effectiveness of equal doses of x rays, alpha rays, beta rays and neutrons in producing various kinds of biological damage. Ways in which the activities of the AEC relate to radiation protection standards for industry, medicine, and research are discussed (H G D)

1152 A CONSIDERATION OF BASIC RADIATION PROTECTION GUIDES APPLICABLE TO THE GENERAL POPULATION Paul C Tompkins (Federal Radiation Council Washington D C) p 76-81 of "Proceedings of the American Medical Association Congress on Environment Health Problems" Chicago, American Medical Association 1964

Trends in the development of basic standards for radiation protection applicable to the general population are considered. The introduction of the non-threshold statistical risk concept had the effect of putting scientific judgments of dose-effect relationships and political judgments concerned with national welfare on a somewhat equal footing particularly when exposure of the general population is a factor in proposing basic radiation protection guides. Standards and judgments employed by the ICRP and the FRC in establishing radiation protection guides are discussed (H G D)

1153 IAEA LABORATORY ACTIVITIES SECOND REPORT (International Atomic Energy Agency Vienna (Austria)) Technical Reports Series No 41 1965 113p STI/DOC/10/41 \$1.00, \$21.-, 6/-stg, £ Fr 4, DM 3.20 (IAEA)

Developments and scientific work during 1964 at Vienna and Seibersdorf are described. Work in physics, chemistry, low-level radioactivity, agriculture and medical physics is summarized. Production and analysis of tritium are described along with electronic and mechanical developments. Tables of isotopic standards, analytical results and other measurements are included. Activities at the Monaco Marine Radioactivity Laboratory are reported along with those at the Trieste Theoretical Physics Center and the Middle Eastern Radioisotope Center for Arab Countries (J R D)

1154 RADIOACTIVE MATERIALS IN PHARMACY V. LEGAL REGULATIONS Spierdijk P (Rijks Instituut voor de Volksgezondheid Utrecht) Pharm Weekblad 98 1137-46 (Dec 6 1963) (In Dutch)

The legal foundation of regulations governing the use of radioactive isotopes and related materials in the Netherlands is briefly reviewed. Particular attention is directed to the pharmacist and the administration of radioactive materials to patients. A set of examples illustrating mathematical calculations for practical examples is given in this connection. The following standards taken from the American Pharmacopoeia (16th edition) are given: ^{32}P -sodium radiophosphate solution, ^{51}Cr -sodium radiochromate injection, ^{60}Co -radiochromic cobalamin solution, ^{131}I -radioiodinated serum albumin, sodium radioiodide capsules, sodium radioiodide solution, ^{198}Au -radiogold solution. The preparation of the nuclides and preparation of the compound for medical use is listed together with the doses for diagnostic and therapeutic uses where applicable. For the I compounds special mention is made for methods of measuring the radioactivity of samples (BBB)

1155 PROTECTION AGAINST IONIZING RADIATIONS IN NUCLEAR INDUSTRIES Deforge A. Protect Securite Hyg Trav, 44 No. 6, 5-30 (June 1964) (In French)

The dangers of radioactive materials were studied. Various aspects of the safety program employed by industries controlled by the French Atomic Energy Commission reviewed include: establishment of maximum permissible radiation levels, elaboration and application of regulations, education of personnel, warning signs, and use of suitable equipment for the prevention of radiation and contamination. Responsibility for technical safety measures falls on heads of departments with the assistance of safety engineers and other specialists. A number of safety organizations also give assistance to the French Atomic Energy Commission. Finally, a number of measures for the protection of personnel and equipment are reviewed. Descriptions of monitoring equipment are presented in an appendix (auth)

1156 RADIATION PROTECTION PROGRAM FOR A 10-Mev LINEAR ACCELERATOR. Bozich, Thomas A (Air Force Hospital, Hill AFB, Utah). Am Ind Hyg Assoc J, 26 311-17 (May-June 1965).

The procedures adopted in establishing a radiation protection program for a 10 Mev linear accelerator employed for industrial radiography are described. The program included calculation of the facility modifications required to provide adequate biological shielding as well as a complete survey after the modifications were accomplished to ensure their adequacy. The average effective energy of the x radiation at various areas was also determined (auth)

1157 DETERMINING INDUSTRIAL HYGIENE REQUIREMENTS FOR INSTALLATIONS USING RADIOACTIVE MATERIALS Brodsky Allen (Univ of Pittsburgh) Am Ind Hyg Assoc J 26 294-310 (May-June 1965)

A set of guidelines is proposed as an aid in determining the specific facilities, equipment and procedures required for operations involving radioactive material. The guidelines are centered around a tabulation that groups the commonly used radionuclides into eight groups corresponding to the relative magnitudes of their maximum radiotoxicities and then presents curie quantities above which the need for various safeguards should be examined. The eight groups of radiotoxicity are chosen to correspond to the eight orders of magnitude over which the estimated maximum doses per curie range for the various nuclides when they are delivered in a single intake by inhalation (auth)

1158 STANDARDS OF RADIOACTIVITY Campion P J, Williams A (National Physical Lab Teddington Middx Eng) Health Phys 11 769-72 (Aug 1966)

It is important that the certificates which accompany standards of radioactivity should contain as much of the relevant data as possible. The information that a supplier can reasonably be expected to give is discussed and illustrated by reference to the concepts used at the National Physical Laboratory (auth)

1159 TRANSPORTING RADIOACTIVE MATERIAL Wilson E J New Scientist 126 522 (May 20 1965)

New international regulations on safety precautions that form the basis of national regulations for radioactive consignments by land, sea and air are discussed. Factors considered in drafting the new standards were containment, shielding, criticality and heat emission (H G D)

1160 (NP 15183) BACKGROUND MATERIAL FOR THE DEVELOPMENT OF RADIATION PROTECTION STANDARDS. PROTECTIVE ACTION GUIDES FOR STRONTIUM-89, STRONTIUM-90 AND CESIUM-137 Report No. 7 (Federal Radiation Council Washington, D C) May 1965 44p GPO 5030 cy

Information is presented for guidance in situations involving contamination of the environment by ^{89}Sr , ^{90}Sr and ^{137}Cs . Both acute localized contamination in which protection will be necessary to avoid exposure of the population and widespread generally increasing low level contamination such as from stratospheric fallout that causes a certain amount of radioactive materials by large numbers of people and populations are considered. The transmission of radioactive material from the atmosphere through food chains to man is outlined and biological risk dosimetry and protective measures are discussed. It is concluded that in the event of an acute contamination event

protective actions taken within 2 days will avert 90% of the projected intake while protective actions initiated at approximately 2 weeks following the contamination will avert 50% of the projected intake. A review of data on radioactivity in food from stratospheric fallout in the U.S. in 1965 led to the conclusion that the health risk from radioactivity in food over the next several years will be too small to justify protective actions to limit the intake of radionuclides either by diet modifications or by altering the normal distribution and use of foods, particularly milk and dairy products. (C.H.)

1161 THE EFFECT OF IONIZING RADIATION ON THE AIR CONTENT OF INDUSTRIAL PREMISES Dmitriev, M. T. (Scientific Research Inst. of Hydrometeorological Equipment Moscow) *Gigiena i Sanit.* No. 4, 39-44 (Apr. 1965). (In Russian)

A study was made of processes leading to the production of nitrogen oxides and ozone in the air under the action of ionizing radiation and neutrons. A comparison of the data obtained with concentrations of nitrogen dioxide and ozone gases formed in the air under natural conditions made it possible to set the maximum permissible doses of ionizing radiation and that of the integral neutron current in the air of industrial premises. The standard values of ventilation required in industrial premises containing radioactive isotopes are given. (auth.)

1162 PHILOSOPHICAL INFLUENCES ON RADIATION PROTECTION STANDARDS Taylor, Lauriston S. (National Bureau of Standards, Washington, D.C.) *Health Phys.* 11, 859-64 (Sept. 1965)

Radiation protection philosophies and practical developments derive from a mixture of technical facts and numerous non-technical influences involving judgment and educated opinion. Various technical developments and various segments of our society each exert their own influence on our radiation protection standards. A complex of national and international bodies, each having its own special interests, has served to complicate rather than simplify the philosophical approach to the problem of maximizing man's protection against the hazards of radiation. Whether this redundancy of radiation standards making activity is necessary or even good is still an open question. (auth.)

1163 GUIDES, STANDARDS AND REGULATIONS FROM THE FEDERAL RADIATION COUNCIL POINT OF VIEW Palmiter, C. C. Tompkins, P. C. (Federal Radiation Council, Washington, D.C.) *Health Phys.* 11, 865-8 (Sept. 1965)

The Federal Radiation Council, established in 1959, advises the President with respect to problems in which radiation is a factor and recommends to the President guidance for Federal agencies in their radiation protection programs. In the development of radiation protection guidance it is necessary to consider the balance between the need for radiation programs and the possible effects on the health of the individual and the public. This involves fundamental determinations of public policy influencing national security, economics and other factors. In a specific case where this balance is achieved, the guide which is developed does not and cannot set a line which is safe on one side and dangerous on the other. Guidance for protective programs to reduce exposure from radioactive materials after they are in the environment must consider any health benefit associated with the available reduction in exposure and the overall impact on the program. The decision to implement a protective action program must consider such factors as the resulting exposure if no action is taken, how much exposure can be reduced by taking the action, the difficulty of making the action effective, and possible risks to health, direct or indirect, that may be associated with the action itself. Judgment and discretion in the application of any radiation protection guidance are necessary to assure in a reasonable manner the attainment of the goal of protecting man and also realizing the benefits from the uses of ionizing radiation. (auth.)

1164 (CONF-650616-5) DEVELOPMENT OF SAFETY PERFORMANCE CRITERIA AND TESTS STANDARD FOR RADIOISOTOPE SEALED SOURCES AND DEVICES Hitch, James W. (Division of Isotopes Development (AEC) Washington, D.C.) [1963]. 12p. Dep. mn, CFSTI \$1.00 cy, \$0.50 mn.

From Health Physics Society, Annual Meeting, Los Angeles

The Atomic Energy Commission, in recognizing the ever increasing use of radioisotopes, also recognizes the increased possibility of the accidental release of radioactive materials to the environment through fires, collisions, etc. Accordingly, a safety testing program has been initiated to develop a technical basis for safety performance standards. The program is aimed at preventing mishaps during the many types of applications and associated handling procedures for radioactive materials and/or isotopic devices. The tests are designed to provide information for more accurate assessment of the engineering safeguards for control of the risks involved in permitting wider beneficial usage. This information should assist the manufacturer in designing more reliable equipment and assist regulatory groups in establishing safe yet reasonable safety standards. Equally important, the public will be more assured that isotope equipment is built to meet carefully developed safety standards. The classification of sources within a performance rating system, together with a companion system for classification according to application, is described. The development of specially designed radioactive materials for selected applications, and the type of tests necessary to assure that these desired standards are met, are also briefly described. (auth.)

1165 (SC-RR-65-98 pp 32-44) PACKAGING STANDARDS Appleton, G. J., Servant, J. Y.

The two standards of packaging, Type A and B, are discussed. A review is given of the research conducted to make the standards for Type A and B packaging more objective. After a consideration of normal and accident conditions in the transport environment, mechanical and physical tests for prototype packages of Type A and B are discussed. It is pointed out that the revised IAEA regulations no longer contain reference to normal transport or maximum credible accidents, but instead define Type A and B packages in relation to tests. (D.L.C.)

1166 (SC-RR-65-98 pp 45-54) REGULATORY PACKAGING STANDARDS Barker, Robert F. Hopkins, Donald R.

A discussion is presented of the transport regulation recommended by IAEA and of these proposed for use with in U.S. The principles involved in the proposed AEC regulations are defined. The transport of fissile materials is considered in some detail. (D.L.C.)

1167 SAFETY IN HANDLING FISSIONABLE MATERIALS Callihan, Dixon. (Oak Ridge National Lab., Tenn.) Johnson, E. B. *Mag. Std.* 36, 81-4 (Mar. 1965).

Prevention of nuclear chain reactions in handling, storing, processing, transporting, and treating fissionable nuclides outside reactors is the purpose of a new safety standard. The standard presents generalized criteria on which to base design of equipment and processes for handling fissionable materials. It also references literature that provides solutions to specific problems. Prevention of unintentional chain reactions is important because the energy released in the reaction, principally as heat and radiation, might be lethal to nearby personnel, cause property damage, or interrupt process schedules. (*Public Health Eng. Abstr.* 45, No. 6 (June 1965))

1168 FEDERAL RADIATION COUNCIL GUIDES AND OTHER EXPOSURE STANDARDS Grendon, Alexander. (Univ. of California, Berkeley) *Am. J. Public Health* 55, 738-47 (May 1965)

The first staff report of the Federal Radiation Council, published in May 1960, dealt with basic radiation protection standards applicable to the normal peacetime uses of radiation that affect the exposure of the civilian population. The concepts on which this report is based are reviewed with emphasis on recommendations of the International Council of Radiation Protection and AEC standards of radiation exposure and the corresponding allowable concentration of radioisotopes in air and water. Recommendations as to the control of the intake of certain isotopes such as ^{89}Sr , ^{90}Sr , and ^{131}I are discussed. (C.H.)

1169 INDUSTRIAL USES OF IONIZING RADIATION Eisenbud, Merrill. (New York Univ., New York) *Am. J. Public Health* 55, 748-59 (May 1965).

Industrial uses of nuclear energy are discussed in terms of the current status and future possibilities. It is pointed out that more is known about the safe handling of nuclear

materials, processes, and products than is known about many other substances and processes in our environment. Applications of radioisotopes such as ^{238}Pu , ^{90}Sr , and ^{137}Cs as sources of heat for the generation of small amounts of electrical power and possible applications of isotopic power units are reviewed. The present status of nuclear energy as a source of power is reviewed and the operation of the 29 nuclear power plants in use at present is discussed. Emphasis is placed on standards of safety in modern technology. (C.H.)

1170 ON THE ^{90}Sr CONTAMINATION OF TISSUE AND A STANDARD DIET. Pribilla, O.; Mutschke, U. (Universitaet, Kiel). *Klin. Wochschr.*, 43: 690-4 (June 15, 1965). (In German).

Extensive data are given on radioassays for Sr in human bone and soft tissue (including placenta, testis, and blood) and of diets covering the period from 1958 to present. Since July, 1962 a standard diet, including beverages and milk, has been analyzed for its ^{90}Sr and ^{89}Sr content. A considerable increase of ^{90}Sr contamination in the diet was observed. A ^{90}Sr level of 60 pC/day was found to be the average for 1963. The increase of the ^{90}Sr content in the diet has, after resumption of the atomic bomb tests in the autumn of 1962, been accompanied by a considerable increase of the ^{90}Sr content in human bones and tissues. At the commencement of 1964 the values for placenta were over 4 pC/g Ca and for bones of newborn 3 pC/g Ca. In radioassays of human plasma made in Kiel, the ^{90}Sr content rose from 0.10 pC/l (0.9 pC/g Ca) in Oct. 1961 to 0.35 pC/l (4.2 pC/g Ca) in Oct., 1963. In the same period the ^{90}Sr content of human testis rose from 0.15 pC/kg fresh weight (1.6 pC/g Ca) to 0.61 pC/kg (3.3 pC/g Ca). Considerable amounts of other data are also tabulated. (BBB)

1171 STANDARDS OF ACTIVITY. Newbery, G. R. Amersham, Eng., The Radiochemical Centre, 1965. 27p.

Factors governing the supply of specially measured and certified radioactive material are discussed. Types of standards available, certification, use of standards of activity, absolutely standardized solutions, reference solutions, other standardized solutions, and measurement techniques are considered. (M.C.G.)

1172 (JPRS-31993) REGULATIONS PERTAINING TO WORK WITH IONIZING RADIATION SOURCES. Translations from Sluzbeni List SFRJ, No. 31, 1198-1205 (July 14, 1965). 26p. (TT-65-32487). CFSTI \$1.00 cy, \$0.50 mn.

Regulations for working with sources of ionizing radiation in Yugoslavia are presented. Standards are discussed for health examinations and conditions, permissible doses, professional training, and operation and use of sources exceeding designated limits of activity. (H.G.D.)

1173 INTERNATIONAL AND NATIONAL RECOMMENDATIONS, NORMS, GUIDES, ETC. FOR PROTECTION AGAINST IONIZING RADIATION. Rodriguez, Eduardo Ramos (Junta de Energia Nuclear, Madrid). *Energia Nucl. (Madrid)* 9: 185-99 (May-June 1965). (In Spanish).

The evolution of standards in protection against ionizing radiation is briefly indicated. The major recommendations with respect to the lesions of a somatic character, lesions of a genetic character, critical organs, permitted doses, categories of exposure, reduction of the maximum permissible dose, and time interval between permitted doses are summarized. (J.S.R.)

1174 (JPRS-31646) STANDARDS OF RADIATION SAFETY. Kalaydzhev, V.I.; Popov, Iv. Translated from *Durzhaven Vestn.*, No. 59, 2-6 (June 27, 1965). 22p. (TT-65-32141). CFSTI \$1.00 cy, \$0.50 mn.

Standards of radiation safety were developed on the basis of the standards adopted in 1964 by the member countries of the Council of Mutual Economic Cooperation. These standards include the maximum permissible doses of external and internal irradiation and maximum permissible concentrations of radioactive substances in the water and in the air. These standards are listed. (M.O.W.)

1175 ^{60}Co (3000 C) STANDARD γ -RAY IRRADIATION FACILITIES AND MEASUREMENTS OF DOSE RATES DISTRIBUTIONS. Moriuchi, Yasuyuki; Takebe, Masahiro. *Denki Shikensho Iho*, 29: 315-23 (Apr. 1965). (In Japanese). Necessary conditions for the establishment of exposure standards whose intensities are higher than 10^3 R/hr are

described. A γ -ray irradiator of ^{60}Co (about 3 kC) which has been set up at the Tanashi Branch of Electrotechnical Laboratory is described together with its irradiation room, and its attached equipments. The results of measurements of leakage or scattered γ -ray dose rates distributions inside or outside of this room are also described. The γ -ray source which is set in the lead vessel 1.5 m above the floor level can be issued horizontally through the shutter hole. If the horizontal γ -ray beam flux of about 0.03 steradian collimated by the shutter hole is used, the so-called inverse square law is established within $\pm 0.3\%$ of relative accuracy in the distance of about 1 to 7 m from the source. Under these conditions, the standard γ -ray field of any intensity from about 400 R/min to 0.8 R/min is easily available. (auth)

1176 IMPROVING ECONOMY WITH THE USE OF STANDARDIZED, MOVABLE, IN-CELL BOXES, AND THE DECONTAMINATION OF THEIR EQUIPMENT AT THE CENTRAL DECONTAMINATION FACILITY. Brinkmann, G.; Schenk, W.; Schulz, W.; Stocksclaeder, F. (Kernforschungsanlage, Juelich, Ger.). pp. 653-66 of International Symposium on Working Methods in High Activity Hot Laboratories. Vol. II. Paris, Organization for Economic Cooperation and Development, 1965.

When a nuclear research center has several hot laboratories, all of which use in-cell boxes, it is desirable to standardize the cells and boxes as far as possible in order to achieve maximum economy, efficiency, and convenience. The principles of planning laid down at KFA-Juelich, in connection with the construction of several plants, are discussed. The advantages are enumerated and the conditions, which must be observed during planning, are described. The decontamination facility is also described. A manipulator exchange technique is discussed. (auth)

1177 ON THE INDIVIDUAL DOSIMETRIC CONTROL TECHNIQUE. Korenkov, I. P.; Golikov, V. Ya.; Sobolevskii, M. A. (Medical Inst., Dept. of Radiation Protection, Moscow). *Gig. Sant.*, No. 8, 67-71 (Aug. 1965). (In Russian).

The health protection laws concerning operations with radioactive materials and other sources of ionizing radiation require that the institutions in which such work is carried take steps for the effective dosimetric control of the operations. This requires individual monitoring of the personnel. Data obtained by means of the usual fixed and portable instruments placed in work areas are not sufficient for this purpose, personal meters must be used to determine the integral dose to the critical organs and the type of radiation involved. Ionization chambers, photographic films, and thermoluminescent aluminophosphate glasses are used mostly for this purpose, the actual method depends primarily on the type of radiation expected and its range. For emergency use, dosimeters with direct reading are most suitable. Correct positioning of the meters on the body of the workers is important, errors are mostly due to poor placement and to improperly chosen reading period of the instrument. The self-discharge characteristics of the instruments used must be known and a calibration program must be instituted. Upon advice of the medical department, the management of the institution must decide on the basis of the dose data obtained whether to authorize continued work of an individual in a radiation zone. (TTT)

1178 (NP-15451) L'APPLICATION DES NORMES SANITAIRES EN MATIERE DE PROTECTION RADIOLOGIQUE. (Application of Sanitary Standards in the Matter of Radiological Protection). Jammet, Henri (Paris Univ. (France). Institut de Droit Compare). 1965. 33p. Dep. mn.

The standards for radiological protection set up by the ICRP and their implementation by signatory nations, particularly France, are indicated. The classification of radiations and the reference doses are given. The regions of application and health standards for each are summarized. The administrative control for the enforcement of regulations enacted is considered. In conclusion, the problems of transport, wastes, and fallout are discussed. (P.C.H.)

1179 (ORNL-TM-1304) A STANDARD SURFACE FOR FISSION PRODUCT DEPOSITION EXPERIMENTS. Browning, W. E. Jr.; Davis, M. E. (Oak Ridge National

Lab., Tenn.), Oct. 29, 1965. Contract W-7405 eng-26. 20p. Dep. mn, CFS11 \$1.00 cy \$0.50 mn.

A standard surface is recommended for use in the USAEC Nuclear Safety Program to provide a basis for comparison of fission product deposition between different experiments and by different experimenters. Precautions are discussed relative to the use of such a standard and to the interpretation of results. Type 304 stainless steel strip with number 1 finish (cold rolled and annealed and pickled) produced according to ASTM Specification A-240 should be used. This material should be cut into coupons degreased pickled one hour with occasional stirring in an aqueous solution of 3 wt % HF and 20 wt % HNO₃ at room temperature rinsed with distilled water and heated for one hour at 600°C in a slowly moving air stream. Extreme care should be taken to see that the coupons are not contacted by bare hands after beginning this surface preparation. (auth)

1180 (LGR-4(Suppl 1)) RADIOLOGICAL HEALTH MANUAL FOR THE EXPERIMENTAL GAS-COOLED REACTOR RADIATION PROTECTION STANDARDS AND REGULATIONS (Tennessee Valley Authority Oak Ridge, Tenn.) 1965 Contract AT(40-1)-2742 28p Dep. CFS11 \$1.00 cy \$0.50 mn

Health physics aspects for radiation protection in association with the EGR are presented. Regulations and standards are listed. (PCH)

1181 (LA-DC-6827) DESIGN AND OPERATIONAL RADIATION SAFETY CRITERIA FOR MANNED SPACE FLIGHT Langham, Wright H. (Los Alamos Scientific Lab Univ. of California, N. Mex.); Brooks, Phillips M. (McDonnell Aircraft Corp., St. Louis, Mo.); Grahn, Douglas (Argonne National Lab., Ill.) [1964]. Contract W-7405-eng-36 262p Dep. mn, CFS11 \$6.00 cy, \$1.25 mn.

A study to derive criteria for consideration of man's response to space radiation exposure so that radiation risks may be taken into account, during spacecraft design and operational planning phases along with the other inherent hazards of manned space flight is presented. The only basis for derivation of such criteria is the vast amount of radiation data on animals and occasionally man. The space radiation environment is discussed in some detail. A review of known biological effects of ionizing radiation is presented. Applications of these results to space flight operations are discussed. (MOW)

1182 SOME PROBLEMS IN THE APPLICATION OF ICRP MAXIMUM PERMISSIBLE LEVELS FOR OCCUPATIONAL EXPOSURE. Dunster, H. J. (United Kingdom Atomic Energy Authority, Harwell, Eng.). Health Phys., 12: 77-82 (Jan. 1966).

The problems are discussed from the standpoint of the interpretation rather than the implementation of ICRP recommendations. It is suggested that it would be useful to consider the recommendations in two distinct groups. The first group would comprise recommendations dealing with fundamental matters directly affecting people such as maximum permissible organ doses. These would be regarded as mandatory. The second group would contain the more general recommendations dealing with the workers environment and with the organization of protective measures. These could be treated as general guides and interpreted with flexibility. Suggestions are made for changes in the fundamental recommendations that would simplify their practical use. Emphasis is placed on the need to depend more on the professional judgment of the health physicist and medical officer and less on a rigid form of recommendation which can be interpreted legalistically. (auth)

1183 THE EVOLUTION OF THE ACCURACY OF ISOTOPIC ANALYSIS BY THERMAL IONIZATION FROM 2 PERCENT TO 0.02 PERCENT. Shields, W. R. (National Bureau of Standards, Washington D. C.). Vienna International Atomic Energy Agency 1965 Preprint N. SM 67/41 13p. (CONF 650803-44). ORINS

From IAEA Symposium on Nuclear Materials Management, Vienna

The parameters that affect the precision both internal and external of an isotopic analysis were studied. The magnitude of the effects of some of these parameters on the analysis of transuranic elements is shown. The effects of pH, concentration and composition on purity on an anal-

ysis are discussed. By changes in the analytical method or by modification of the mass spectrometer the magnitudes of the effects can be altered from a point at which the bias terms are generally additive to one at which they are compensating. Provable accuracy statements are contingent on identification and control of all bias factors including those involved in sample preparation and analytical procedure as well as those involving the collector system and measuring circuit. A table of the best estimates of the isotopic compositions of 16 uranium isotope standards distributed by the National Bureau of Standards is presented. The current level of analytical proof of these values is given along with a discussion of the work (in progress) that is necessary to change the analytical precision statements to accuracy statements. (auth)

1184 RADIOECOLOGY AND RADIOLOGICAL PROTECTION. Michon, G. (Cl. A. Paris), Energie Nucl., 333-9 (Sept.-Oct. 1965). (In French).

The basic standards of radiological protection are shown to be not directly applicable to certain practical aspects of population protection, especially in that which concerns environment contamination. It is possible (by using the same reasoning used to define the maximum admissible concentrations of air and water consumed by man) to define the maximum quantities and concentrations in a nuclear environment. Instead of using biological constants inherent in man it is necessary to define ecological constants which are described in general for certain types of radioactive effluent disposals. (auth)

1185 NUCLEAR SAFETY. Volume 6 Number 1. Cottrell, Wm. B. Jordan, W. H. (eds.). Contract W-7405 eng-26. One of the five Quarterly Technical Progress Reviews published for the Division of Technical Information USAEC Oak Ridge National Lab., Tenn. Summer 1965. 165p. GPO \$0.70 Domestic \$0.90 Foreign.

Information on nuclear safety is presented in 20 sections. Separate abstracts were prepared for 11 of these. The section for which no abstract was prepared is concerned with a review of publications related to radiation protection standards, a symposium on pickling and transportation of radioactive materials, and power reactor siting. (JRD)

1186 THE ADMINISTRATION OF RADIATION SAFETY AT HANFORD. Keene, V. R. (General Electric Co. Richland Wash.). Nucl. Safety, 6: 343-3 (Summer 1965).

Methods used in administering radiation safety at Hanford from 1947 to 1965 are described. (JRD)

1187 UNITED STATES AND SOVIET UNION WASTE-DISPOSAL STANDARDS. Parker, F. L. Nucl. Safety, 6: 433-6, 439-40 (Summer 1965).

The standards for waste disposal in the two countries are compared. Disposal of liquid, gaseous and solid wastes is discussed along with findings and conclusions. (JRD)

1188 PROGRESS AND PROBLEMS IN RADIATION STANDARDS AND RADIOACTIVE WASTE DISPOSAL. Ramey, James T. Nucl. Energy, 333-41 (Nov.-Dec. 1965).

The development and application of radiation standards are reviewed and the specific application of standards in the field of radioactive waste disposal are discussed. Concepts of radiation standards, the role of ICRP and NCRP, the role of the Federal Radiation Council, the role of the Public Health Service, the role of the AEC, the responsibilities of the states, and problems of standards setting are considered. Radiation protection in the AEC radioactive waste disposal program is described. The concepts of concentrate and contain and dilute and disperse for waste disposal are considered. Estimates of wastes from the civilian power program are presented. (MCG)

1189 AIMS AND STANDARDS OF STERILIZATION TREATMENTS. Artandi, C. pp 85-94 of Ionising Radiation for the Sterilization of Medical Products. London, Panel on Gamma and Electron Irradiation, 1965.

Sterilization is discussed with respect to definition, production, measurement, maintenance, and minimization of changes induced in materials by the sterilization process. It is concluded that good manufacturing practices, high professional standards of the manufacturer, efficient

methods of sterilization, and eternal vigilance are prerequisite for superior, sterile products (H.G.D.)

1190 PACKAGING REQUIREMENTS FOR RADIATION-STERILIZED ITEMS. Powell, D. B. pp 95-103 of *Ionizing Radiation for the Sterilization of Medical Products*. London, Panel on Gamma and Electron Irradiation, 1965.

Sterility of a packaged product is dependent on the integrity of the package in which the item is contained and packaging is, therefore, an extremely important aspect to be considered in marketing a presterilized product. One of the most important factors affecting bacterial permeability of packaging materials is the occurrence of pinholes. Ordinarily two or more plies of material are used as coatings or laminations to avert this hazard. When materials are converted into a package, the most important problem is to produce efficient heat seals. Methods for packaging surgical items are illustrated by presenting four ways of packaging a plastic disposable hypodermic syringe and studying the problems encountered. Opening of a sterilized package and the development of printing inks that may be used as indicators in radiosterilized articles are discussed. It is suggested that packaging requirements for various items be considered individually and that the package must be subjected to thorough examination both during production and after marketing (H.G.D.)

1191 STANDARDIZATION OF MEASUREMENTS OF IODINE UPTAKE OF THE THYROID GLAND BY ^{131}I . Gwiazdowski, Bohdan; Chomiczki, Oskar; Gwiazdowska, Barbara; Siwicki, Henryk (Inst. of Physical Oncology, Warsaw). *Nowotwory*, 13: 373-6 (1963). (In Polish).

Methods of standardization for measurements of thyroidal ^{131}I uptake as used in the 24-hr uptake test are discussed. A nationwide evaluation program was conducted. This program uses a measurement set that consists of a plastic neck phantom, ^{131}I vials with standardized dimensions, and a long-lived mock I standard, composed of a mixture of ^{133}Ba and ^{137}Cs in a ratio of 13:1. The activity of the standard is $20 \pm 2 \mu\text{C}$. The methods for measurement that are outlined conform to recommendations of the International Atomic Energy Agency (TCO)

1192 STANDARDISATION OF RADIOACTIVITY. Lowenthal, G. C.; Oakley, A. E. (Australian Atomic Energy Commission). *At. Energy Austral.*, 9: 19-24 (Jan. 1966).

The establishment and maintenance of standards of measurement in the field of radioisotopes are discussed. Establishment of Australian radioactivity standards is described. Standardization procedures include, absolute counting, ionization chamber measurements, and microcalorimetry. Research on electrodeposition techniques, chemical precipitation techniques, and radioisotopic purity is reviewed (M.C.G.)

1193 (RFP-343) DRY BOX GLOVE TESTING AND EVALUATION. Giebel, R. E.; Riegel, R. L. (Rocky Flats Div., Dow Chemical Co., Golden, Colo.). [nd]. Contract AT(29-1)-1106. 3p. (CONF-631112-1). Dep. mn. CFSTI \$1.00 cy, \$0.50 mn.

From Integrated Contractors Materials Meeting, Livermore, Calif.

Studies were made to determine if installations are testing glove boxes or by what criteria they are buying them. Testing procedures developed by Rocky Flats are presented in an attempt to establish a standardized testing procedure and standardized dry box glove specifications (P.C.H.)

1194 FEDERAL RADIATION COUNCIL PROTECTIVE ACTION GUIDES. HEARINGS BEFORE THE SUBCOMMITTEE ON RESEARCH, DEVELOPMENT, AND RADIATION OF THE JOINT COMMITTEE ON ATOMIC ENERGY, CONGRESS OF THE UNITED STATES, EIGHTY-NINTH CONGRESS, FIRST SESSION, JUNE 29 AND 30, 1965. Washington, D. C., Joint Committee on Atomic Energy, 1965. 702p. GPO.

The Subcommittee on Research, Development, and Radiation of the Joint Committee on Atomic Energy, Eighty-ninth Congress of the United States held hearings on June 29 and 30, 1965, on the Federal Radiation Council's Protective Action Guides, as set forth in FRC Reports Nos. 5 and 7. Protective Action Guide was defined as the projected absorbed radiation dose to individuals in the general popula-

tion which would warrant protective action following a contaminating event. Because of the relationship of these guides to fallout, additional information was presented that updated information that had accrued since the 1963 hearings regarding levels of fallout nuclides in the atmosphere, on the ground, and in food chains, with emphasis on ^{137}Cs , ^{131}I , ^{89}Sr , and ^{90}Sr and the special case of contamination of arctic ecology by ^{137}Cs and ^{90}Sr . Actions appropriate to situations involving contamination of the environment by these radionuclides were discussed with emphasis on an acute contaminating event that may result from an accident rather than from a planned program, limitation of the hazard by controls exercised at the source, and means for reduction of a potential hazard after it has been created. Statements of witnesses, additional material inserted in the record, and a subject index are included. (C.H.)

1195 RADIATION PROTECTION IN LAWS, REGULATIONS, AND INSTRUCTIONS. Seelentag, Walter (Bundesgesundheitsamt, Berlin). *Radiologe*, 4: 349-55 (Nov. 1964). (In German).

Radiation protection standards effective in Germany are reviewed historically. The significance of various rules and regulations in the medical and industrial accident and safety fields is discussed. Guidelines that have been provided by international organizations, legal regulation of radiation protection in nonmedical and medical fields, and the fundamental considerations that affect modern radiation protection procedures are considered. The permissible individual radiation doses for occupationally exposed persons and entire populations are outlined briefly (TCO)

1196 COMITE CONSULTATIF POUR LES ETALONS DE MESURE DES RADIATIONS IONISANTES, 5e SESSION, 1964, 28-29 SEPTEMBRE. (Consultative Committee for Standards of Measurement of Ionizing Radiations, 28-29 Sept., 1964). Paris, Gauthier-Villars and Cie, [1964]. 106p. (CONF-640923).

Five reports given at the fifth session are reported. Separate abstracts were prepared for 4 of the 5 papers. (M.C.G.)

1197 U. S. FOOD AND DRUG ADMINISTRATION POLICY ON RADIOPHARMACEUTICALS. Hauser, Julius (Dept. of Health, Education and Welfare, Washington D. C.). pp 689-95 of CONF-651111.

The U. S. Food and Drug Administration policy on radiopharmaceuticals with regard to adulterated and misbranded drugs, new drugs, investigation of new drugs, requirements for tests in humans, new-drug application, and temporary exemption of investigational radiopharmaceuticals are described. The effects of revised AEC regulations on new-drug applications are also discussed. (P.C.H.)

1198 GOVERNMENTAL RESPONSIBILITIES IN RADIOACTIVE DRUGS. Bruner, H. D. (Atomic Energy Commission, Washington, D. C.). pp 697-700 of CONF-651111.

The government is primarily charged with achieving a balance between the conservatism expected of the physician, who is charged with the patient's care, and the requirements of the research investigator eager to acquire new information about man. The licensing and regulatory activities of government take on the function of a stabilizing balance wheel since a regulatory agency must sense and coordinate both the wishes of the public and the needs of the groups for which it is responsible (P.C.H.)

1199 INTERNATIONAL COOPERATION IN RADIO-NUCLIDE MEASUREMENT AT THE B.I.P.M. Terrien, J. (Bureau International des Poids et Mesures, Sevres, France). *Metrologia*, 2: 57 (Jan. 1966).

The urgent need for accuracy and world-wide uniformity in the measurement of ionizing radiations, which gave rise to the creation of a new section at the Bureau International des Poids et Mesures (BIPM) has been met successfully in the field of standardizing radionuclides, as was noted at the meeting of a Working Group in the BIPM lab (September 1965). International agreement among the most advanced standardizing laboratories in the absolute determination of activity standards, in terms of number of disintegrations per sec, is now getting out of the one or two % range, precisions of the order of one part/1000 appear possible in such important cases as thin solid sources of ^{60}Co ,

the decay scheme of which is simple and well known. The results of recent international comparative measurements of the spectra of solutions of ^{54}Mn , ^{60}Co , $^{90}\text{Sr} + ^{90}\text{Y}$, and ^{241}Am were also discussed at the meeting, and agreement was reached on the cooperative work between the national laboratories and the BIPM. This includes a critical study of the recent comparisons and plans for another intercomparison of a standard solution of ^{60}Co for testing the progress which will be made in the operating techniques (BBB)

1200 (CONF-660308, pp 131-42) AEC MATERIALS MANAGEMENT POLICIES. George, Douglas E. (Division of Nuclear Materials Management (AEC), Washington D. C.)

Broad aspects of the AEC's nuclear materials control system are discussed. The specific topics discussed pertain to transfers, records and reports, and procedure manuals (M O W)

1201 (CONF-660308, pp 143-8) AEC REGULATORY PRACTICES AND POLICIES FOR LICENSING PLUTONIUM PLANTS. McBride, J. A. (Division of Materials and Licensing (AEC), Washington, D. C.)

Comments were made on the general criteria used by the AEC Regulatory Staff in the evaluation of license applications covering processing and transportation of plutonium. Because of the unusually high radiotoxicity of plutonium and the pyrophoricity of plutonium metal, particular emphasis must be placed on the applicant's proposed controls over the confinement and containment of the plutonium, and his methods of fire prevention and emergency controls in the event of fire, explosion, or other accidents likely to affect containment adversely (M O W)

1202 SHIPPING IRRADIATED NUCLEAR FUEL SAFELY. Langhaar, John W.; Braidech, Mathew M. Mag. Stand., 36, 279-81 (Sept. 1965).

Preventing public exposure to ionizing radiation hazards in the event that a vehicle carrying spent and irradiated fuel from a nuclear reactor to a reprocessing site is involved in an accident in passing through a populated area is the purpose of a new American Standard. Materials present in such fuel can be harmful if inhaled or ingested or if they expose the body to external radiation. Shipping containers must therefore be designed to contain the fuel components and to provide radiation shielding around the fuel under severe accident conditions. In addition, they must remove the heat generated by fission products and prevent possible accidental rearrangement of the fuel that might result in an uncontrolled nuclear chain reaction. The recommendations in American Standard Guide for Design and Operation of Shipping Containers for Irradiated Solid Fuel from Nuclear Reactors, N5 3-1964, are intended to provide such safeguards. These recommendations include containers for off-plant shipment of irradiated fuel by customary land transportation or by both land and water carriers. Air shipment and shipment entirely by water are excluded (Public Health Abstr.)

1203 X-RAY STANDARDIZATION AND COMPARISON OF THE FINNISH AND SWEDISH X-RAY STANDARDS. Rannikko, Simo, Toivola, Ahti. (Inst. of Radiation Physics, Helsinki). Ann. Acad. Sci. Fenn., Ser. A VI, No. 201, 1-15 (1966).

The Finnish 100 to 300 kv x-ray standard chamber is described. Factors affecting the accuracy of exposure measurements using a parallel-plate free-air ionization chamber are discussed. The maximum disagreement between the Finnish and Swedish x-ray standards was found to be 0.6%. This was well below the value of 1.2%, which is the maximum possible error in the Finnish standard dose measurement (auth)

1204 SECONDARY STANDARDS IN DOSIMETRY. Dutreix, J.; Dutreix, A.; Wambersie, A. (Institut Gustave-Roussy, Villejuif, France). J. Belge Radiol., 49, 157-68 (1966). (In French).

Theoretical, technical, and practical studies were made on secondary standards in dosimetry. Two types are considered suitable for use as secondary reference dosimeters: ionization chamber and chemical FeSO_4 dosimeter. In the problem of estimating the dose absorbed in water, according to the dosimeter indicator, two steps are to be considered: determination of the absorbed dose in the detector, and evaluation of the relation between the dose

absorbed in the detector and in the irradiated medium (water). Theoretical advantages and disadvantages of the ionization chamber and of FeSO_4 are discussed (P C H)

1205 PREPARATION OF RADIOISOTOPES, RADIATION SOURCES, AND LABELED COMPOUNDS IN CZECHOSLOVAK SSR. Chorvat, Karol. (Inst. of Investigation, Preparation, and Utilization of Radioisotopes, Prague). Jad. Energ., 12: 225-7 (June 1966). (In Czech).

The status of the preparation of radioisotopes, labeled compounds, sealed sources, luminous paints, and standards at the Institute for the Investigation, Production, and Utilization of Radioisotopes is described. For evaluation of the evolution of the use of radioactive substances in the Czechoslovakian radioisotope industry, data are reported on the activities, price, number of deliveries, selections, and number of users of radioisotopes. Some information on the production and utilization of radioisotopes in foreign countries is included for comparison (tr-auth)

1206 GUIDELINES FOR RADIATION PROTECTION IN HOSPITALS AND CLINICS. Verslag. Mededel. Betreffende Volksgezondheid, No. 9, 1405-1559 (Sept. 1965). (In Dutch).

The guidelines formulated by the Commission of Health for the utilization of radiation in hospitals and clinics are given (J S R)

1207 (ORNL-TM-626) OPERATING GUIDE FOR RADIOCHEMICAL LABORATORIES AT VARIOUS ACTIVITY LEVELS. Guthrie, C. E.; Beauchamp, E. E.; Corbin, L. T.; Burnett, T. J.; Arehart, T. A. (Oak Ridge National Lab., Tenn.). July 22, 1963. Contract W-7405-eng-26. 7p. Dep. mn. CFSTI \$1.00 cy, \$0.50 mn.

A guide for radiochemical laboratory safety is presented. Various types of laboratory facilities are classified as to the quantity and radiotoxicity of isotopes that may be handled safely. It is pointed out that both radiation and contamination hazards must be considered in the radiochemical laboratory. Approximately 150 radioisotopes are classified as to relative toxicity based on inhalation or immersion hazard when compared to one gram of ^{239}Pu (C H)

1208 PROBLEMS OF RADIATION HYGIENE. Nevstrueva, M. A. Gig. Sanit., No. 12, 3-6 (1965). (In Russian).

Problems of present-day radiation hygiene are reviewed. The determination of standards for various types of ionization radiation in case of their individual action or in combination with environmental factors of a nonradiational nature is considered. Soft x-rays are considered one of the most immediate problems. Various aspects of the problem of the radioactive waste burial are discussed (auth)

1209 REGULATIONS AND STANDARDS FOR THE TRANSPORTATION OF RADIOACTIVE MATERIALS. Haff, K. W.; Horton, T. R. Nucl. Safety, 7, 409-13 (Summer 1966).

A brief summary of current and proposed regulations and standards on transportation of radioactive materials is presented, and an attempt is made to show differences and similarities. Tables listing the agency, the regulation or standard, and a summary of the contents are included (auth)

1210 MEDICAL RADIATION PROTECTION IN NUCLEAR PHYSICS PLANTS IN THE U.S.A. Biese, A.; Peters, Th. (Innenministerium des Landes Nordrhein-Westfalen, Düsseldorf). Zentralbl. Arbeitsmed. Arbeitsschutz, 15: 57-62 (Mar. 1965). (In German).

Standards for protection against radiation as practiced in various nuclear research installations in the United States are reviewed and discussed. The information presented resulted from a survey trip through the installations. Installations included the Atomic Energy Commission, Washington, D. C., the nuclear power plant of the Consolidated Edison Co., Indian Point, N. Y., the Dresden power plant of the Commonwealth Edison Company, Morris, Illinois, Vallecitos Atomic Laboratory, General Electric Co., San Jose, Calif., John Jay Hopkins Laboratory, General Atomic Division of General Dynamics, San Diego, Calif., Atomics International, Canoga Park, Los Angeles, Calif., the National Reactor Testing Station, Idaho Falls, Idaho

and the Yankee Atomic Power Plant Rowe, Miss. Limits of exposure, maximum permissible concentrations and special precautions for protection against high level radiation are reviewed. (BBB)

1211 CODE OF PRACTICE FOR THE PROTECTION OF PERSONS EXPOSED TO IONISING RADIATIONS IN RESEARCH AND TEACHING. London, Her Majesty's Stationery Office 1964. 64p. 4s. 6d.

General principles of radiation protection are discussed in reference to administrative organization, suitability of buildings for work with ionizing radiation, medical supervision of employees, emergency procedures, storage of sealed and unsealed sources, transport of radioactive materials, and disposal of radioactive wastes. Specific guidelines are established for work involving sealed and unsealed sources, x-ray installations, and nuclear reactors and criticality experiments. (H.G.D.)

1212 THE DEFINITION OF DOSE EQUIVALENT, THE REM UNIT, AND THE VALUATION FACTORS. Berger, Hans, Harder, Dietrich, Huebner, Walter, Jaeger, Robert. *Strahlentherapie* 131: 143-9 (Sept. 1966). (In German).

The dose equivalent D_q is the product of the absorbed dose D and a valuation factor q determined by mutual agreement and characterizing the risk from the different types of radiation in radiation protection work. The rem, originally proposed as roentgen equivalent man, serves for stating dose equivalents instead of the rad but is identical to the absorbed dose unit rad. Until now these terms have not been closely defined. In the meantime, however, they have found general acceptance and it is necessary to have them approved as a standard. A specification to this effect will be issued by the German Committee on Radiological Standards in the near future. (auth)

1213 PRODUCTION OF RADIOACTIVE STANDARDS FOR PAPER CHROMATOGRAPHIC SEPARATION. PART 2. SEPARATION OF ^{90}Sr AND ^{90}Y WITH THE HELP OF RING OVENS. Sorantin, H. (Technische Hochschule, Vienna). *Mikrochim. Acta*, No. 6, 957-64 (1966). (In German).

The nuclide pair ^{90}Sr - ^{90}Y was separated into its components on various kinds of paper in the ring furnace through various chemical separatory operations. The fastest separation occurred with 0.1 to 0.2N ammonium thiocyanate solution, the ^{90}Y being retained in the central portion of the paper disk while the ^{90}Sr was concentrated in the outer ring. A reversal was accomplished by sulfate precipitation or extraction with theonitrifluoroacetone (TTA). In these cases the divalent ion remained in the center while the trivalent ion was washed into the ring. The separatory effect was detected autoradiographically through the decrease of the isolated ^{90}Y . The respective activity zones of the separated radio nuclide could be punched out and used as a relative standard. (auth)

1214 PRECISION MEASUREMENTS OF STANDARD GAMMA-RAY ENERGIES. White, D. H., Groves, D. J. (Univ. of California, Livermore). Contract W-7405 eng-48. *Nucl. Phys.* A6702: 453-9 (1967). (UCRL-14996).

Several useful secondary standard gamma-ray energies have been measured with a high resolution Ge(Li) detector. By intercomparing close lying full energy peaks and pair escape peaks, precise energy values are determined. The resulting values in keV, based on the annihilation gamma energy 511.003 ± 0.005 keV and standard gamma energies of ^{182}Ta , ^{192}Ir , ^{198}Au and ^{137}Cs are as follows: ^{141}Ce -145.41 $\pm$ 0.03, ^{51}Cr -320.11 $\pm$ 0.03, ^{65}Zn -438.70 $\pm$ 0.10, ^{60}Co -1173.25 $\pm$ 0.08, ^{22}Na -1274.58 $\pm$ 0.10, ^{41}Ar -1293.76 $\pm$ 0.14, ^{60}Co -1332.56 $\pm$ 0.05, ^{52}V -1434.19 $\pm$ 0.05, ^{124}Sb -1691.24 $\pm$ 0.08, ^{28}Al -1778.70 $\pm$ 0.17, ^{88}Y -1836.17 $\pm$ 0.12. (auth)

1215 ANALYSIS AND CONTROL OF RADIOACTIVE STANDARDS BY USING BETA AND GAMMA SPECTROMETRY. Legrand, J., Brethon, J. P., Fraisse, J., Boulanger, J. P. (CEN de Saclay, Gif sur Yvette, France). Vienna International Atomic Energy Agency 1966. Preprint No. SM-40-34p. (In French). (CONF-661012-18). DIII.

From IAEA Symposium on the Standardization of Radionuclide

Vienna. The following analytical techniques employed to determine the radiochemical and radioisotopic purity of the products used as radioactive standards are described: gamma spectrometry using scintillation counters, beta and gamma spectrometry using semiconductor detectors (silicon and germanium) and control using a two parameter analysis circuit. The data obtained for each of these techniques are processed on a computer. Special methods of calculation and programs were developed, e.g., a least-squares method for complex mixtures and a method of representing total absorption peaks by mathematical functions for finding the areas and separating peaks that are very close together. Precise examples are given for each of the analytical techniques, together with the minimum detectable contents. A number of special cases

are studied in greater detail: measurement of ^{199}Au in ^{198}Au where the content varies according to the irradiation conditions and analysis of the mixture ^{95}Zr + ^{95}Nb and determination of traces of one in the other. It is possible to measure several parts per thousand of ^{95}Zr in ^{95}Nb and vice versa using gamma spectrometry by means of lithium drifted germanium detectors. (auth)

1216 A SUMMARY OF EXPOSURES TO THE OFF SITE POPULATION AS A RESULT OF NUCLEAR REACTOR TESTS CONDUCTED AT THE NUCLEAR REACTOR DEVELOPMENT STATION DURING THE OAK RIDGE NATIONAL LABORATORY (ORNL) Gmelin ALD CONFERENCE.

From Health Physics Society 11th Annual Meeting, Houston, Texas.

A summary of whole body and thyroid exposures to off site five nuclear reactor experiments conducted at ORNL during 1965 is presented. The exposures are compared with the limits for thyroid and it is shown that the exposures are well below the limits. (auth)

1217 (ORNL-4007 pp. 211-41) INTERNAL DOSIMETRY. Snyder, W. S. (Oak Ridge National Lab., Tenn.).

The revision of the standard man is suggested to include the information needed for the estimation of radiation dose, whether from external or from internal sources, to provide an estimate of the variability of dose due to individual differences, and to afford methods of adjusting the estimate to correct for an individual's characteristics. Data are presented on the mass (in g or ml) and the percent of total body of 52 tissues and organs based on a 70 kg man. The revision of the lung model used by ICRP to estimate exposure to an aerosol and to determine maximum permissible concentrations (MPC) for various aerosols is reported. The use of the model in studies on the deposition and clearance of particulate matter from the respiratory tract is discussed and methods and formula for obtaining dose estimates of radioactive aerosols are presented. Phantoms of infants and adults were used to determine variations in the radiation dose ($\beta + \gamma$) from a given unit source of ^{137}Cs in the body of man as a function of body size and position of the source in the body. A three compartment model for iodine metabolism by the thyroid and by the body is presented that is valid radioactive iodine. The use of the mathematical equations was demonstrated by employing ^{131}I as an example. Computer studies are discussed on the linear combination of exponentials representing power functions used to represent data on excretion from and retention in the body of bone-seeking radionuclides. Data are presented on the elemental composition of standard man. The percent by weight and amount in grams of 38 elements in a 70 kg man are given. Diets of teen-age children in several cities of the United States were analyzed for Cs and Rb content. Procedures used for chemical preconcentration plus flame photometry are discussed and results are included from an analysis of ashed biological materials for inorganic elements. (CH)

1218 ALTERATION OF THE HALF DOSE LAYER IN SHORT FOCUS X-RAY THERAPY. Ruderman, A. I., Stavitski, R. V. *Med. Radiol.* 11, No. 8: 38 (Aug. 1966). (In Russian).

Under discussion are the values of the half dose layer of radiation (3.5, 9.0 and 12 mm) as standard for all possible surface localizations subjected to short focus roentgen therapy. The authors propose a technique of determining the regimen of work of the x-ray tube for ensuring the necessary values of the half dose layer of radiation. On the basis of experimental research the authors obtained a table of optimal conditions for the formation of the x-ray radiation beam for the PYM-7 apparatus. (auth)

1219 (EUR-3173 e) IMPROVED METHOD OF QUANTITATIVE AUTORADIOGRAPHY FOR INDUSTRIAL PURPOSES. Matteoli, L., Loggi, P. (Istituto di Ricerche Breda S.p.A., Milan, Italy). Sept. 20, 1966. 64p. Dep. m.

A simple method to get quantitative measurements from autoradiographs was developed. A method has been set up that requires the exposure at the same time and with the same photographic emulsion of standards of radioactivity and of the sample under examination, tagged with the radioactive tracer. On the autoradiographs obtained, the blackening produced by the beta radiation exposure is measured by a microphotometer. By comparison of the photographic densities of the standard and the sample autoradiographs, taking into account the correction factors, a correlation is calculated at first between photographic density and radioactivity of the tracer, then between photographic density and the concentration of the tagged constituent in the sample. Series of radioactivity standards have been prepared for ten beta-emitting radioisotopes; the relative photographic efficiency has been determined so as radioactivity standards of radioisotopes differing from those under examination could be used. Working conditions for reproducible exposures and developments have been deter-

mined, several photographic emulsions have been tested. A method to make thin sections of metals and minerals specimens has been developed. Quantitative autoradiography was used in five studies that are reported as examples of possible applications. They refer to the examination of components liquation in alloys to the tagging of a mineral to the absorption on steel surface of a corrosion inhibitor (auth).

1220 (ORNL-P-2656) RESEARCH SAFETY. Hoy, H. C. (Oak Ridge National Lab., Tenn.). [1966]. Contract W-7405-ng-26. 12p. DTIC.

Problems of protection and safety have arisen with the development of complex research machines at Oak Ridge National Laboratory. The lack of knowledge concerning the operating parameters such as voltages, magnetic forces, vacuum handling ability, and temperature extremes, has contributed to hazards to personnel working with these machines. A set of Electrical Safety Guidelines has been written by research personnel for the various types of equipment used in operations at ORNL. Injuries resulting from electricity are classified into 2 types: shock and radiation. The damage from shock is the result of current passing through or on the surface of the body. Radiation injuries are caused by electromagnetic waves and by visible or invisible light. An outline of electrical safety guides is included. The responsibilities of the supervisor and other personnel are listed. National standards and supplementary standards are given. Power supply protective measures are described. Effects of various current ranges on the heart and respiration are described. The mouth-to-mouth method of artificial respiration is explained. (H. L. W.)

1221 STANDARD MAN IN RELATION TO INTERNAL RADIATION DOSE CONCEPTS. Snyder, Walter S. (Oak Ridge National Lab., Tenn.). Amer. Ind. Hyg. Ass. J., 27: 539-45 (Nov.-Dec. 1966).

The extension of the Standard Man concept insofar as radiation protection is concerned is considered to provide a basis for estimation of dose when exposure of a population is in question. Discussion is organized around three main considerations: data of a physical and chemical nature concerning the principal organs and tissues, data of metabolic nature concerning bodily intake and excretions, and ranges of individual variation that are not uncommon and means of allowing for these differences (auth).

1222 BULLETIN OF THE ATMOSPHERIC RADIOACTIVITY, NO. 44, JANUARY-MARCH 1966. Takai Hoshano Kansoku Seiseki, No. 44, 1-78 (Jan.-Mar. 1966).

Data are reported on the results of routine observations of fallout during the period from January to March, 1966, including measurements of temporary standard samples, U_3O_8 , mean and observed radioactivity in rainwater collected at fixed times daily, radioactivity in airborne dusts, and radioactivity measurements in sea water. (R. C. K.)

1223 LIMITATION OF THE SURFACE CONTAMINATION FOR HANDLING UNPROTECTED RADIOACTIVE SUBSTANCES. Koenig, L. A. (Kernforschungszentrum, Karlsruhe, Ger.). Atompraxis, 12: 555-8 (Nov. 1966). (In German).

The order of magnitude of irradiation due to surface contamination is estimated with regard to the different kinds of exposure. Standard values for the limitation of contamination may be deduced from these evaluations. The inhalation risk following the resuspension in air of loose contamination (bad ventilation being presumed) leads to the most limiting conditions. The evaluations practically lead to the order of magnitude of those standard values, which are already used at some places. The safety of persons handling uncovered radioactive substances depends decisively on the precautionary measures taken, e.g., protective clothing and respiratory protection. Therefore the importance of limiting contamination must not be underestimated. The introduction of new standard values is not considered to be urgent. If they are to be introduced, however, reflections show that it would be sensible to fix these standard values for the nuclides concerned as proportional to the maximum permissible concentrations for respiratory air (auth).

1224 RADIOACTIVITY AND AMBIENT RADIATION. Eugster, J. Naturwiss. Rundsch., 19: 332 (Aug. 1966). (In German).

The problem of whether the activity of a well-defined prepared radioactivity standard might be affected by extremely low, but relatively defined ambient radiation if the exposure was protracted enough was studied. A measured UO_3 preparation was divided into 2 parts. One was placed within an Fe casing with 10-cm thick walls in the Simplon tunnel. The other sample was exposed to cosmic radiation on top of the Jungfrauoch without shielding. The ambient radiation in the Simplon tunnel was $0.2 \pm 3 \times 10^{-2}$ ion pairs/cm³ of air/sec, and on the Jungfrauoch the average was 20 pulses/cm²/sec. Measurements were made with an ionization chamber. The samples were placed on the base of the ionization chamber in the center between the internal electrode and the

chamber wall ~ 3 cm from each. The UO_3 delivered an ionization current with a current equivalent of $1.71 \cdot 10^{-1}$ esu/cm². At 760 mm pressure at 15°C ~ 30 particles/sec were emitted by the sample. From sample I 1.16×10^5 ion pairs were produced along the path of a single α and for sample II 1.27×10^5 ion pairs were produced. In relative units the net ionization effect of the first sample was 239.5 ± 2.5 and that of the second was 289 ± 1.8 . The results indicated that a standard radioactive preparation does not show the same activity if the ambient radiation represents extreme conditions over a long time interval, possibly because of frequent "fissions" related to cosmic radiation. (BBB)

1225 THE MAXIMUM PERMISSIBLE CONTAMINATION OF THE SOIL WITH ^{90}Sr . Reissig, Herbert (Institut fuer Bodenkunde und Standortslhre, Dresden). Wiss. Z. Tech. Hochsch. Dresden, 10: 395-403 (1961). (In German).

Maximum permissible concentrations (MPC) of ^{90}Sr were evaluated for several soil types. The values were based on the MPC of ^{90}Sr for the human skeleton and on data for discrimination between Sr and Ca during passage from soil to man. Several factors that affect the ^{90}Sr concentration of soil were discussed. These included relations of ^{90}Sr in soil and the turnover of ^{90}Sr and Ca in soils, the passage of ^{90}Sr from soils by way of plants and milk to the human skeleton, evaluation of MPC of ^{90}Sr in soils, the effects of the retention of ^{90}Sr on the plant leaf surfaces or cuticles on its MPC, proportionality factors for calculation of ^{90}Sr contamination in plants and milk, and the possible effects of agronomical procedures on the MPC of ^{90}Sr . Generally, the decrease of activity in soil takes place primarily only by way of physical decay. Since the physical decay of ^{90}Sr is slow compared to man's lifetime, other additional measures would be required to reduce concentrations of ^{90}Sr in soils, plants, or milk. This would require addition of K ions to soil, incorporation of Ca compounds in cattle fodder, or removal of ^{90}Sr from milk by ion exchangers. (BBB)

1226 THE RADIUM STANDARD FOR BONESEEKERS. EVALUATION OF THE DATA ON RADIUM PATIENTS AND DIAL PAINTERS. Evans, Robley D. (Massachusetts Inst. of Tech., Cambridge). Contract AT(30-1)-952. Health Phys., 13: 267-78 (Mar. 1967).

The selection in 1941 of 0.1 μg radium as the maximum permissible skeletal burden was based on the then-studied total of about 30 cases. To date approximately 420 radium cases (about two-thirds of whom were dial painters) have been studied at M.I.T. and about 275 additional cases at Argonne National Laboratory. The results from the two laboratories are in good agreement. Approximately 100 of the M.I.T. cases ingested mixtures of ^{226}Ra and ^{228}Ra (MsTh). The MsTh radiation dose can be expressed in terms of the amount of pure ^{226}Ra which would produce the same skeletal dose measured in cumulative rads. The total effect of the mixtures is thus expressed as "pure radium equivalent", or μg Ra (PRE). No clinically significant signs or symptoms have been seen in persons with residual body burdens of less than 0.5 μg Ra (PRE). Above 0.5 μg the incidence and severity of symptoms increases with increasing body burden. The usual clinical sign of osteoporosis is followed by symptoms which include primarily osteomyelitis, spontaneous fractures, osteogenic sarcomas, and carcinomas of the paranasal sinuses or mastoids, all referable to α -ray bombardment of bone or immediately adjoining tissue. In the M.I.T. series there have been no proved cases of leukemia. Out of 81 cases of 0.5 μg Ra (PRE) or higher (up to 44 μg) the M.I.T. series contains 26 cases with osteogenic sarcoma and 7 cases with paranasal or mastoid carcinoma. Within any dose bandwidth, e.g., 2-5 μg Ra (PRE) or 10-15 μg Ra (PRE), the incidence (fraction of cases with sarcoma or carcinoma) is roughly 40 per cent and, within reasonable statistical limits, is the same for all dose levels. The time of onset for sarcomas is 7-43 yr (median 23 yr) after first exposure, for carcinomas it is 19-41 yr (median 34 yr) after first exposure. The M.I.T. and the Argonne groups have jointly developed a semiquantitative method for assigning a numerical "x-ray score" (running from 0 to 45 in the cases studied) as a single parameter describing the effects produced by skeletal irradiation. The dose (PRE)-response (x-ray score) relationships have been studied by computer techniques. A control group of 120 unexposed individuals (matched for age, sex, height and weight with the M.I.T. radium cases) has been studied to determine the x-ray score of a normal population, for comparison with the radium cases. At residual body burdens greater than 0.5 μg Ra (PRE) neither symptoms nor signs (i.e., zero x-ray score) are present in subjects with 2.6 μg Ra (37 yr), 1.3 μg Ra (30 yr), and 1.0 μg Ra (43 yr). At residual body burdens between 0.5 and 0.1 μg Ra (PRE) the M.I.T. series contains 32 symptom-free cases, in 5 of which minimal osteoporotic signs are present, between 0.1 and 0.5 μg Ra (PRE) there are 23 sign-and-symptom-free cases, between 0.05 and 0.01 μg Ra (PRE) there are 84 sign-and-symptom-free cases, below 0.01 μg Ra (PRE) there are 193 such cases. All the radium burdens

reported are the residual body burdens, usually 30–50 yr after radium was taken into the body. The initial or maximum skeletal radium burden was much larger, typically about twenty times the residual burden. Clearly, the present Radiation Protection Guide or standard of a maximum skeletal deposition of 0.1 μg Ra (PRE) appears abundantly safe and conservative. (auth)

1227 RADIOISOTOPE CHARACTERISTICS, MEASUREMENTS, AND STANDARDS. Reynolds, S. A. (Oak Ridge National Lab., Tenn.). *Isotop. Radiat. Technol.*, 4: No. 1, 46–52 (Fall 1966).

The development of techniques and standards for measuring the characteristics, such as half-lives and gamma intensities, of radioisotopes is surveyed. The improvement in accuracy and precision of nuclear measurements is described. The knowledge and methods of today are contrasted with those of 20 years ago (L.C.L.)

1228 RADIATION HAZARDS AND RADIATION SAFETY STANDARDS IN MANNED SPACE OPERATIONS. Schaefer, H. J. (Naval Aerospace Medical Inst., Pensacola, Fla.). *Health Phys.*, 13: 327–43 (Apr. 1967).

Part of the material in this article was presented at the Houston meeting of the Health Physics Society, 28 June 1966.

The natural environment of ionizing radiation in space consists of three components: galactic radiation, trapped particles in the radiation belt, and solar particle beams. Whereas the exposure dose rate for the galactic radiation remains well below 100 mrad/24 hr, dose rates in the radiation belt may exceed 200 rad/hr. Still higher values can occur in solar particle beams. The energy spectra of trapped and flare produced particles are quite similar, exhibiting steep negative flux/energy gradients. As a consequence exposure radiation levels and depth-dose distributions in the body depend sensitively on shielding. The fact that flare events occur essentially at random with only very limited prediction possibilities, together with the fact that space flight is an endeavor of high risk in general, would seem to call for a basically different philosophy of radiation protection in space. Even if one is prepared to allow substantially greater Maximum Permissible Doses (MPD's) or Radiation Protection Guides (RPG's) for manned space operations, the difficulty arises that critical dose levels for incipient deterioration of performance cannot be defined for the unique depth-dose distributions encountered in space radiation exposures. The dosage fields in the body, as they develop from trapped or flare produced particles vary, depending on shielding and spectral type, over a very wide range with Half Value Layers (HVL's) from less than 1-mm tissue to several centimeters. The fact that animal or human data on the effects of such total body exposures are missing constitutes a serious gap in present radiobiological knowledge for assessing the astronaut's exposure status in operational emergencies. (auth)

1229 GERMAN STANDARDIZATION IN RADIOLOGICAL TECHNIQUES, ITS ORIGIN AND DEVELOPMENT. Graf, Herbert (Siemens-Reiniger-Werke AG, Erlangen, Ger.). *Strahlentherapie*, 131: 568–76 (Dec. 1966). (In German).

The Standardization Office of the German Radiological Society in retrospect and its achievements (1927–1940) are discussed. Brief remarks concerning the German Radiation-Standardization Office and the work accomplished by the standardization committee of the electron-medical department of the Electro-Industry Economic Group (1940 to 1945) are given. A description of the founding of the Committee on Radiological Standards of the German Standardization Commission, in cooperation with the German Radiological Society in 1951, its structure and its development up to the present time is also given. (auth)

1230 PHYSICAL IDEAS AND QUANTITIES IN THE DOSIMETRY OF IONIZING RADIATION. Fraenz, Hans (Physikalisch-Technische Bundesanstalt, Brunswick). *Strahlentherapie*, 131: 270–7 (Oct. 1966). (In German).

The relations between physical quantities and units, which are defined in the German Journal of Standards and in the Recommendations of the International Commission on Radiological Units and Measurements and used describing radiation sources, radiation fields, and the interaction between ionizing radiation and matter as well as their relations to optic quantities are discussed. (auth)

1231 STANDARDS OF MEASUREMENT. Terrien, J. (International Bureau of Weights and Measures, Sevres, France). Vienna, International Atomic Energy Agency, 1966, Preprint No. SM-79/1, 12p. (In French). (CONF-661012-45). DTIC.

From IAEA Symposium on the Standardization of Radionuclides, Vienna.

A number of aspects which are characteristic of the standards of measurement for the main physical quantities are considered. This is followed by a discussion of the role of the International Bureau of Weights and Measures in establishing standards for radionuclides. (S.F.I.)

1232 PROBLEMS OF RADIOACTIVE CONTAMINATION IN THE SPHERE OF NUTRITION OCCASIONED BY TECHNICAL ATOMIC DEVELOPMENTS. A CONTRIBUTION TO THE DISCUSSION OF RISKS, CONTROL, AND PROTECTION POSSIBILITIES. V. FOUNDATION AND DEVELOPMENTS IN RADIO-PROTECTIVE PRACTICE. Herbst, Willy (Univ., Freiburg i. B.). *Vitalst. Zivilisationskr.*, 8: 256–61 (Dec. 1963). (In German).

The author discusses the basic regulations for radiation protection as promulgated by the International Commission on Radiological Protection. Factors that affect protection from radionuclides include the degree of their biological incorporation, the extent of their introduction into food chains, the amounts of information relative to the effects of incorporated radionuclides and the legal regulations pertaining to protection of the general population as well as those engaged in activities directly associated with use of radiation and radionuclides. In order to provide for a fruitful combination of biology and medicine with radiation protection, much more information will be required in the area of basic research in radiation effects and in incorporation studies. Also in order to assure proper site selection and suitability of nuclear installations to their surroundings, the effects of various radionuclides on the biosphere require comprehensive study. The author discusses the possibilities of effective radiation protection by use of flexible adaptation to the environmental biosphere. (TSS)

1233 RESPONSIBILITY AND JUDGEMENT INTERPLAY IN HEALTH PHYSICS DECISIONS. Dunning, Gordon M. (Atomic Energy Commission, Washington, D. C.). *Health Phys.*, 13: 509–12 (May 1967).

The subject is discussed in regard to establishing standards for radiation protection in nuclear weapons testing, and in connection with radiation protection guides (with particular reference to ^{131}I). (UKAE)

1234 THE ACHIEVEMENT OF A COMMON STANDARD FOR DOSAGE STATEMENT IN RADIOTHERAPY. Massey, J. B. (Christie Hospital and Holt Radium Inst., Manchester, Eng.). pp 425–36 of *Atti Colloq. Rapp. Fis. Med. Levico, Roncegno Terme*, Sept. 14–19, 1964. Trento, Arti Grafiche Saturnia, 1965.

The techniques used by a physicist, associated with a radiotherapy department, to assure that radiation hygiene is enforced in the use of various types of equipment are described. In considering whether the equipment is working properly, he must be concerned with such problems as the x-ray tube voltage and filtration which control the penetrating power of the radiation. The collimating system should be correct, defining a beam of the proper size. It is only when the radiation beam quality and collimation are correct that % depth dose data and isodose charts can be used. Although absolute accuracy in the statement of dose delivered to the patient is desirable, it is even more important that all radiotherapists, in all centers and at all times, should mean exactly the same thing when they state that a particular patient was given a dose of 5500 rad, for example. It is only if this is so that previous experiences at the same and different centers may be profitably exchanged and used to improve techniques. Various dosimeter techniques are examined and evaluated. It is important that the calibration of the dosimeter should be checked periodically for changes in both over-all sensitivity and in its response to different qualities of radiation. Calculation involved in examining the data and its interpretation are discussed. (BBB)

1235 MEASUREMENT OF STANDARD ION DOSE IN SOLID AND LIQUID MEDIA FOR X RAYS AND GAMMA RAYS WITH ENERGIES BETWEEN 50 keV AND 3 MeV. III. STUDIES ON RELATION BETWEEN SENSITIVITY OF IONIZATION CHAMBERS AND INCIDENT RADIATION DIRECTION FOR MEASUREMENTS IN SOLID AND LIQUID MEDIA. Will, Wolfram, Rakow, Adalbert (Inst. fuer Biophysik, Berlin). *Strahlentherapie*, 132: 387–98 (Mar. 1967). (In German).

The relation between the sensitivity of different ionization chambers and the incident radiation direction was determined for 120- and 200-kV x rays and ^{60}Co gamma rays in air and in a water phantom. The angular distribution results obtained in the phantom were different from those obtained in air. The angular distribution for the phantom, which depends only to a small degree on the irradiation conditions considered, can cause errors in the determination of the standard ion dose in the phantom since the calibration is related to a special incident direction free in air. (auth)

1236 INTERNATIONAL COOPERATION IN STANDARDIZATION OF IONIZING RADIATIONS UNDER THE AUSPICES OF THE INTERNATIONAL BUREAU OF WEIGHTS AND MEASURES. Yura Osamu. *Denki Shikensho Iho*, 30: 1035–40 (Dec. 1966). (In Japanese).

An outline of the cooperative activities internationally performed in the field of the standardization of ionizing radiation during the last decade is given based on the reports of the Consultative Committee for the Standards of Measurement of Ionizing

Radiations presented to the International Committee of Weights and Measures (tr auth)

1237 EVAPORATION LOSSES DURING RADIOISOTOPE STANDARDIZATION PROCEDURES. Goodier, I. W.; Pritchard, D. H. (National Physical Lab., Teddington, Eng.). *Int. J. Appl. Radiat. Isotop.*, 18: 332-4 (May 1967).

In the preparation of radioactivity standards, techniques are often used which could introduce errors associated with solution evaporation. In view of this a study was made of the effects of evaporation during manipulative procedures involved in standardization, using $^{59}\text{Fe Cl}_3$ in HCl and in HCl/methanol, the latter having a much higher evaporation rate. Measurements were made using a high pressure 4π ionization chamber and the 4π β - γ coincidence technique. Percentage differences on comparing the standardizations using the normal HCl carrier and the more volatile mixture of methanol and HCl were 0.2%. For the manipulation techniques employed, the error due to evaporation loss was equivalent to about 0.03%, allowing for the differences in evaporation rates (factor of 6) of the two solutions. The small magnitude of this loss suggests that errors due to evaporation are relatively unimportant for carefully chosen techniques (UK).

1238 CHANGES IN THE MAXIMUM PERMISSIBLE DOSES OF IONIZATION RADIATION IN THE LIGHT OF THE LATEST RECOMMENDATIONS OF THE ICRP (INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION). Musiałowicz Tadeusz (National Committee for Radiation Protection, Warsaw). *Pol Przegl Radiol Med Nuk*, 29: 579-82 (1965). (In Polish).

Recommended changes in the values for the maximum permissible dose of ionizing radiation for man and the establishment of maximum permissible dose of internal radiation from accumulated radionuclides as set forth by the ICRP are presented. Several recommendations are made by the ICRP (TSS).

1239 RADIATION RISKS AND RADIATION PROTECTION. Eriskat, H. *Neue Tech*, 8: 360-4 (Dec. 1966). (In German).

The basic standards of EURATOM on permissible radiation doses are outlined and the procedures used for the application and testing of these standards are given. The special risks entailed in the separation of radioactive materials and methods used for the monitoring of environmental radioactivity are discussed. Research activities in the field of radioprotection are briefly described (J S R).

1240 ACCEPTABLE CONCENTRATION OF RADON IN DRINKING WATER. Hems, G. (Radiological Protection Service, Sutton, Eng.). *Int. J. Air Water Pollut.*, 10: 769-75 (Oct. 1966).

Recommendations are made for acceptable concentrations of Rn in domestic water supplies. Following ingestion of Rn in water, the stomach receives the highest dose. The International Commission on Radiological Protection recommended that for the general population the dose to the stomach should not exceed 0.5 rem/yr; however, there is no evidence to indicate whether or not consumption of Rn water which could deliver a dose of 0.5 rem/yr to the stomach would have any deleterious effects. Radon is poorly soluble in water, and is readily lost by aeration. The intake of Rn, by mouth, would be determined by the amount of raw water drunk. In temperate climates, a reasonable average figure would be 300 ml/day, the remainder of the daily intake would be as beverages for which the water was boiled, and most of the Rn removed by aeration. A further factor in calculating the daily intake of Rn is the loss of Rn by aeration when collecting the water at the tap, and also during swallowing. When the Rn concentration is measured a sample would be collected with care to avoid losses by aeration and so the product of the measured Rn concentration and the daily intake would overestimate the amount of Rn ingested. The concentration of Rn in drinking water measured at the tap, which would lead, in a large population to a dose of 0.5 rem/yr to the stomach is 20,000 pCi/l. This value is based on a daily intake of 300 ml of water, and in view of losses mentioned above, the Rn concentration is likely to be a conservatively low estimate (BBB).

1241 VADE-MECUM DU TECHNICIEN. CONTROLE DES RAYONNEMENTS IONISANTS ET MISE EN ŒUVRE DES TECHNIQUES DE PROTECTION. TOME PREMIER. (Handbook for Technicians. Control of Ionizing Radiations and Development of Protection Techniques. Volume I). Pannetier, Raymond. Paris, Francis Duhanel, 1966. 746p.

A handbook is presented for technicians on control of ionizing radiations and protection techniques. The contents include review of radiation units, mathematics, atomic physics and electronics, nuclear physics and radioactivity, measurement of ionizing radiation, standards and calculations of dose and dose output, protection against irradiation and contamination, methods for decontamination, organization of radioprotection, a bibliography, descriptions of nuclear centers and a nuclear dictionary (J S R).

1242 SAFETY CONSIDERATIONS IN THE TERRESTRIAL APPLICATIONS FOR ISOTOPE POWERED GENERATORS. Morley, F. (Atomic Energy Research Establishment, Harwell, Eng.). pp 669-72 of *Industrial Applications for Isotopic Power Generators*. Paris, European Nuclear Energy Agency, 1967.

The potential radiation hazards associated with terrestrial applications of isotope powered generators are summarized and emphasis placed on the need for high standards of containment for generator fuel. It is suggested that safety standards commanding a wide degree of international acceptance are desirable. To a large extent, however, it should be possible to borrow from codes and regulations which have already been developed for general application in the field of radiation safety. Existing regulations governing the safe transport of radioactive materials may be particularly valuable as a basis for the formulation of standards for containment integrity and tests to demonstrate compliance with these standards (auth).

1243 BELGIAN LEGISLATION IN RELATION TO PROTECTION OF THE PUBLIC AND THE WORKMEN AGAINST IONIZING RADIATION. Hublet P. *Arch Belg Med Soc Hyg Med Travail Med Legale* 23: 168-72 (Mar 1965). (In French).

Three laws enacted in Belgium in 1963 to protect workers against ionizing radiations are described. In general the standards prescribed by Euratom were followed. The physical and biological bases for such protection are discussed, particularly the concept of relative biological effectiveness. The maximum permissible doses are calculated as a function of age and are based on an annual dose of 5 rem. The maximum 13-week dose cannot exceed 3 rem. Pregnant women and persons under the age of 18 are forbidden to be occupationally exposed to radiation. The laws make it mandatory for employers to keep adequate records of personnel exposure and to submit three copies of these records to the Ministry of Health. Provisions are also made for monitoring exposure and periodic and/or special health examinations for all exposed workers. Special examinations would be required if film badge dosimetry recorded excessive exposure (BBB).

1244 BASIC PRINCIPLES FOR THE USE OF RADIOACTIVITY IN MEDICINE. A REVISION. VII. PRACTICAL APPLICATION OF RADIATION PROTECTION. Rach, K. (Univ., Berlin). *Roentgenpraxis*, 19: 89-95 (Apr. 1966). (In German).

Data are given on the basic principles for the use of radioactive material in medicine. Chemical radioprotection is obtained through the use of sulphhydryl compounds, such as cysteine and cysteamine. The effects of radiation are reduced by 20 to 50% if these sulphhydryl compounds are administered before exposure to radiation. Complexing agents are the most effective means for decorporation of ingested or injected radioisotopes, if given immediately following incorporation of the radioisotope. Standards for shielding are discussed. Laboratory methods and materials to minimize incorporation of radioisotopes are outlined. Among these are remote pipetting, rubber gloves, glove boxes, and remotely controlled instruments. Criteria of maximum permissible doses are briefly discussed. The use of whole-body counters and other detection instruments for detection of small amounts of radioisotopes are discussed (TSS).

1245 (ANL-7291) RADIATION SAFETY TECHNICIAN TRAINING COURSE. Moe H J, Lasuk S R, Schumacher, M C (Argonne National Lab III). Sept 1966. Contract W-31-109-eng-38. 359p. Dep CFSTI.

This report supersedes ANL-6991.

Lectures prepared for a training course for radiation safety technicians are presented. Topics discussed include basic information on radiation, natural radioactivity, properties of radiations, radiation units and dose determinations, shielding, biological effects of radiation, background radiation, radiation protection standards, internal dose calculations, radiation detection principles, operating characteristics of radiation detectors, radiation survey instruments, personnel monitoring devices, air sampling methods and the design characteristics and radiation protection problems of reactors, hot cells, and particle accelerators (38 references) (C H).

1246 (IAN-SR-1) REGLAMENTO DE SEGURIDAD RADIOLÓGICA. (Regulations for Radiological Safety). Toro, J.; Guzman, M. (Instituto de Asuntos Nucleares, Bogotá (Colombia), División de Radiofísica Sanitaria). Dec. 1964. 62p. (In Spanish). Dep.

Radiological safety regulations designed to protect the population in general, persons working with radioactive materials, particularly, and specifically workers of the Instituto de Asuntos Nucleares are compiled. The regulations are based on the recommendations of the International Agency of Atomic Energy and the manual of the National Bureau of Standards (J S R).

1247 (LFEN-55) PROTECCAO CONTRA RADIACOES EM PORTUGAL. (Radiation Protection in Portugal). Cacho, Carlos; Galvao, Julio Pistacchini; Raposo, Joao Simoes (Junta de Energia Nuclear, Sacavem (Portugal). Laboratorio de Fisica e Engenharia Nucleares). 1966. 14p. (In Portuguese). (CONF-650986-2). Dep.

From 10th Brazilian and 1st Portuguese Congress on Radiology, Rio de Janeiro, Brazil.

The development in Portugal of radiation protection standards and the organization of official bodies to supervise the radiation protection standards adopted are briefly reviewed (J S R)

1248 (NCRP-32) RADIATION PROTECTION IN EDUCATIONAL INSTITUTIONS. (National Council on Radiation Protection and Measurements, Washington, D. C.). July 1, 1966. 63p. NCRP Publications, Washington, D. C. \$0.75.

Recommendations of the National Council on Radiation Protection and Measurements concerning radiation protection during the use of radiation sources in educational institutions are presented. Emphasis is placed on the protection of both students and teachers when radiation sources are used for demonstrations and experiments at the high school and under-graduate college level (C H)

1249 USPHS DRINKING WATER STANDARDS OFFICIALLY APPROVED. J. Amer. Water Works Ass., 54: 1548(1962).

Portions of revised version of the U. S. Public Health Service Drinking Water Standards applicable to radioactivity in water are given. Approval of water supplies containing radioactive materials shall be based upon the judgment that the radioactivity intake from such water supplies when added to that from all other sources is not likely to result in an intake greater than the radiation protection guidance recommended by the Federal Radiation Council. Water supplies shall be approved without further consideration of other sources of radioactivity intake of ^{226}Ra and ^{90}Sr when the water contains these substances in amounts not exceeding 3 and 10 $\mu\text{Ci/l}$, respectively. When these concentrations are exceeded, a water supply shall be approved by the certifying authority if surveillance of total intakes of radioactivity from all sources indicates that such intakes are within the limits recommended by the Federal Radiation Council for control action. In the known absence of ^{90}Sr and α emitters, the water supply is acceptable when the gross β concentrations do not exceed 1000 $\mu\text{Ci/l}$. Gross concentrations in excess of 1000 $\mu\text{Ci/l}$ shall be grounds for rejection of supply except when more complete analyses indicate that concentrations of nuclides are not likely to cause exposures greater than that recommended by the Council (BBB)

1250 THE NATIONAL RADIATION ADVISORY COMMITTEE. Report to the Prime Minister. Austral. J. Sci., 29: 59-72(Sept. 1966).

The fifth report of the National Radiation Advisory Committee of Australia is presented. Included in the report are reviews and brief outlines of current scientific knowledge on the effects of ionizing radiation on man, the revisions and confirmations of radiation protection standards and guides, the means for minimizing the degree of radiation exposure incurred in mass miniature x ray surveys for the early detection of tuberculosis, the methods for safe and permanent disposal of radioactive wastes, and the study of the precautions that are to be observed in relation to visits by nuclear powered vessels. The nature of radioactive fallout from nuclear weapons tests and the possible consequences to the population were dealt with in considerable detail, the overall fallout situation in relation to current data is reassessed and discussed (B H S)

1251 RADIOISOTOPES USED IN PHARMACY. I. IMPORTATION AND USE OF RADIOACTIVE SUBSTANCES. A SURVEY. Kaern, M. (National Health Service, Copenhagen). Dansk Tidsskr. Farm., 5: 185-93(Oct. 1961). (In Danish).

Danish regulations concerning acquisition and application of isotopes are outlined. Since 1953 importation and use of radioactive substances has been subjected to the control of the National Health Service, as stipulated by Act No. 94 of 31 March 1953 on the Use of Radioactive Substances, an Order of the same date concerning Exceptions from Act on Radioactive Substances, and an Order of 15 June 1955 concerning Safety Precautions during the use of radioactive substances. After application to the National Health Service 3 types of permission may be granted. Standing permission is granted to universities, other higher schools of learning, and similar scientific institutions, including radium users who maintain a highly qualified staff. Such a permission gives, under certain conditions, the right to unrestricted import and use of radioactive substances. Group permission is granted to specially qualified persons who use many different isotopes. Certain groups

of isotopes in stipulated quantities can be imported and used. Single permission is given for the use of only a few isotopes and only those isotopes in stipulated amounts which are specified in the permission may be used. Depending upon the isotopes and sp

activities used, various requirements are established concerning the qualifications of the person in charge, the equipment and arrangement of the lab, storage, and disposal of radioactive waste. The field in which the radioactive substances are to be used and the extent to which they will be used are also taken into consideration. The necessary information is given on a form obtained from the National Health Service, and a new form is required for each application. The National Health Service is informed of all importations of radioactive substances. In 1961, 62 different isotopes, with a total activity of 174 Ci were used. The National Health Service, in collaboration with the Fire Department and the Inspectorate of Labor and Factories, inspects those institutions and factories where isotopes are used, and ensures that the rules stipulated by ICRP are complied with (BBB)

1252 RECOMMENDATIONS OF THE INTERNATIONAL COMMISSION FOR RADIATION PROTECTION. REPORT OF THE COMMITTEE II. PERMISSIBLE DOSE IN THE INCORPORATION OF RADIONUCLIDES. Schriftenreihe Bundesmin. Wiss. Forsch., Strahlenschutz (Munich), No. 27, 1-265(1966). (In German).

Basic standards for the maximum permissible radiation burden by incorporated radionuclides are outlined. The highest permissible values for professional radiation burden are given. The calculation of the maximum permissible value for the radiation burden is described. Factors necessary for the evaluation of the equations for the maximum permissible concentrations are defined. The values obtained are tabulated (J S R)

1253 SUGGESTIONS ON PRACTICAL APPLICATION OF MPC VALUES RECOMMENDED IN SEW RADIATION PROTECTION STANDARDS. Musialowicz, T. (Polish Government Commissioner for Use of Nuclear Energy, Warsaw). pp 85-90 of Proceedings of the Second Symposium on Health Physics, Pecs, Hungary, September 26-30, 1966. Vol. II. Budapest, Publishing Group of the Central Research Institute for Physics, 1966.

See CONF-660948-(Vol.2).

Maximum Permissible Concentrations of single radionuclides recommended in SEW standards are chosen as the most restrictive values given by the International Commission on Radiological Protection. It permits use of very simple formulae to define MPC of the mixture of these radionuclides. Formulae are suggested for determination of the MPC of the radionuclide mixture in drinking water and in air for A, B, and C exposure categories. The formulae are based on the interpretation given in SEW standards in which the limiting factor for MPC values is based on the quarterly or annual intake (auth)

1254 UMGANG MIT RADIOAKTIVEM STOFFEN. (Association With Radioactive Materials). Mueller, Rolf-Heinz. Munich, Carl Hanser Verlag, 1966. 262p

Agreements made according to the First Radiation Protection Ordinance are summarized. The physical bases of radiation are reviewed and the effects of ionizing radiation on human beings are discussed. The use of radioactive materials in industry, research, and medicine is considered. Regulations on the transportation of radioactive materials are outlined (J S R)

1255 THE SYNCHROTRON RADIATION OF THE 6-GeV DESY MACHINE AS A FUNDAMENTAL RADIOMETRIC STANDARD. Lemke, D., Labs, D. (Landessternwarte Heidelberg-Koenigstuhl, Heidelberg). Appl. Opt., 6: 1043-8(June 1967).

The characteristics of synchrotron radiation emitted by the 6-GeV DESY machine were studied in the spectral range 2200-5500 Å. For this purpose, the synchrotron radiation was compared photometrically with the radiation of standardized sources in a nearly differential manner. These sources (tungsten ribbon lamp, Krefft-Rosslow normal) were calibrated with high accuracy against a blackbody. Good agreement was found between our experimental results and the values predicted by the theory of the synchrotron radiation derived by J. Schwinger. The relative spectral distribution was verified to within about $\pm 2\%$, and the absolute values of the theoretically predicted flux were ascertained to within about $\pm 15\%$. For the application of synchrotron radiation as a radiometric standard in most cases only the relative spectral distribution is important. If one supposes the validity of the theory also in the far uv, and if the synchrotron radiation is calibrated in the visible by a standard source, one can give the absolute flux in the far uv. In this way it is possible to calibrate photometers or sources in the far uv in absolute units with an accuracy of about $\pm 3\%$ with the aid of the synchrotron radiation (auth)

1256 SYMPOSIUM ON STANDARDIZATION OF RADIONUCLIDES HELD BY THE IAEA (VILNNA, OCTOBER 10-14, 1966). Ciuffolotti, L. (Sorm, Saluggia, Italy). Energ. Nucl. (Milan), 14: 300-5(May 1967). (In Italian).

The main subjects discussed in the course of the IAEA Symposium on the standardization of radionuclides are surveyed. Useful information may be drawn from the experience gained by several laboratories in radiation detector techniques and methods of absolute measurements. (auth)

1257 (ANS-SD-4, pp 11-17) **CRITERIA FOR RADIATION PROTECTION PERMISSIBLE DOSE TO CRITICAL ORGANS.** Rossi, Harold H. (Columbia Univ., New York, Radiological Research Lab.).

The major factors which determine the biological effects of radiation are dose magnitude, dose rate, radiation quality, volume irradiated, organ sensitivity, individual variability, and age. In general the degree of effect depends on the magnitude of these factors in a complex way. Some of the effects which are of particular importance to radiation protection are leukemia and other cancers, aplastic anemia, cataract, aging, and genetic anomalies. Because of the complex interaction of the variables, extensive simplifications in the formulation of standards are necessary. The most important biophysical question in the formulation of protection standards concerns the existence of a threshold for radiation injury. There are certain indications that there should be no threshold for late effects due to chronic irradiation and it is altogether prudent to assume that risk is proportional to dose. Equal absorbed doses of various radiations can lead to different levels of effect, and it is consequently necessary to apply a weighting factor, known as a quality factor (QF), which allows for this difference. The quality factor is related to the linear energy transfer (LET) and in essence is equal to the $-dE/dx$ of the charged particles. Its values are also selected conservatively for the most extreme case of low doses and dose rates in organ systems showing the largest quality effects. The product of the quality factor and the absorbed dose is the dose equivalent and its unit is the Rem. Thus the term maximum permissible dose is, more precisely speaking, the maximum permissible dose equivalent. Basic limits for occupational and non-occupational radiation exposure, based on basic principles of radiation protection, set forth in NBS Handbook 59, are presented. (C H)

1258 **RADIATION HAZARDS AND PUBLIC HEALTH.** Meckstroth, George R. (Tulane Univ., New Orleans), Parker, Roy A. J. La. State Med. Soc., 119: 121-6 (Mar. 1967).

Recommendations of the Louisiana Division of Radiation Control for protection of patients during dental and diagnostic radiography are reviewed. (C H)

1259 **RADIOACTIVE CORPSES.** Brit. Med. J., 1: 331 (May 6, 1967).

Hazards associated with handling cadavers bearing radioisotopes, administered clinically, are considered, particularly with reference to a recent report pertinent to this problem issued by the Australian National Health and Medical Research Council. When a patient dies in hospital, a radioisotope given therapeutically to a patient a few days before death may be forgotten so that there is a potentially serious risk to the post-mortem room attendant, pathologist or embalmer. Radioisotopes are not usually given to moribund patients but occasionally a patient who has been treated with intraperitoneal ^{187}Au for metastatic tumor, or one who has had a high dose of ^{131}I for thyroid carcinoma, may die unexpectedly within a few days of treatment. The Australian report sets out a code of practice for the safe handling of corpses containing radioactive substances, and deals concisely and clearly with the main problems. In many instances it is possible to reduce the level of radiation greatly by removing part or all of the main source of radioactivity at the start of the necropsy or before embalming. The ascitic fluid can be removed by suction pump and the thyroid and major metastatic deposits can be resected and stored until the level of radioactivity has fallen to a safe level. The problem of whose responsibility it is to warn the pathologist or mortuary attendant that a therapeutic dose of radioisotope has recently been administered is discussed. (BBB)

1260 (AHSB(RP)R-76) **THE STANDARDISATION OF PRESSURISED SUITS.** (United Kingdom Atomic Energy Authority, Harwell (England). Authority Health and Safety Branch). June 1967. 18p. Dep. CFSTI, UK 5s. 6d.

Standards are specified for light-duty pressurized suits and blouses, personnel air hoses, and their connecting fittings. The work leading to the specification of such Standards is described. In addition to the articles mentioned, standards are also specified for air-line hoods and oversuits. Although it was not found possible to draft a standard for personnel air hose couplings, a specification of preferred design characteristics for such devices was prepared. Prototypes of the standard clothing have been subjected to trials and the standard specifications take account of the few changes of a minor nature shown to be necessary by these trials. (auth) (UK)

1261 **USA STANDARD SAFETY LEVEL OF ELECTROMAGNETIC RADIATION WITH RESPECT TO PERSONNEL.** IEEE (Inst. Elec. Electron. Eng.), Trans. Bio-Med. Eng., BME-14. 152 (Apr. 1967).

Recommendations are made to prevent possible harmful effects resulting from exposure to electromagnetic radiation in the frequency range from 10 MHz to 100 GHz. They apply to all radiations originating from radio stations, radar equipment, and other possible sources of electromagnetic radiation such as used for communication, radionavigation, and industrial and scientific purposes. For normal environmental conditions and for incident electromagnetic energy of frequencies on this range the radiation protection guide maximum exposure is 10 mW/cm², as averaged over any possible 0.1-hr period. This guide applies whether the radiation is continuous or intermittent. Exposure to electromagnetic radiation in this frequency range is but one of several sources of heat input into the body. Body temperature depends in part on sources of heat input such as electromagnetic radiation, physical labor and high ambient temperature and on heat dissipation capability as affected by clothing and humidity. People suffering from circulatory difficulties and certain other ailments are more vulnerable. The frequency of radiation and its penetration affect the percentage of absorbed radiation. Hence, the power levels established in the radiation protection guide are related in a complicated way to power levels at which damage occurs. The guide values are appropriate for moderate environments. Under conditions of moderate to severe heat stress the guide number given should be appropriately reduced. These formulated recommendations pertain to both whole-body irradiation and partial-body irradiation. (BBB)

1262 (HSR-RR-67/8-5d) **FEASIBILITY OF DEVELOPING STANDARD DESCRIPTIONS OF POST-ATTACK SITUATIONS.** Nordlie, Peter G. (Human Sciences Research, Inc., McLean, Va.), June 1967. Contract OCD-PS-65-29. 33p.

The objective of the study was to evaluate the feasibility of developing a particular methodological tool to aid in conducting research on post-attack phenomena. All such research faces the necessity of studying phenomena in hypothetical future situations. To aid in solving the many problems this fact poses, the concept was advanced of a set of standard situational cases reflecting the range of situations nuclear attacks could create. The study was initiated to determine if the concept of the standard situational case offered sufficient promise for development as a practically applicable research tool. It was concluded that development of the original concept of the standard situational case was not feasible primarily for two reasons: the initial inability to provide criteria for distinguishing between relevant and irrelevant information, and the failure to find means for reducing the cases to a manageable number. However, from a number of the insights gained in the course of the study, a new concept was developed different from, but aimed at the same objectives, as the standard situational case concept. This new concept followed from the realization that the definition of recovery would provide criteria for testing the relevance of information about post-attack situations. The remainder of the study was devoted to further development of this new concept of defining critical information categories for post-attack situations. Developing this set of categories involves two basic steps: first, the specification of a set of recovery goals, and second, the delineation of the factors on which the achievement of each goal depends. The concept was partially developed in this report, and the tasks yet required to develop the concept into a fully operational research tool are outlined. (auth)

1263 (NP-16789) **QUELQUES PROBLEMES POSES PAR L'APPLICATION PRATIQUE DES PRINCIPES FONDAMENTAUX DE RADIOPROTECTION DES TRAVAILLEURS.** Etude Comparative des Legislations des Pays de la Communauté Européenne. (Some Problems Posed by the Application of Fundamental Principles of Radioprotection of Workers. Comparative Study of Legislations of the European Community Countries). Carbone, Ferdinando. (Paris Univ. (France). Institut de Droit Compare). 1966. 150p. (In French). Dep.

The legislative enactments implementing the treaty instituting the European Community of Atomic Energy are compared for the member nations—France, Italy, Belgium, Luxembourg, Germany, and the Netherlands. The normative production and legislative technique in the European community with respect to the radioprotection of workers are outlined. Some specific problems of the health monitoring of nuclear workers are considered. (J S R)

1264 (JPRS-41259) **MAXIMUM PERMISSIBLE LEVELS OF IONIZING RADIATIONS.** Kimel', L. P., Mashkovich, V. P. Translation of Chapter III from Zashchita ioniziruyushchikh Izlucheni, Moscow, 1966. 20p. (TT-67-31899). CFSTI.

Maximum permissible levels of radiation exposure are presented for persons working with radioactive substances and

sources of ionizing radiations in the Soviet Union. Data are tabulated on maximum permissible doses for external irradiation of the whole body and internal irradiation of critical organs, maximum permissible dose and relative biological effectiveness of various types of radiation, maximum permissible levels of contamination of working surfaces, clothing, footwear and hands during occupational exposure, and maximum permissible concentrations of 32 biologically-important radioisotopes in drinking water. Legislation in the Soviet Union governing the use of radioactive substances and sources of ionizing radiations are discussed briefly (30 references) (C H)

1265 MEASURING UNITS FOR IONIZING RADIATION DOSIMETRY AND RADIOPROTECTION. Keirim-Markus, I. B., Kochetkov, O. A., Moskalev, Yu. I., Popov, V. I. *Izmeritel. Tekh.*, No. 11, 18-19 (Nov. 1966). (In Russian).

Until the introduction of new standards (in the case of the revocation of GOST 8848-63) it is necessary to follow the international recommendations (ICRU) and to use universally adopted units (rad, GeV, R). It is considered inexpedient to introduce unilaterally new units for the measurement of ionizing radiation. It is necessary to strive for agreement within the ICRU (tr-auth)

1266 PROTECTION FROM IONIZING RADIATIONS: A REVIEW OF THE REGULATIONS. Mullett, G. W. (Royal Hospital, Wolverhampton, Eng.). *Ann. Occup. Hyg.*, 10, 269-76 (July 1967).

It is stated that five years' experience of the relevant legislation has shown that while much of the radiation protection in industry is adequately provided without undue disruption of the industrial process, difficulties do arise which cause concern. The time is now opportune to examine the regulations in the light of this experience and ask whether they are adequately performing their function. It is suggested that some of the requirements of the regulations are over-stringent, causing unnecessary interference with industry. In the light of this experience the appropriate parts of the regulations should be revised to allow greater flexibility without causing any significant increase in the radiation hazard (auth) (UK)

1267 (BNL-tr-141) CONTRIBUTION TO THE SETTING-UP STANDARDS FOR INERT RADIOACTIVE GASES. Goussev, N. G.; Kochetkov, O. A.; Mikhailov, L. M.; Tourkin, A. D.; Trukhmanova, E. S.; Filipovich, V. P. (Ministerstvo Zdravookhraneniya SSSR, Moscow Institut Biofiziki). Translated by S. J. Amoretti (Brookhaven National Lab., Upton, N. Y.), from a report, 23p. Dep. CFSTI, JCL \$2.60 fs, \$0.89 mf.

Calculations and experimental data are presented on the distribution of the annual gamma-radiation dose on the ground from the continuous emission of ^{41}Ar from a 100 m chimney within a radius of 20 km. A discrepancy between ^{41}Ar ground concentration and ground gamma dose is shown. Standards of inert radioactive gas emission to the atmosphere are given. Calculated and experimental data on the distribution of the depth of doses of external beta-radiation in tissue-like materials are given and are used for the calculation of maximum permissible concentrations of inert radioactive gases in a working room. These doses proved to be 10 to 15 times more than those recommended by ICRP. Standards for Ar, Kr, and Xe isotope concentration in the atmosphere are based on the total gamma-radiation dose, the main controlling value is the maximum permissible ejection. Standards for working room air are based on the maximum permissible concentration taking into account the volume limitation of the room and consideration of the fact that external radiation dose is determined by the field of the beta particles and conversion electrons (F S)

1268 (NP-17029) DATA FROM RADIATION PROTECTION PROGRAMS. Volume 4, Number 2 (Department of National Health and Welfare, Ottawa (Ontario), Radiation Protection Div.), Feb. 1966, 40p. Dep. CAN

Radiation protection guides adopted in Canada to ensure that exposure of radiation workers and of the general population will remain within acceptable limits are presented. The guides are based on the recommendations of the International Commission on Radiological Protection. Data are presented on fallout during Jan. 1966. Data are included on total β activity in air and precipitation samples and the content of ^{137}Cs and ^{90}Sr in milk samples. Analysis of urine samples from people residing in the northern part of Canada showed high levels of ^{137}Cs that were not related to the consumption of caribou or reindeer meat. Samples of seal meat were analyzed for ^{137}Cs content. The average value of ^{137}Cs in seal samples was found to be comparable to the value obtained for beef samples from local markets in Ottawa. It was concluded that the consumption of seal meat did not contribute to the high content of ^{137}Cs in the bodies of the people of North Canada. Data are included from monitoring programs in the environs of reactors in Canada during Jan. 1966 (C H)

1269 (NP-17040) GUIDANCE FOR THE CONTROL OF RADIATION HAZARDS IN URANIUM MINING. Report No. 8,

Revised, (Federal Radiation Council, Washington, D. C.), Sept. 1967, 60p, GPO \$0.40.

The control of radiation hazards in uranium mines is discussed. It is pointed out that the natural radioactive decay of U leads to the formation of various radioisotopes in ore bodies, including Rn, which is gaseous. Radon gas formed by the radioactive decay of ^{226}Ra escapes from exposed rock surfaces into the air in U mines, where it continues to decay, generating a series of radon daughters, which present a carcinogenic hazard when inhaled by miners. Most U ore is mined from sandstone that contains free silica, the causative agent of silicosis in miners. Physical hazards associated with the use of machinery, handling of materials, falls of persons, and falls of ground are comparable with those found in other mining operations. Emphasis is focused on the control of radiation hazards associated with the underground mining of U. Background material is presented for use in the development of guidance by federal agencies in regulatory programs and in programs of co-operation with states concerning radiation protection in the mining of U ore (C H)

1270 CRITERIA FOR RADIATION PROTECTION. Loutit, J. F. (Medical Research Council Radiobiological Research Unit, Harwell, Eng.), Russell, R. Scott, pp. 27-43 of *Radiactivity and Human Diet*, Russell, R. Scott (ed.), New York, Pergamon Press, 1966.

The criteria established by the International Commission on Radiological Protection for the protection of the general population from radiation exposure from a variety of sources are discussed. With regard to occupational exposure, criteria were set up for allowable doses that could be received in a 13 wk period, with special limits for persons under 18 yr. Protection criteria for exposure of the general population to uncontrollable sources included such things as mitigation of dose rate levels where the social cost is slight, and guidance regarding radiological risks at given exposure doses. Criteria for protection from controllable sources focused on the source and its regulation. The importance of monitoring systems is discussed in relation to both sources. Recommended limits of environmental exposure both of a continuous and emergency nature are listed. Criteria are also established for recommended limits of dietary contamination with regards to both total diet and individual articles of diet (E R B)

1271 THE DEVELOPMENT OF A TEST METHOD FOR ASSESSING THE DECONTAMINABILITY OF SURFACES. Smith, K. (Central Electricity Generating Board, London), pp. 39-54 of *Proceedings of the First International Symposium on the Decontamination of Nuclear Installations*, Harwell, England, May 4-6, 1966. Blythe, H. J., Catherall, A., Cook, A., Well, H. (eds.), New York, Cambridge University Press, 1967.

See CONF-660520.
Experimental work carried out in support of the proposed British Standard in preparation by the British Standard sub-committee NCE/5/2 is summarized. The proposed standard is intended for application to paint and other non-metallic surface coatings used in areas subject to contamination. The significance of various factors in the test method and details the evolution of a standard contaminating solution are discussed. Reference is made to the high adsorption of cerium and cobalt onto surfaces of glass and polythene containers from dilute solutions of mixed isotopes (auth)

1272 GUIDE FOR DESIGN AND OPERATION OF SHIPPING CONTAINERS FOR IRRADIATED SOLID FUEL FROM NUCLEAR REACTORS. American Standards Association N5.3(1964) New York, American Institute of Chemical Engineers, 1965, 12p

The design and operation of containers for off-plant shipment of irradiated solid fuel including ^{235}U , ^{238}U , ^{239}Pu , and ^{241}Pu , either by land or water vehicles, to provide a high and consistent degree of protection to the public are discussed. The standard does not apply to shipments within an establishment where the general public is not in the proximity of the shipment, or to shipment exclusively by water or to air transportation or to fuel with a radiation level of less than 1 R/hr at all surfaces of the fuel element. The standard deals only with the cask and its contents. Method of mounting the casks on vehicles, operation of vehicles, control, and methods of reporting are not included (F S)

1273 BIOLOGICAL AND MEDICAL ASPECTS OF RADIO-PROTECTION. Devoret, R., Levy, C. (CNRS, Gif-sur-Yvette, France), pp. 775-804 of *Radiobiologie Appliquee*, Tome II, Loiseleur, J. (ed.), Paris, Gauthier-Villars, 1966. (In French).

The biological and medical aspects of protection against radiation are summarized. The variables that condition the gravity of radiolesions are outlined. The lesions caused by acute and chronic irradiation are described. The long-term consequences of irradiation, i.e. cancer induction, shortening of the average life span, and genetic effects, are considered in some detail. The present level of the irradiation of the general population from natural radioactivity, medical irradiation, fallout and

eventual irradiation as a result of a nuclear industrial development is calculated. Professional exposure is discussed and examples are given. The laws governing radioprotection are outlined. The chemical and biological monitoring regulations are given. (J S R)

1274 SANITARY LAWS OF THE COUNTRIES PARTICIPATING IN THE COUNCIL OF ECONOMIC COOPERATION IN THE FIELD OF RADIATION HYGIENE. Lyarski, P. P. Terman, A. V. Gig. Sanit., No. 4, 81-6 (Apr. 1967). (In Russian)

A brief review is given of the history of the health laws in the field of radiation hygiene. The maximum permissible doses of external and internal radiation of the whole body and of the vital organs are tabulated. Various types of radiation are analyzed and their effects are correlated. The maximum permissible levels of personnel clothing contamination are also tabulated for α and β emitting isotopes. (R V J)

1275 (ACRHS 2) SEMI-ANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION. Jacobson, Leon O. Doyle, Margot (eds.). (Argonne Cancer Research Hospital, Chicago III.) Mar. 1966. Contract AT(11-1) 69. 13 p. Dep. CFSI.

ESTROGENS—effects on metabolism of sulfobromophthalein sodium in rats

DISEASES—etiology of juvenile gout; effects of uric acid production on

DISEASES—etiology of Wilson's; effects of uric acid production on

MAN—metabolism of uric acid in tracer study of

MAGNESIUM—metabolism in rats; effects of dietary deficiency on

INTESTINE—magnesium uptake by rats; tracer study of

IMMUNE REACTIONS—radiation effects on rat spleen

effects of repopulation with lymphocytes on x

X RADIATION—effects on immune reactions in rats; effects of splenic shielding on

CELLS—migration of spleen; effects of on immune reactions in rats

TRANSFERRASIS—activity of; effects of adsorption on anion exchanger on

BACTERIA—*Escherichia coli* extracts from activity of ribonucleic acid sulfur transferase in

RIBOSOMES—protein structure of isolated from cells of *Escherichia coli* liver and reticulocytes; tracer study of

ENZYMES—effects on ribosomes isolated from *Escherichia coli* liver and reticulocytes

ERYTHROPOIESIS—radiation effects on in mice; effects of erythropoietin and previous exposure on x

ERYTHROPOIETINS—effects on erythropoiesis in x irradiated mice

X RADIATION—effects on erythropoiesis in mice; effects of erythropoietin and previous exposure on

SPLEEN, BONE MARROW—radiation effects on stem cell compartment in mouse, β and x

ERYTHROPOIETINS—purification of; method for

BONE MARROW—metabolism of heme in cultures of from patients with polycythemia; effects of erythropoietin on

STANDARDS—Atomic Energy Commission for use of radioisotope labeled pharmaceuticals

STANDARDS—National Institutes of Health for use of radioisotope labeled blood products

STANDARDS—Food and Drug Administration for use of accelerator produced radioisotope labeled pharmaceuticals

RADIATION—dosimetry in radioisotope labeled pharmaceuticals

ELECTRONS—dosimetry of beams of high energy

STANDARDS—Subcommittee on Radiation Dosimetry of American Association of Physicists in Medicine for dosimetry of high energy electrons

RADIATION DOSIMETRY—standards for radioisotope labeled pharmaceuticals; standards for high energy electron beams

SCINTISCANNING—use of multi detector scanner and technique for brain

RADIATION DETECTORS SCINTILLATION—design for brain scanning

COLLIMATORS—design for use with scintillation detectors in brain scanning. (C H)

1276 FDA REGULATIONS FOR IRRADIATED FOODS AND PACKAGING MATERIALS. Garlock, E. A. (Hazleton Labs Inc., Falls Church, Va.). *Isotop. Radiat. Technol.* 4, 137-41 (Winter 1966-1967).

The types of information required by the U.S. Food and Drug Administration to support petitions for clearance of irradiated foods are outlined. A set of guidelines is included. (auth)

1277 TRANSPORT OF RADIOACTIVE MATERIALS AND SAFETY. Sousselier, Y. *Energ. Nucl. (Paris)*, 9, 266-8 (June-July 1967). (In French)

The safety regulations in the transport of radioactivity material are briefly outlined. The standards which a container must satisfy for large radioactive sources are indicated. (J S R)

1278 (CONF. 660649) GEMEINSAME TAGUNG UEBER ERFAHRUNGEN BEI DER ANWENDUNG VON STRAHLEN SCHUTZREGELUNGEN IN KERNTECHNIK UND INDUSTRIE, VOM 1-3 JUNI 1966 IN DER KERNFORSCHUNGSANLAGE JUELICH. (Joint Meeting on Experience in the Use of Radiation Protection Rules in Nuclear Technology and Industry, June 1-3 1966 in the Juelich Nuclear Research Center). (Societe Europeenne de Protection Contre les Rayonnements) Sept. 1966. 237 p. (In German) Dep.

Twenty-seven papers discuss regulations of European countries regarding radiation protection in industries: research installations and laboratories using radioisotopes and radiation sources and at cyclotron sites. Topics discussed include maximum permissible radiation doses; waste disposal; licensing procedures; cost factors involved in radiation protection; requirements for personal dosimeters and their reliability for legally required radiation protection measurements; problems in calibration of radiation dosimeters; the measurement of radiation fields; the monitoring of sealed radiation sources; special problems of industries using radioactive materials and radiation sources; the handling of contamination incidents by industry and international cooperation for radiation protection. (C H)

1279 REGULATIONS AND CONTROL FOR RADIATION PROTECTION. Voss, Milo D. (Ames Lab., Iowa). *Trans. ASAE (Amer. Soc. Agr. Eng.)*, 9, 421-3, 427 (1966).

Protection against personnel exposure, particularly in laboratories using radioisotopes, is reviewed. Actions that should be taken to assure radiological safety are discussed. (RBB) (TSS)

1280 REPORT OF THE COMMITTEE ON PUBLIC HEALTH AND RADIOLOGICAL FALLOUT. Schroeder, R. J., Brandly, P. J., Courter, R. D., (and others). *Proc. U. S. Livestock Sanit. Ass.*, 68, 241-7 (1964).

The report of a Federal Committee sponsored by the Dept. of Health, Education and Welfare relating to fallout and other health hazards pertinent to livestock is outlined. It concerns mainly the Protection Action Guide. The Guide is defined as the projected absorbed dose to individuals in the general population that warrants protective action following a contaminating event. The projected dose is the dose that would be received in the future by individuals in the population group from the contaminating event if no protective action is taken. The Protective Action Guide for ^{131}I is 30 rad to the thyroid. If the projected dose exceeds the Protective Action Guide, protective action is indicated. Of various actions that might be effective in averting the major part of the potential exposure, two appear to provide the most acceptable combinations of maximum effectiveness and minimum undesirable consequences. One of these is the diversion of fresh milk to provide unaffected milk in the contaminated area, and to use the affected milk in the production of dairy products that may be conveniently stored until the ^{131}I has effectively decayed a matter of a few weeks. The other is the substitution of stored feed for pastureage until most of the ^{131}I has decayed. The report indicates the following changes in the fallout situation since 1963: Short-lived radioisotopes produced by nuclear testing, ^{131}I and ^{85}Sr , have disappeared from the environment. The inventory of the long-lived isotopes ^{90}Sr and ^{137}Cs in the atmosphere by mid-1964 was reduced to one-half that in January 1963, at the end of the last test series. Long-lived isotopes reached a delayed peak in the diet during 1964 and will decrease in future years. (BBB)

1281 RICHTLIJNEN VOOR STRALINGSBEVEILIGING IN ZIEKENINRICHTINGEN EN POLIKLINIEKEN. (Directives for Radiation Protection in Hospitals and Polyclinics). The Hague Health Council, 1966. 145 p. 6 80 Nfls.

Directives drawn up by a committee of specialists include information on the following subjects: general items (basic concepts and their definitions; maximum permissible radiation doses; radiation monitoring; medical control; contamination); radiation protection in the use of x-rays for diagnostic and therapeutic purposes; handling of stationary sealed radioactive sources; handling of portable sealed radioactive sources; handling of unsealed sources; compilation of parameters in graphs and tables including definitions. The Radioactive Substances Decree issued within the framework of the Netherlands Goods Act, the Ionising Radiations Safety Decree and other legal provisions are reproduced in the appendix. (Occup. Safety and Health Abstr.)

1282 CODE OF PRACTICE AGAINST RADIATION HAZARDS. Fifth Edition. Imperial Coll. of Science and Tech. 1966. 51 p.

Basic control procedures with which organizations must comply when carrying out work involving sources of ionizing radiation are outlined. Details of the methods to be used in implementing the

basic control procedures are presented in relation to the following legislation, protection of personnel hazards from ionizing radiation, x-ray equipment, particle accelerators, reactors, classification of radioisotopes and grading of laboratories specifications for radiochemical laboratories, handling of sealed and unsealed sources of radioactive materials storage transport, disposal of radioactive waste, monitoring, and accidents and emergency procedures (27 references) (B H S)

1283 STANDARDIZATION OF RADIONUCLIDES AT AEET Gupta, U. C., Srivastava, P. K.; Misra, S. C., Sidhu, N. P. S., Dhinra, K. C. (Atomic Energy Establishment, Trombay, India) pp 434-47 of Proceedings of the All India Symposium on Radioactivity and Metrology of Radionuclides, Bombay, March 14-18, 1966 Bombay, Atomic Energy Establishment Trombay, 1966 See CONF-660341

The present status of radioactive standardization at the Atomic Energy Establishment Trombay (India) is described. The different steps involved in standardization and considerations in the choice of the original radioactive solution together with a comparative study of the various counting methods are discussed (auth)

1284 (SCPRI(RM)-IX-1967 and Suppl.) RAPPORT D'ACTIVITE, SEPTEMBRE 1967 (Report of Activities, September 1967) (Service Central de Protection Contre les Rayonnements Ionisants, Le Vesinet (France)) 28p (In French) Dep

Radioactivity was monitored in the atmosphere at ground level and at high altitudes, rain water, milk, and vegetables. Tabulations were made of contents of ^7Be , ^{54}Mn , ^{90}Sr , ^{137}Cs , ^{106}Ru , ^{106}Rh , ^{131}I , ^{137}Cs , and ^{140}Ba . Tables also presented for ^{90}Sr content of animal bones, ^{131}I content of thyroid glands of cattle, tritium content of water, ^{137}Cs content of fish, and ^{137}Cs and ^{90}Sr content of sea water. A bibliography on radiation protection standards is included. (H L W)

1285 (AEC-tr-6467/2 pp 143-76) REGULATIONS FOR TRANSPORTING RADIOACTIVE COMPOUNDS Translated from Sbornik Vazhneishikh Ofitsial'nykh Materialov po Voprosam Gigeny Truda i Proizvodstvennoi Sanitarii, Gosudarstvennoe Izdatel'stvo Meditsinskoi Literatury, Moscow, 1962.

Regulations governing the transportation of radioactive compounds in the U S S R are presented. Requirements for the packaging of radioactive compounds for transportation and data on minimum permissible distances between packages containing radioactive compounds and undeveloped photographic movie and x-ray films are included. (C H)

1286 SELECTION OF RESPONSE CRITERIA AND THEIR APPLICATION TO SPACE-RADIATION RISKS pp 243-66 of Radiobiological Factors in Manned Space Flight Langham, Wright H. (ed.) Washington, D C, National Academy of Sciences-National Research Council, 1967

The Space Radiation Study Panel of the NRC concluded that internationally accepted standards for occupational radiation protection cannot be applied unconditionally to manned space flight. Radiation is only one among many potential risks to the success of any flight mission. Astronauts differ in number and functions from any other groups occupationally exposed to radiation, space-radiation risks are not precisely predictable and a risk-versus-gain philosophy must be applied to each individual mission. Criteria and guidelines for evaluation of risks are presented. (M M B)

1287 (AEC-tr-6467/2 pp 195-222) INSTRUCTIONS AND METHODOLOGICAL SPECIFICATIONS FOR PREVENTIVE MEASURES, DIAGNOSIS, AND TREATMENT OF CHRONIC RADIATION SICKNESS Translated from Sbornik Vazhneishikh Ofitsial'nykh Materialov po Voprosam Gigeny Truda i Proizvodstvennoi Sanitarii, Gosudarstvennoe Izdatel'stvo Meditsinskoi Literatury, Moscow, 1962

Procedures for the diagnosis and treatment of chronic radiation sickness in man are described. The pathology of radiation sickness, radiation injuries of the skin and radiation-induced cataracts are described and the use of diet, drugs, hormones and blood transfusions in the treatment of radiation sickness is discussed. Standards for the maximum permissible dose of extraneous γ and x radiation are presented. Legislation of the U S S R governing occupational exposure to radiation is discussed. (C H)

1288 RADIATION HAZARD IN RADIOGRAPHY OF THE FEMALE ABDOMEN AND PELVIS Reekie, D.; Davison, M.; Davidson, J. K. (Southern General Hospital, Glasgow) Brit J Radiol, 40: 849-54 (Nov, 1967).

The International Commission on Radiological Protection (1964) has recommended that all radiological examination of the lower abdomen and pelvis in women of reproductive age be limited where possible, to the ten day interval following the onset of menstruation. This is not incorporated in the British Code of Practice (1964). It is also recommended by the I C R P and the British Code of Practice that for designated persons the abdominal dose should not ex-

ceed 1.3 rads in any 13 week period and that the dose to the fetus should not exceed 1 rad during the known period of pregnancy. The somatic hazard to the fetus from 1 rad can lead to a risk of one in 5,000 of subsequently developing cancer, or approximately doubles the natural risk of dying from some form of cancer at an early age. The genetic hazard is much less, but one rad will increase the natural mutation by three percent. The actual radiation exposure given to patients in a large general hospital for various radiographic investigations of the abdomen was measured. The gonad and fetal doses were obtained by calculation of the relevant depth doses taking the most probable position of the ovaries before and during pregnancy and of the fetus at term. The results show that in early pregnancy the embryo may receive approximately one rad in lateral radiographs of the lumbar spine and of the lumbo-sacral junction, in renal arteriography and similar examinations requiring multiple exposures, and in all screening examinations of the pelvis and lower abdomen. Even with a repeat radiograph, none of the other projections seems likely to lead to a serious hazard. It is highly unlikely that, under existing practice, these or other abdominal examinations would be carried out on pregnant women unless there were clearcut clinical indications. It is suggested that examination of the lumbar spine, examinations requiring multiple exposures of the lower abdomen, and all screening examinations of the pelvis and lower abdomen be limited to the ten day interval following the onset of menstruation. (auth)

1289 RADIOBIOLOGICAL FACTORS IN MANNED SPACE FLIGHT pp 3-7 of Radiobiological Factors in Manned Space Flight Langham, Wright H. (ed.) Washington, D C, National Academy of Sciences-National Research Council, 1967

The Space Radiation Study Panel of the National Research Council does not recommend permissible doses for manned space operations, but suggests that each space agency balance the potential risk of radiation injuries to astronauts against the anticipated gains of the missions and program. The Radiation Protection Guides provide a framework for radiation protection requirements. The panel proposes to provide a quantitative description of the range of radiation risks assignable to different combinations of radiation exposure and to describe the upper limits of human tolerance to such exposure. Responses are evaluated in the following categories, which are listed in order of potential importance to missions up to two or three years duration: immediate or early sequelae (symptoms appearing within a few hrs or weeks following irradiation); progressive sequelae or semiacute hematopoietic deterioration during long flight periods; and probabilities of late or delayed sequelae necessitating intervention in planned flight series and astronaut careers. (M M B)

1290 (CONF-670305- pp 192-6) CONTRIBUTION OF BIOLOGY TO STANDARDS OF RADIATION PROTECTION Nabrit, Samuel M. (Atomic Energy Commission Washington D C).

A semihistorical review is given of the contributions of radiobiology to the overall field of radiation. The influence of the radiobiologist is seen not only in the contributions to basic cellular and molecular studies but also in the establishment of biological parameters that can be utilized by the allied disciplines in nuclear science. Emphasis is given to two new research tools for the radiobiologist, the Omnitron accelerator at Berkeley and the Meson Physics Facility to be constructed. (I R B)

1291 (CONF-670305- pp 280-8) ROLE OF CELLULAR RADIOBIOLOGY IN RADIATION PROTECTION Rossi, Harold H. (Columbia Univ. New York Radiological Research Lab.)

The influence that cellular radiobiology on the formulation of radiation protection regulations is discussed. The variables involved in determining biological effects are of two types: biophysical parameters such as dose, dose rate and radiation quality and biological parameters such as fraction of organ irradiated, organ radiosensitivity, age and individual variability. Each set of parameters is subject to strong mutual interactions that complicate an estimation of RBE and establishment of radiation protection standards. Data from the RBE committee of the ICRP and the ICRU are presented. (I R B)

1292 RADIATION EFFECTS, RADIATION INJURIES AND RADIATION PROTECTION Seelentag, Walter (Bundesgesundheitsamt Berlin) Lebensversicherungsmedizin 18: 120-32 (Oct 4 1966) (In German)

Radiation effects are classified into somatic, somatic-stochastic, and genetic types. Somatic effects included tissue defects and necroses that resulted from over-exposure to irradiation, growth inhibitions resulting from irradiation in utero or for various diseases and injuries resulting from occupational exposure to x radiation. Incidences of leukemia in Japan are compared with respect to dose for normal and irradiated populations. Included under somatic-stochastic irradiation effects are the nonspecific life-shortening effects of radiation. The genetic effects of radiation exposure that are discussed include effects observed in experimental animals and plants: the recessive nature of mutations

and general mechanisms of effects of radiation on chromosomes. The legal standards established for radioprotection in various populations and occupations are discussed briefly (BBB)

1293 SMALL ENERGY SHIFTS IN X- AND γ -RAYS AND SELECTION OF THE WAVELENGTH STANDARD IN X- AND γ -RADIATION. Sumbakov I. I. Izv Akad Nauk SSSR, Ser Fiz., 31: 343-8 (Feb 1967). (In Russian)

Since the existing wavelength standards are inherently variable, it is deemed necessary to consider the effects which may lead to energy shift in the x-ray emission lines and, therefore, dependence of the standard wavelength on the conditions of experiment. It is concluded that the γ transition with an observable Mossbauer effect at $f \approx 1$ would make a reasonable and convenient standard (JPRS)

1294 OFFICIAL STANDARDS AND INDEXES FOR MEASURING IONIZING RADIATION. Yudin, M. F., Karavaev, F. M., Yaritsyna, I. A., Ruzer, L. S. Izmer. Tekh., No. 11, 107-16 (Nov. 1967). (In Russian)

Problems related to the determination of standards for measuring ionizing radiation and problems of transferring the unit value from the standard to the specimens and working radiation sources and instrumentations are discussed. Methods of quantum, neutron and β radiations dosimetry, measurements of radioactive aerosols and neutron fluxes are analyzed. A listing of 27 references is included (R V J)

1295 THE IONISING RADIATIONS (UNSEALED RADIOACTIVE SUBSTANCES) REGULATIONS 1966. (DRAFT). London, Her Majesty's Stationery Office, 1967. 31p. 2s. 9d.

Section headings are as follows: Interpretation and general, administration, notifications, and records, basic principles of protection, radiological supervision, medical supervision, arrangement of premises and plant, personal protection, organization of work, monitoring and measures to deal with contamination. Schedules are included for maximum permissible radiation doses, maximum permissible levels of contamination and method of assessment, classification of radionuclides (UK)

1296 STANDARDS AND QUANTITIES IN RADIATION DOSIMETRY. Wyckoff, H. O. (Armed Forces Radiobiology Research Inst., Bethesda, Md.) pp 333-45 of Solid State and Chemical Radiation Dosimetry in Medicine and Biology. Vienna, International Atomic Energy Agency, 1967.

From Symposium on Solid-State and Chemical Radiation Dosimetry, Vienna. See STI/PUB 138, CONF-661005.

The International Commission on Radiation Units and Measurements (ICRU) has defined the quantities needed for medical and biological dosimetry of x-rays, gamma rays and electrons. It has also suggested a method for obtaining the absorbed dose at the point of interest. This material is reviewed and some consideration given to the needs for standards in the higher-energy x-ray and electron field (auth)

1297 AVAILABILITY OF STANDARDS FOR COMMON RADIONUCLIDES. Reynolds, S. A. (Oak Ridge National Lab., Tenn.). Isotop. Radiat. Technol., 5: 118-21 (Winter 1967-68).

Radionuclides (93) for which standard preparations are available or needed are listed in a table, together with some sources of supply. Some discussion of the use and importance of radionuclidic standards is included (auth)

1298 (BNL-50073) DOSE-EFFECT MODIFYING FACTORS IN RADIATION PROTECTION. Report of Subcommittee M-4 (Relative Biological Effectiveness) of the National Commission on Radiation Protection. (Brookhaven National Lab., Upton, N. Y.). Aug. 1967. 34p. Dep. CFSTI

Recommendations of the National Commission on Radiation Protection Subcommittee on Relative Biological Effectiveness on dose-effect modification factors to be used in practical radiation protection are presented. It was deemed desirable to characterize an individual's entire cumulative exposure status by a single number. To do this, it is necessary to extend the present methods for summing exposures so that the incremented dose-equivalent values can be summed for all types of external and internal irradiations. To achieve this goal, a new system was devised for evaluating, summing, and recording occupational exposures. It is recommended that the risk from all radiation exposures be expressed relative to that from a basic whole-body exposure to a standard low-LET radiation, and that ^{60}Co gamma be designated as this standard low-LET radiation. The risk from any exposure is related to that from whole-body exposure to the standard radiation through an effectiveness factor (ef). This correction factor for external radiation is the product of several subfactors, including radiation quality, body region irradiated, and penetrating power. The product (dose in rad $\times$ ef), the dose equivalent, is expressed in terms of exposure record units (eru), analogous to the rem. It is also recommended that ef values be established for internal emitters, in order that the

risk from known body burdens of internal emitters relative to that from external radiation can be represented in the cumulative eru record. Recommendations on how to accomplish this, and representative suggested ef values, are given (CH)

1299 (NP-17180) NORMES DE BASE RELATIVES A LA PROTECTION SANITAIRE DE LA POPULATION ET DES TRAVAILLEURS CONTRE LES DANGERS RESULTANT DES RADIATIONS IONISANTES (Fundamental Standards Relative to the Sanitary Protection of the Population and Laborers from the Hazards Resulting from Ionizing Radiation). (European Atomic Energy Community). June 1967. 42p. (In French). Dep.

The radioprotection standards established by the European Atomic Energy Community are presented. The radioprotection concepts are defined and the areas of application of the standards are given. The maximum permissible doses for professionally exposed personnel are given. A table is presented showing maximum permissible concentrations of radioisotopes in drinking water and inhaled air of professionally exposed personnel (J S R)

1300 HEALTH ASPECTS OF SAFETY. Kuhl, Ralph (American Medical Association, Chicago). J. Occup. Med., 9: 163-9 (Apr. 1967).

Radiation hazards, accidents, and protective principles are reviewed, in addition to health aspects of safety in other fields. During its last 2 decades of existence, the entire atomic energy field has maintained a remarkable safety record. There have been about 10 fatalities to date in radiation accidents in 20 yr. Personal injuries and contamination of the environment from peaceful uses of nuclear power have not occurred. This record represents an excellent example of due regard for the health aspects of safety, demonstrating that with effective safeguards, accidents do not occur. However, because of the expanding nuclear reactor program and because of the great quantities of radioactive waste products produced, the possibility of serious accidents continues to be of concern. This concern increases as use of radioactive materials expands from the major AEC installations where high standards of radiation safety are maintained to medical facilities, industrial plants, and research laboratories, where principal disposal routes are the sewer and the incinerator, for liquid wastes and solid wastes, respectively. After 2 decades of success in the safe use of radiation within AEC installations, the new challenge is the establishment and maintenance of equally high standards of radiation safety outside these installations (BBB)

1301 THE BASIS OF THE ICRP RECOMMENDATIONS ON PERSONNEL MONITORING. Lindell, Bo (National Inst. of Radiation Protection, Stockholm). pp 27-34 of Radiation Dose Measurements: Their Purpose, Interpretation, and Required Accuracy in Radiological Protection. Paris, European Nuclear Energy Agency, 1967.

From Symposium on Radiation Dose Measurements, Their Purpose, Interpretation, and Required Accuracy in Radiological Protection, Stockholm. See CONF-670621.

The recommendations of the ICRP, contained in ICRP Publication 9 (1965), concerning personnel radiation monitoring are discussed. It is pointed out that the new text refers only to adults exposed to radiation in the course of their work and to exposure of the public to radiation. The maximum permissible dose (MPD) to workers under normal operating conditions, where the critical organs are the bone marrow and gonads, recommended is 5 rems/yr. The dose limitation for the public recommended is one-tenth of the annual occupational MPD. The recommendations are discussed with regard to operational procedures (CH)

1302 TECHNICAL PROBLEMS POSED BY APPLICATION OF ICRP RECOMMENDATIONS. Jammet, H. P. (Commissariat a l'Energie Atomique, Fontenay-aux-Roses, France). pp 35-45 of Radiation Dose Measurements: Their Purpose, Interpretation, and Required Accuracy in Radiological Protection. Paris, European Nuclear Energy Agency, 1967. (In French)

From Symposium on Radiation Dose Measurements, Their Purpose, Interpretation, and Required Accuracy in Radiological Protection, Stockholm. See CONF-670621.

Applications of the ICRP recommendations for radiation dosimetry, particularly those given in Publication 9, raise a number of technical problems. As the dose limits are set for the whole-body and for particular organs, the dose measurement made on workers need to be interpreted in terms of absorbed doses to the organs. It is therefore necessary to consider a system of translating the crude data obtained from dosimeters into effective absorbed doses. The dose limits are set in relation to various periods of time, the most common of which is a quarter of a year. Several problems arise regarding the most suitable system of reading and recording dose measurements. The recommendations made in Publication 9 envisage a flexible organization of radiation protection according to whether workers are likely to receive doses below or above 0.3 of the dose limits. It is therefore necessary to resolve the prob-

lems relating to the use of collective or individual measurements in order to arrive at a final interpretation in relation to the observance of health norms. In a not inconsiderable number of cases high energy radiations may raise such problems as the choice of quality factors. It must be possible under accident conditions to record the high level of absorbed dose and to know the spatial distribution accurately. All the technical problems raised in this way are such as to deserve having the greatest importance attached to them with a view to obtaining results which are comparable and easily interpreted. (auth)

1303 (PRWRA-GNEC-7(Rev.2)) RADIATION PROTECTION STANDARDS. Bonnet, Juan A Jr. (Puerto Rico Water Resources Authority, Rincon, Bonus Nuclear Power Station). May 1967. Contract AT(40-1)-2672. 187p. Dep. CFSTI

The practices and regulations to be followed during operation of the BONUS plant for radiation protection are discussed. Topics include responsibilities of health physics personnel, radiation and contamination limits, maximum permissible concentrations in air and water, operating regulations, plant restrictions, routine operations, emergency procedures and facilities, instruments and equipment, and records and reports. (B G D)

1304 (SC-M-67-2973) PULMONARY RADIOTOXICOLOGY. Bruner, H D. (Division of Biology and Medicine (AEC) Washington, D C.). Dec. 1967. 21p. (CONF-670956-1) Dep. CFSTI

From Biological Science Symposium, Albuquerque, N. Mex. For Sandia Corp., Albuquerque, N. Mex.

The contamination of the respiratory system by fine radioactive particles is discussed. Possible sources of radioactive particles in the atmosphere include reactors used to generate power, research reactors, the manufacture of reactor fuel elements, the processing of spent fuel particles suspended in the atmosphere by past atmospheric testing, and reentry burn-up of isotopic power units of various SNAP devices. Standards for the maximum permissible concentration of radioactive isotopes in air established by the International Commission on Radiological Protection and the National Council on Radiological Protection and their value for the radiation protection of personnel in nuclear industry and the public are discussed. Problems encountered in the production of stable, reproducible aerosols and in measurements of the number and size of particles in the aerosol used for research studies are discussed. It is pointed out that the biophysical principles governing movement of various sizes of particles in the respiratory system and the radiation dosimetry of aerosols are very complex. The value of NaI(Tl) crystal detectors in pulmonary radiotoxicology is discussed. Research programs in pulmonary radiotoxicology sponsored by the Atomic Energy Commission are reviewed briefly. It is concluded that although the science of pulmonary radiotoxicology is well advanced, additional experimental and theoretical studies in this field are needed. (C H)

1305 PROPOSED RADIOACTIVITY CONCENTRATION GUIDE FOR SHELLFISH. Weaver, C L. (National Center for Radiological Health, Washington, D. C.). Radiol. Health Data Rep., 8: 491-4 (Sept. 1967).

The recommendations of the International Commission on Radiological Protection (ICRP), the National Committee on Radiation Protection (NCRP), and the Federal Radiation Council (FRC), were applied in deriving proposed guides for radioactivity in shellfish. FRC Report No. 1 presents basic exposure criteria, FRC Report No. 2 presents intake guides for ^{88}Sr , ^{90}Sr , ^{131}I , and ^{226}Ra , and NCRP and ICRP provide data on the maximum permissible concentrations of radioisotopes in water. The proposed guide was assembled by the National Center for Radiological Health in collaboration with the Water Supply and Sea Resources Program of the National Center for Urban and Industrial Health, Public Health Service. (auth)

1306 BASIC STANDARDS AND NEW CONCEPTS OF THE INTERNATIONAL RADIOLOGICAL PROTECTION COMMITTEE. Recht, P. (EURATOM, Brussels). J. Belge Radiol., 50: 318-24 (1967). (In French).

Recent publications by the International Radiological Protection Committee suggest some new concepts and a new terminology. The changes that they might bring about in the basic standards for maximum permissible doses are considered. (auth)

1307 PROTECTION OF WORKERS AGAINST INDUSTRIAL USE OF X RAYS. Halleux, O. (Usines Balteau, Liege). J. Belge Radiol., 50: 312-17 (1967). (In French).

The industrial use of x rays led various countries to lay down a number of basic standards for the protection of their workers. The principles on which the Belgian basic standards NBN 491 is based are explained. The precautions to be taken when using x ray equipment in shielded rooms and on building yards are reviewed. (auth)

1308 ZAKLADY IZOTOPOWE Z ZAMKNIETYM ZROD-LAMI PROMIENIOWANIA GAMMA. WYMAGANIA OCHRONY PRZED PROMIENIOWANIEM JONIZUJACYM. (Isotope Laboratories for Sealed Gamma Radiation Sources. Requirements for Protection Against Ionizing Radiation). PN 63/J-80102. Warsaw, Polish Standards Committee, 1964. 3p. 2.40 Zloty

This standard specifies requirements for isotope laboratories in which sealed radioactive sources with a γ radiation equivalent of 50 mg Ra are employed for scientific, medical, industrial and other purposes. Recommendations are made concerning planning, selection of location, protection of neighboring rooms and areas, safety devices and warning signs, dosimetry equipment and fire protection. The standard also includes special provisions concerning medical laboratories in which sealed sources are used therapeutically. The standard finally sets out requirements for the approval of plans for isotope laboratories and the approval of completed projects. (Occup. Safety & Health Abstr.)

1309 DIMENSIONS OF THE PROBLEM OF FALLOUT. Terry, Luther L. (Univ. of Pennsylvania, Philadelphia). Pediatrics, 41: Suppl., 170-3 (Jan. 1968).

The implications of fallout on public health are discussed. Fallout has a unique position among all health hazards since no living person in the Western hemisphere and probably very few persons throughout the world have escaped some exposure to this agent. Peacetime fallout is a health problem whose sources confer benefits as well as hazards upon society. Three principal applications of this benefit vs. risk equation at the public policy level are considered. The first involves setting standards for acceptable radiation exposures consistent with maintenance of national defense and exploitation of nuclear energy for peacetime purposes. The second would fix standards of potential exposure levels beyond which public health protection action must be taken for uncontrollable emergency situations. The third requires balancing the health gains expected of a given protective measure against the health hazard or economic impact which the measure would create. Responsibilities of official agencies in setting standards governing environmental irradiation of populations deal with very complex problems since very little is known about the effects of small doses of radiation such as natural background radiation and the fallout from nuclear testing. In particular, it is not known definitely whether there is a so-called damage threshold. Determining the relation between radiation exposure and the long term biological effects of such exposure is complicated further by the fact that these effects are similar to existing diseases which are not radiation caused. (BBB)

1310 STATEMENT ON THE RADIATION HAZARD TO FEMALE RADIOGRAPHERS. Radiography, 33: 225-6 (Oct. 1967).

A statement prepared by the Radiation Protection Committee of the Council of the British Institute of Radiology relating to reducing hazards to women working in radiology departments was discussed. It was suggested that radiographers in diagnostic departments other than those whose duties included use of Ra and radioisotopes would not need to take any additional action in regard to radiation safety in the event of pregnancy but should as always employ good practices and wear protective aprons whenever indicated, avoid holding children while an exposure was being made, and guard against accidental exposure. The same general recommendations were made for radiographers working in x ray and γ ray therapy departments. Radiographers working either diagnostically or therapeutically with Ra and radioisotopes and those whose duties included the radiography of Ra and radioisotope heated cases might, in some circumstances need to have their duties modified in the event of pregnancy. Doses recorded on their film badges or protection dosimeters would indicate to the Protection Officer what steps, if any, needed to be taken. Only if the average monthly surface dose of a pregnant radiographer exceeded 150 mrem and she was using x ray energies over 100 KV would the question of assessing the fetal dose arise. There would be no need to assess fetal doses in the case of workers with low voltage diagnostic equipment provided the monthly surface dose did not exceed 400 mrem. (BBB)

1311 NEW TRENDS IN THE INTERNATIONAL RECOMMENDATIONS IN THE ESTABLISHING OF MAXIMAL DOSES OF IONIZING RADIATION. Musialowicz, T. Pol. Przegl. Radiol. Med. Nukl., 31: 903-10 (Nov.-Dec. 1967). (In Polish).

New recommendations of the International Commission on Radiological Protection were published in 1966. Two basic categories were established: exposure of individuals and exposure of populations. The first category was divided into two subdivisions: occupational exposure and exposure of the general public. Recommendations included maximum permissible doses for occupational exposure of individuals, dose limit values for members of the general public, and genetic dose limits for populations. (H L W.)

The Public Health Service of the United States in collaboration with the A E C and other government agencies developed guidelines for the control of radiation hazards in uranium mines. The environmental conditions in uranium mines are outlined and the biological effects from exposure to radon and its decay products are summarized. The basic safety standards proposed are given (J S R)

1323 NORME REPUBLICANE DE PROTECTIE A MUNCII. (Republican Standards for Worker's Protection). Bucarest, Comitetul de Stat Pentru Protectia Muncii, Ministerul Sanatatii si Prevederilor Sociale, 1966. 262p.

The various sections of these general occupational safety and health regulations, issued pursuant to article 4 of Act No 5/1965 on Workers' Protection (see CIS 1162-1966, Vyz (622)), cover general provisions, industrial buildings and halls, safety engineering (research, planning, design and use of tools, machines and installations), loading, unloading, conveying, handling and storage of materials, installations under pressure, hand tools, electrical installations and equipment, excavation work, microclimate, ventilation and heating, occupational health standards, prevention of diseases and accidents caused by gases, vapors or dusts, fire protection, ionizing radiation, lighting, noise and vibration, personal protection, first aid, medical examinations, safety training, safety campaigns, final provisions (Occup Safety and Health Abstr)

1324 JAHRESBERICHTE DER GEWERBEAUFICHT. BUNDESREPUBLIK DEUTSCHLAND, 1965. (Annual Reports of the Industrial Inspectorate. Federal Republic of Germany, 1965). Bonn, Bundesministerium fuer Arbeit und Sozialordnung, 1967. 832p.

A collection of annual reports of the Regional Industrial Inspectorates of the Federal Republic of Germany is arranged under the following headings: statutory provisions enacted in 1965 in the field of occupational safety and health, accident prevention, protection against fire and explosions, industrial organization and hygiene, health protection, radiation protection, environmental protection, enforcement of provisions on working hours, additional protection for special categories of persons. The individual sections contain numerous examples of actual accidents and safety measures applied in practice. Statistical tables are given at the end of each report regarding plant inspections, complaints lodged, warnings, summonses and penalties, and investigations of occupational accidents and diseases. Statistics for the Federal territory as a whole, and a subject index, conclude the work (Occup Safety and Health Abstr)

1325 ANWEISUNG UEBER DIE EINFUEHRUNG UND ANWENDUNG ARBEITSHYGIENISCHER NORMEN. (Instruction Concerning the Introduction and Implementation of Occupational Health Standards). Berlin, Veruegungen und Mitteilungen des Ministeriums fuer Gesundheitswesen, 1966. 23p.

New standards are laid down for the evaluation of workplaces, processes and production shops. Appendices contain the relevant occupational health standards relating to the following: measurement and evaluation of maximum concentrations of toxic dusts, gases and vapors at workplaces (threshold limit values), measurement and evaluation of non-toxic dust concentrations at workplaces, measurement and evaluation of maximum allowable radiation doses at workplaces (Occup Safety and Health Abstr)

1326 INDUSTRIAL USE OF RADIOACTIVE SOURCES. SEALED GAMMA RADIATION SOURCES FOR GAMMA RADIOGRAPHY. Bull. Inform. A.T.E.N. (Ass. Tech. Energ. Nucl.), Suppl. No. 52, 15p. (Mar.-Apr. 1965). (In French).

The radioactive elements used in γ radiography include ^{60}Co , ^{137}Cs , ^{192}Ir , and ^{170}Tm . This brochure describes the hazards stemming from the radiation emitted by them and lists the precautions to be taken in their industrial use, on the basis of directives drawn up by various international bodies (ICRP, ILO, EURATOM) which are applicable in France. The use and storage of apparatus and source containers and the action to be taken in the event of accidents on public thoroughfares, in workshops, or on building construction sites, and in the event of fire are considered. The formalities required in obtaining authorization to procure or use radioactive elements are described (Occup Safety and Health Abstr)

1327 RADIATION PROTECTION IN INDUSTRY. Kaufmann E. pp 54-61 of Radioisotope in der Industriellen Messtechnik. Bern, Schweizerische Vereinigung fuer Atomenergie, 1965. (In German).

A review is given of the relevant Swiss legislation concerning radiation protection in industry, the activities of the Swiss inspection authorities, and the qualifications that experts must hold. Radiation protection in the use of sealed-source measuring

instruments (thickness gauges, level indicators, density and moisture content measuring instruments with a neutron source, gas chromatography equipment, etc) is also discussed (Occup Safety and Health Abstr)

1328 DECREE NO. 67-228 OF 15 MARCH 1967 CONTAINING ADMINISTRATIVE REGULATIONS CONCERNING THE PROTECTION OF WORKERS FROM THE HAZARDS OF IONIZING RADIATION. J. Offic. Repub. Fr., No. 69, 2754-71 (Mar. 22, 1967). (In French).

This Decree replaces the Decree of 5 December 1934 and Orders of 26 December 1934 concerning the protection of workers from radioactive substances and radiation. It contains provisions designed to safeguard workers in the medical, industrial and commercial fields: anyone in possession of radiation generating equipment or of a natural or artificial radiation source must declare same to the Labour Inspectorate, records must be kept of the characteristics of and any modifications to the source of the uses made of it and of staff employed, technical provisions are laid down regarding the extent of monitored areas and radiation dosimetry: workers under regular medical supervision must have a special record, to be kept by the responsible occupational physician and preserved throughout their life, a register of dates, length and cause of absences from work and of results of haematological and radiological tests to be maintained. Special provisions cover certain mobile or sealed sources and medical applications, data on maximum equivalent doses and concentrations are appended (Occup Safety and Health Abstr)

1329 (CONF-660573-, pp 97-109) IMPLEMENTATION OF PROCEDURES AND TECHNIQUES FOR SAFE OPERATIONS OF LASERS. Fine, Samuel. (Northeastern Univ., Boston, Mass.).

Personnel duties, medical supervision and records maintenance, and the design of facilities for the safe operation of lasers are outlined and discussed. Protection standards and dosimetry methods and the management of accidents are also discussed. In the ensuing panel discussion the design, availability, and efficiency of protective attenuators of laser radiation (clothing and eye-protection goggles) are emphasized (B S L)

1330 (STI/PUB-124) RISK EVALUATION FOR PROTECTION OF THE PUBLIC IN RADIATION ACCIDENTS. Safety Series No 21. (International Atomic Energy Agency, Vienna (Austria)) 1967. 78p. IAEA \$2.00, Austrian Schillings 52, 14/2 stg, F Fr 9.80, DM 8.

The report of a panel of experts who convened to define a range of reference doses of radiation that should be helpful in assessing the hazards of nuclear installations and in making policy decisions is presented. It was published on behalf of the World Health Organization and the IAEA. The report is separately available in French or English (auth)

1331 RADIATION PROTECTION FOR DIAGNOSTIC X RAY FACILITIES. Meckstroth, George R. (Tulane Univ. School of Medicine, New Orleans). J. La. State Med. Soc., 119: 115-20 (Mar. 1967).

Various factors to be considered in radiation protection aspects of diagnostic x-ray facilities are incorporated into the Louisiana Radiation Regulations. The current recommendations for permissible radiation levels for several categories of workers and for the general population are discussed. The maximum permissible doses for three categories are given. The doses are specified for various organs and parts of the body. The permissible dose to nonradiation workers is less than that recommended for radiation workers and as the hazard is very much reduced, personnel monitoring is no longer necessary. Data for medical fluoroscopic, medical radiographic, mobile diagnostic, photofluorographic, and dental radiographic units are set forth in the Louisiana Radiation Regulations (BBB)

1332 PHYSICAL ASPECTS OF IRRADIATION. PART I. Kernenergie, Beil., 11: B243-60 (Apr. 1968). (In German).

A report from the International Commission for Radiological Units and Measurements is presented. The report is concerned with the physical aspects of radiation and contains new data available since the report published in 1959. It gives an extensive discussion of the methods available for the measurement of the energy dose and ion dose. The characteristics of radiation measurement devices especially some remarks on standards are reported. The section on spectra was reworked and the spectra for neutron measurements and standards are introduced. The available data on the stopping power ra^+ and the mean energy expenditure W for the formation of an ion pair in a gas were tested. As a result of these tests it was necessary to modify these factors from the previously published values in ICRU tables. The stopping power ratios were modified by 1 to 2% and W by up to 1% (tr-auth)

1333 (AECL-1027(5th Ed.)) HEALTH AND SAFETY ORGANIZATION. Fifth Edition. (Atomic Energy of Canada Ltd., Ottawa (Ontario)). July 1968. 43p.

A summary of the provisions for health and safety, in particular radiation safety, at Atomic Energy of Canada Limited is presented. Such matters as derivation of legal authority, establishment of policy, assignment of operational responsibility and provision of expert advice for management are discussed. Standard Policies and Procedures define the terms of reference of some of the committees and panels mentioned in the report. New terms of reference for all such groups will be published in the same way. These will be the authoritative texts for operating purposes. (auth)

1334 RADIATION HYGIENE AND PRACTICE IN DENTISTRY. J. Amer. Dent. Ass., 76: 107-16 (Jan 1968).

It is estimated that approximately 95 000 x ray units are in use in dental offices in the United States at the present time. Approximately 60% of the states have adopted mandatory regulations regarding the use of radiation in dentistry and over 90% of the states either require registration of dental x ray units or have general radiation codes. Data on regulations of the 50 states, the District of Columbia, and Puerto Rico are presented, with general information on state administering agencies, requirements of inspection, record maintenance, equipment standards, structural shielding standards, operating procedures, and radiation protection standards applicable to the use of radiation in dentistry (C H)

1335 STANDARDS OF WORKING LOADS FOR PHYSICIANS OF X-RAY DIAGNOSTIC ROOMS. Katsman, A. Ya.; Tikhonov, K. B.; Khristian, V. I. (Central Scientific-Research Inst of Roentgen-Radiology, Leningrad). Vestn Rentgenol Radiol, No 6, 75-81 (Nov-Dec. 1967). (In Russian)

All standards should be included into the working time part used for patient examination (with the x-ray tube switched on and off), due protection should be provided for all office personnel from possible radiation injuries. In a correctly organized structure of working time of a roentgenologist $\frac{2}{3}$ of it should be devoted to the examination of patients (200 minutes per shift). Determination of the maximal permissible time of personnel irradiation is of great importance. This time represents a calculation value determined by objective indices: nominal generation voltage, nominal current, the distance between the x-ray tube and the working place, and the value of the maximal permissible radiation dose. The maximal permissible radiation time of dark room workers per shift is 100 min at a nominal voltage of 110 kV (focus-object distance of 1 m and the nominal current of 3 mA, roentgenoscopy), when the nominal current is 30 mA, only 100 min per shift. (auth)

1336 DOSES COMMITMENTS. Morgan, K. Z. (Oak Ridge National Lab., Tenn.). pp 171-4 of Congress International sur la Radioprotection dans l'Utilisation Industrielle des Radioelements, Paris, 13-15 Decembre 1965. Paris, Service Central de Protection Contre les Rayonnements Ionisants, 1967.

See CONF-651220.

The concept of the maximum permissible radiation dose for lifetime exposure of 25 rem, as used by both the National Council on Radiation Protection and the International Commission on Radiological Protection, is discussed. It is postulated that every radiation worker has inherited a special bank account or loan agreement for 25 credit units of exposure to be used only once in a lifetime, and that when this is used any future radiation work must be restricted. This analogy is expanded by considering that every person, regardless of his occupation, has inherited a bank account of credit units that may be used up in one or many different ways by dose or dose commitments of a variety of agents, factors, or substances that are unfavorable to sustained life. Examples cited include the inhalation of beryllium, lead fumes, and silicon dust; accidents; burns; heart disease; cancer; emphysema; leukemia; premature aging; and toxic effects of detergents and insecticides. The effects of age and sex on response to and recovery from the effects of certain noxious agents are discussed. It is pointed out that occupational exposure to one or more of these risk agents may be considered as the spending or using up of credit units. Some of these doses of risk agents may be received in a single event and result in death. Responsible society must set rules and recommendations such that workers in all fields, including nuclear energy, will not overburden themselves, their children, or society with such debts. (C.H.)

1337 THE UNITS "BER" AND "EQUIVALENT RAD". Isaev, B. M.; Bregadze, Yu. I.; Korshikov, A. V. Izmer Tekh, No. 11, 20-22 (1966). (In Russian)

Objections to GOST 8848-63, establishing standard units for radiological measurements, raised by Yudin and Keirim-Markus are answered. Since GOST 8848-63 permits use of the units rad and roentgen in addition to or instead of the official standard units

joule/kg and coulomb/kg, there is no need to revise the GOST standard as suggested by Keirim-Markus. Elevation of ber and rem to the status of standard units is felt to be premature in the absence of a standard scale or procedure for reproducing these units or calibrating instruments with them. Yudin's suggestions that the ICRU (International Commission on Radiological Units) term dose equivalent be replaced by a new term equivalent dose, is rejected as making a distinction where no difference exists, and as defeating the ICRU's efforts to reserve the noun dose to denote absorbed dose. There is likewise no need to invent a special new unit, the equivalent rad, to express dose equivalent (Yudin's equivalent dose), since the units ber and rem already exist for this purpose. (ATD)

1338 (NUS-301(Vol.1)) RADIOLOGICAL CONTROL PROCEDURES APPLICABLE TO RADIOISOTOPE THERMOELECTRIC GENERATOR SNAP-27. VOLUME 1. NORMAL OPERATIONS. Garcia, Luis F.; Calley, Harry W. (NUS Corp., Washington, D. C.). Sept. 12, 1966. 59p. Dep. CFSTI.

The radiological control procedures applicable to the normal transport, handling, and storage of the radioisotope thermoelectric generator (SNAP-27), prior to launching, are discussed. Procedures and standards, based on standards of the AEC and other regulatory agencies, are established for permissible doses, levels, and concentrations, classification and posting of storage areas, instruction of personnel, monitoring of storage areas and personnel, and precautions and regulations relating to the off-site transport of radioactive materials. The procedures and standards relate only to routine handling by the SNAP-27 custodial staff (E.R.B.)

1339 (NUS-301(Vol.2)) RADIOLOGICAL CONTROL PROCEDURES APPLICABLE TO RADIOISOTOPE THERMOELECTRIC GENERATOR SNAP-27. VOLUME II. RADIOLOGICAL EMERGENCIES. Garcia, Luis F.; Calley, Harry W. (NUS Corp., Washington, D. C.). Sept. 30, 1966. 68p. Dep. CFSTI.

Emergency procedures applicable to potential radiological accidents that may occur during handling, storage, and transport of the radioisotope thermoelectric generator (SNAP-27), prior to launching, are discussed. Procedures and limits, based on standards of applicable regulatory agencies, are established for peacetime emergencies including external and internal exposure of personnel and the general population, ^{238}Pu contamination guides; guidelines for preplanning responses to emergency situations by management, health physics groups, and medical groups; emergency equipment, and practice drills. Criteria for determining the existence of an accident and action to take during handling and storage, alarm systems, scram rules, and evacuation procedures are also discussed. Criteria and action, including notification of proper civil and government authorities and news media in the event of an accident during transport is discussed along with the procedure for detection and recovery of lost capsules. Sources of assistance during a radiological emergency are given as are the post-emergency functions to be followed including follow-up biomedical functions and the keeping of proper and adequate records of the accident. (E.R.B.)

1340 HOW TO GET A LICENSE TO USE RADIOISOTOPES. Washington, D. C., Atomic Energy Commission, 1967. 38p. \$0.30. GPO.

The regulations and safety standards are outlined for state and AEC. The procedures are given for obtaining a license for use of radioisotopes which include preparing applications and all aspects involved. (J.C.W.)

1341 (NP-17266) ANNUAL REPORT TO THE DIRECTOR-GENERAL FOR THE YEAR ENDED 30th JUNE 1967. (Commonwealth X-Ray and Radium Lab., Melbourne (Australia)). 28p. Dep.

Activities of the Commonwealth X-Ray and Radium Laboratory in 1967 are described. Sections on establishment of national standards of activity and exposure, care and maintenance of Commonwealth radium and radon supplies, advisory services for medical users of x radiation, procedures for purchasing and distributing radioisotopes, and health physics services are included (B.S.L.)

1342 THE MEDICAL SERVICE OF THE PLUTONIUM PRODUCTION CENTER OF MARCOULE. Presse Med., 75: 2199-2200 (Oct. 21, 1967). (In French).

The protection of workers against radiation at the Commissariat à l'Energie Atomique Centre de Marcoule is discussed. Innovations in construction were required to provide for safety according to French statutes as well as standards imposed by Euratom regarding workers exposed to radiation. The ground floor of the building contains facilities for decontamination, consultation rooms, laboratories, social services, and radiodiagnosis.

tic and photographic units. The other building contains a section for decontamination, and another section for γ spectrometry. Strict surveillance is maintained over all contacts, accidental or necessary, with radioelements, and decontamination is monitored. Radiation exposures of about 2400 persons are monitored. All contamination incidents are carefully followed and a dossier maintained on each worker. Ophthalmologic otorhinolaryngologic, and various other examinations are made periodically (50,000 hemotologic examinations were made in 7 yr). Studies of those persons exposed to radiation slightly exposed and not exposed showed almost no difference in leukocyte counts. It has been established at the Centre that polymorphonuclear leukocyte counts of 42 to 70% are normal for healthy persons. Measures are also taken to protect workers against internal irradiation caused by internal contamination, to follow excretion of radionuclides, and to perform whole-body counts on personnel (BBB).

1343 MEASUREMENT UNITS USED IN IONIZING RADIATION DOSIMETRY AND RADIATION SAFETY EQUIPMENT. Keirim-Markus, I. B., Kochetkov, O. A., Moskalev, Yu. I., Popov, V. I. *Izmer. Tekh.*, No. 11, 18-19(1966). (In Russian).

The GOST (All-Union State Standard) 8848-63, adopted July 1, 1964 that established joules/kg and coulombs/kg as standard units for measurement of ionizing radiation, absorbed dose, and exposure, respectively is evaluated. In so doing, this GOST standard ignored the decision of the ICRU (International Commission on Radiological Units) to recommend the use of the Rad (~ 1 centijoule/kg) and roentgen (~ 0.257976 millicoulomb/kg), that are the units in which almost all presently used instrumentation is calibrated and almost all current research expressed. The cumbersome numerical data conversions required by use of the GOST units will afflict not only all studies involving absorbed doses expressed in Rads and exposures in roentgens, but also all biological shielding calculations containing equivalent or effective dose units (ber, Rem) based on Rad and roentgen. Indeed, GOST 8848-63 provides no units whatever for the measurement of dose equivalents. The authors propose that GOST 8848-63 be revised to establish the generally used and ICRU-recommended units of Rad, roentgen, and ber as standard units, and further suggest that any new units for radiological measurement should not be officially adopted by individual countries unilaterally, but proposed through and approved by the ICRU (ATD).

1344 GAMMA-RAY ENERGY OF ^{40}K . Yoshizawa, Yasukazu (Osaka Univ.); Morii, Tsuneo; Katoh, Toshio; Gotoh, Hiroshi. *J. Nucl. Sci. Technol.* (Tokyo), 5: 432-3(Aug. 1968).

Gamma-ray energies of ^{82}Br and ^{40}K were measured with an error of the order of 0.5 keV using a 20-cc Ge(Li) detector with a 1024-channel pulse-height analyzer. An average value of 1460.9 ± 0.3 keV was obtained for the ^{40}K γ ray, which can be used as a standard (J W.R.).

1345 PROPOSED DEFINITION OF RADIOACTIVE WASTE CATEGORIES. A SUMMARY OF A USASI STANDARD. Blanco, R. F. *Nucl. Safety*, 9: 515-20(Nov-Dec 1968).

A method of classifying radioactive wastes, based on the maximum permissible concentrations (MPC) established by the International Commission on Radiological Protection (ICRP) has been accepted as a USA standard. Excerpts from proposed definition of radioactive waste categories are presented (M C G.).

1346 (AHSB(RP)-R-77) OCCUPATIONAL HYGIENE STANDARDS FOR NATURAL URANIUM. Spoor, N. L. (United Kingdom Atomic Energy Authority, Harwell (England). Authority Health and Safety Branch). July 1968. 20p. Dep. CFSTI UK 3s. 6d.

The basis of various recommended values for the maximum permissible concentration in air (MPC)_a - of uranium compounds between 1944 and 1967 is examined. The enquiry includes an assessment of the different kinds of evidence used and an evaluation of the contributions from the organizations principally involved (INIS) (UK).

1347 (SC-TM-68-436) SANDIA LABORATORY LASER SAFETY STANDARDS. Parker, D. R. (Sandia Corp., Albuquerque, N. Mex.). July 1968. Contract AT(29-1)-789. 26p. (CONF-680911-1). Dep. CFSTI.

From American Industrial Hygiene Association Annual Meeting, Denver, Colo.

The protective measures necessary to set up and operate a laser system safely are covered in this report. Specifications for safety procedures for operating both continuous wave and pulsed lasers are covered. The assigned responsibilities of the using organization, Safety Division and the Environmental Health Department are also described (auth).

1348 STATE STANDARDS AND BASIC REFERENCE INSTALLATIONS IN THE FIELD OF IONIZING RADIATIONS.

Yudin, M. F., Karavaev, F. M., Yarytsyna, I. A., Ruzer, L. S. *Meas. Tech. (USSR)* (Engl. Transl.), No. 11, 1422-32(Nov. 1967).

Problems in the development of reference standards on which measurements of ionizing radiations should be based are discussed as well as some problems of transferring unit values from reference standards to reference and working radioactive radiation sources and instruments. Dosimetry of quantized neutron and β radiations is considered. To provide uniform and accurate measurements of quantum radiation exposure doses in the quantum range of 5 to 3000 KeV, 4 reference installations were constructed which reproduce the intensity of an exposure dose in ranges of 5-20, 20-60, 60-250, and 250-3000 KeV. Standard ionization chambers for reproducing the exposure-dose units in the ranges of 5-20, and 20-60 KeV were made of the plane-parallel type, principal dimensions of which are given. By meeting the requirements stated exposure-dose unit in the photon energy range of 5 to 60 KeV with an error of 1 to 1.5% could be reproduced. Reference standard for a neutron radiation dose unit consisted of tissue-equivalent and graphite ionization chambers which are similar in their construction and have a volume of 9.33 cm³. The wall thickness of either chamber is ~ 5 mm. The tissue equivalent chamber is filled with a tissue equivalent gas, and the graphite chamber with CO₂ up to a pressure of 0.1 MN/m² (760 mm Hg). Neutron radiation absorbed doses in the range of 2 to 10^4 $\mu\text{W/kg}$ could be reproduced with an error of 1 to 5%. A spectrometric method equipment, and special radiation sources were developed for measuring with high precision concentrations of the disintegration products of radon and thoron (ISS) (BBB).

1349 EVALUATION AND REDUCTION OF RISKS. THE ROLE OF THE GOVERNMENT IN FORMULATION OF GUIDELINES AND PROTECTION STANDARDS. Tompkins, Paul C. (Federal Radiation Council, Washington, D. C.). *Pediatrics*, 41: Suppl., 278-94(Jan. 1968).

This review considers the problems concerned with evaluating the hazards of radioactive fallout, the relation that radiation protection standards may have to such evaluations, and the role of the Federal Government in the formulation of applicable radiation protection guidelines. The general position of the Federal Government is that the control of man-made radiation hazards requires teamwork between agencies of the Federal Government, between the Federal Government and the governments of smaller political subdivisions, and between government and medicine. The Federal Radiation Council recommendations for a general national policy and tentative guidelines for classes of activities involving radiation is considered. One class, the radiation protection guide can be used as a basis for the control and regulation of non-therapeutic applications of radiation. The other class, protective action guide provides a basis for evaluation of the circumstances under which remedial action should be ordered by appropriate government agencies to reduce the risk that would otherwise be associated with an incident involving a radiation source. Rules and regulations, when they are appropriate are formulated by the various federal agencies within the limits of their statutory authority. Any action at any level is the result of a judgment involving the weighing of alternatives (BBB).

1350 RADIATION PROTECTION NORMS. REVISION EDITION 1968. Paris, European Nuclear Energy Agency, 1968. 49p.

Recommendations for maximum permissible doses to occupationally exposed persons and to the population as a whole are presented. An appendix is included giving maximum permissible doses to various organs of occupationally exposed persons. A table giving maximum permissible concentrations of radionuclides in drinking water and in air inhaled for continuous exposure of occupationally exposed persons is presented. Other table giving maximum permissible concentrations of mixtures of unidentified radionuclides in drinking water and in inhaled air are presented (H L W.).

1351 (CONF-681001-, pp 285-90) STATUS OF STANDARDS FOR TIEDOWN. Langhaar, J. W. (Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Atomic Energy Div.).

Some casks have been shipped with attachments to the vehicle or tiedowns obviously incapable of resisting rough handling within the range of ordinary transport. A subcommittee of the U.S.A. Standards Institute and previously of the American Standards Association has for more than two years been seeking an answer to the question of how strong the tiedown should be. It was disturbing to discover that suitable basic information is hard to come by and may necessitate experimental work. Meanwhile preparation of a guide has been undertaken to describe many of the methods of tiedown now in use (auth).

1352 (CONF-681001-, pp 487-500) SURVEY OF FISSILE MATERIAL SHIPPING CONTAINERS FOR BOTH NATIONAL AND

INTERNATIONAL SHIPMENTS. Estes, B. F., Barraclough, E. L., Wood, D. P. (Albuquerque Operations Office (AEC), N. Mex.).

The wide range of activities under the cognizance of the Albuquerque Operations Office (ALO) U. S. Atomic Energy Commission has created requirements for many types of containers for shipping fissile and radioactive materials components and wastes. The containers developed to satisfy these requirements are discussed including a brief description and methods of usage (auth)

1353 (NP-17444) DATA FROM RADIATION PROTECTION PROGRAMS. Volume 6, Number 1. (Department of National Health and Welfare, Ottawa (Ontario). Radiation Protection Div.). Jan. 1968. 33p. Dep.

The problems involved in the application of international standards to radiation protection activities is reviewed in a general way. Solutions are not offered, rather the recommendations of the ICRP are examined in view of the Canadian situation in relation to nuclear activities. The areas discussed in the report include, the problem safety regulations for nuclear personnel licensing of radioisotopes, public health action levels, population doses and dose apportionment, and the problem of medical exposure. Data are also presented in tabular form on the results of the Canadian fallout surveillance program. Included in the data are: total β activity in air and precipitation samples during 1966 to 1967, strontium-90 and cesium-137 content of whole milk and tap water during 1966 to 1967, total α and β activity in water from Ottawa River and Lake Huron, cesium-137, strontium-89, and strontium-90 content of water from Ottawa River, Lake Huron, and Winnipeg River, calcium, potassium, cesium-137, strontium-89, and strontium-90 content of whole milk from environs of Douglas Point Reactor Site and Whiteshell Nuclear Research Establishment, and total α and β activity in air samples from environs of McMaster University Reactor in Hamilton. (E. R. B.)

1354 STRAHLENSCHUTZPRAXIS. TEIL III UMGANG MIT STRAHLERN (Radiation Protection Techniques Part III Handling Radiation Sources) Oberhofer, Martin Thiemig-Taschenbuecher Band 14 Muenchen, Verlag Karl Thiemig KG, 1968 315p. DM 19,80

In the literature on radiation protection there are no directions as to how the fundamental standards, guidelines, and ordinances of radiation protection and the operational, institutional, and labor regulations can be fulfilled. A compilation of currently used protection and operational methods is presented. Those occurrences in connection with the handling of radiation sources which are often overlooked in spite of being self-evident and simple, and which lead to radiation exposures are discussed. The typical accidents and incidents are described, and risk evaluations are made for these. (tr-auth)

1355 SOME ASPECTS OF RADIOACTIVITY STANDARDIZATION AT THE CBNM OF EURATOM. Spornol, A. (EURATOM, Geel, Belgium). Trans. Amer. Nucl. Soc., 11 465 (Nov. 1968).

From International Conference on the Constructive Uses of Atomic Energy, Washington, D. C. See CONF-681101.

1356 THE WORK OF INTERNATIONAL ORGANIZATIONS IN THE FIELD OF RADIOLOGY. Jaeger, Robert G. Roentgenpraxis, 20: 126-34 (June 1967). (In German).

Agencies of the United Nations were concerned with preparation of a three volume standard atlas of radiation dose distributions that presented isodose diagrams for single fields, multiple fields and moving irradiation fields. Effects of physical and geometric factors on dose distribution were discussed for a homogeneous H_2O equivalent medium. The third volume of properties of compounds of ^{14}C , 3H , ^{125}I , ^{131}I , ^{32}P and ^{35}S , was published. Other volumes published by other international agencies included reports on the use of radioisotopes and supravoltage radiation in radioteletherapy, toxicity of radionuclides, safe handling of radioisotopes, removal of radioactive fallout, basic safety standards and norms of radiation protection. Other related subjects that were discussed in various publications included use of the whole-body counter, increases in environmental irradiation due to increased and more widespread use of radioisotopes, establishment of basic standards and values for measurement of radioisotope concentrations and doses, dosimetry of x irradiation, accuracy and reproducibility of standards and equivalent and absorbed irradiation doses. The availability and sources of the various publications mentioned were indicated. (BBB)

1357 STANDARDS OF ACTIVITY. Newbery, G. R. RCC Review No. 4. Amersham, Eng., Radiochemical Centre (UKAEA), 1968. 28p.

Most users of radioactive substances require to know the approximate activity of the material they are handling if only to

abide by safety regulations or so that they may purchase the minimum activity which will enable them to obtain required results. For such applications is the determination of the yield of nuclear reactions and the measurement of cross sections an accurate knowledge of activity is essential and it is always desirable to use standards of known accuracy for the calibration of laboratory instruments. Standards of activity, statement of accuracy, types of standards available, certification of standards of activity, use of standards and standards of activity available from the Radiochemical Centre are discussed. (UK)

1358 (BNWL-SA 2049) COMPOSITE ENVIRONMENTAL DOSE ESTIMATES. Corley, J. P., Essig, T. H. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.). Sept. 23, 1968. Contract AT(45-1)-1830 19p. (CONI-680930-4). Dep. CFSTI

From Electromagnetic Spectrum Conference, Richland, Wash. The population doses received from radionuclides released to the environs are superimposed on those from natural radiation sources plus a minor contribution from weapons testing fallout. Valid estimates of these doses require a knowledge not only of external radiation levels but also of the kinds and quantities of radionuclides present in the atmosphere and in foods and beverages and to what extent these radionuclides are transmitted to man through the food chains. Both the control of industrial plant effluents and the evaluation of an environmental situation arising from the releases of such effluents require comparison of measured or calculated values against appropriate standards. Water and air quality standards for non-radioactive contaminants are generally in terms of concentration limits. Standards for radiation protection however are based on accumulated radiation doses over an extended period of time. In order to quantify the effects of various radionuclides on the different organs of the human body the International Commission on Radiological Protection has adopted the concept of a standard man with assigned biological and physical parameters. The primary radiation dose standards have been translated into secondary standards (Maximum Permissible Body Burdens) and tertiary standards (Maximum Permissible Concentrations in air and water) as additional tools for evaluation. Using the same parameters one can convert the intake of any one radionuclide into radiation dose. The ingested amount of a radionuclide can be estimated by multiplying the concentrations of the radionuclide in beverages and foods by the consumption rates. The intakes of several radionuclides cannot be combined directly since each radionuclide results in a numerically different dose per unit intake for each body organ. The total dose received by a body organ of interest is obtained by adding the doses resulting from each radionuclide ingested to the dose resulting from sources external to the body. This total dose can then be compared with appropriate dose standards. (auth)

1359 (NSJ-tr-100) DERIVATION OF THE WORKING LIMITS OF THE SKIN SURFACE CONTAMINATION. Minami Kentaro, Fukuda, Seiji. Translated from Hoken Butsuri 1 No. 1, 20-30 (1966). 23p. Dep. JCL \$2.60 fs, \$1.10 mf.

Contamination limits on the skin surface employed as a guide for the radiation protection of occupationally exposed individuals are derived by taking into account the external exposure dose to the skin and the internal exposure dose received by the inhalation, ingestion, and skin penetration of the contaminants. The adequacy of the derived permissible limits for occupational exposure is discussed in relation to the performance probability of a hand-foot monitor for the measurement of hand contamination. The contamination limits for the skin that were adopted by the ICRP are reviewed together with the general basis of the derivation. (auth)

1360 (AEC-tr-6866) MINISTRY OF SOCIAL AFFAIRS DECREE NO. 67-228 OF MARCH 15 1967 CONCERNING A PUBLIC ADMINISTRATION REGULATION RELATIVE TO THE PROTECTION OF WORKERS AGAINST THE DANGERS OF IONIZING RADIATION. ORDER OF MARCH 17 1967 RELATIVE TO THE COMPETITIVE EXAMINATION FOR PHYSICIANS FOR APPOINTMENT TO THE GENERAL DIRECTORATE OF PSYCHIATRIC HOSPITALS. Translated from J. Offic. Repub. Fr. 99 2738 2754-72 (1967) 58p. Dep. CFSTI JCL \$5.60 fs, \$1.94 mf.

In consideration of the opinion of the French Atomic Energy Commission, a decree is presented in which articles are listed stating modes of irradiation, maximum permissible dose equivalents and concentrations, and fields of application. Additional articles are given concerning general provisions relating to all operations involving a risk of irradiation or contamination, measures of a technical nature relating to the controlled zone, measures of medical nature relating to the personnel of the controlled zone, measures relating to the work yards or places adjoining the controlled zone.

and to the workers employed in these work voids or places, special provisions for certain radiation sources, special provisions applicable in the prevention, diagnosis, nursing or treatment centers, and to the private medical or dental consulting rooms, and temporary measures. Appendices are included on definitions of mass activity, maximum permissible concentration, dose equivalent rate, and other terms, a list of groups of radioisotopes according to their radiotoxicity, maximum permissible dose equivalents, quality factors and maximum neutron fluxes, and maximum permissible concentrations (H L W)

1361 RADIATION EXPOSURE OF URANIUM MINERS. SUMMARY ANALYSIS OF HEARINGS MAY 9, 10, 23, JUN 6, 7, 9, JULY 26, 27 AND AUGUST 9 AND 10, 1967, BEFORE THE SUBCOMMITTEE ON RESEARCH, DEVELOPMENT, AND RADIATION OF THE JOINT COMMITTEE ON ATOMIC ENERGY, CONGRESS OF THE UNITED STATES, NINTH CONGRESS, FIRST SESSION, DECEMBER 1967. Washington, D C, Joint Committee on Atomic Energy, 1967 60p GPO

Epidemiological data on several thousand uranium miners was collected during the past fifteen years by the Public Health Service. Analysis of the data led to the establishment of a 0.3 Working Level standard, the scientific basis of which was examined by the Joint Committee. The Committee examined whether the Department of Labor standard as written could be legally enforced inasmuch as it did not appear feasible to sustain a meaningful safety program at the 0.3 Working Level with the existing technology. The hearings disclosed certain discrepancies and misunderstandings associated with the Public Health Service epidemiological study. The Secretary of Health, Education and Welfare subsequently requested a review of the study from which it was concluded that the PHS projections of mortality from past and future experience in the mines could not be substantiated. Information generated during the hearing shed new light on several important facets of the miner exposure problem. Although there is still no positive evidence of the cumulative effects of exposure at levels of radiation as low as that embodied in the new standard, it is clear that deaths owing to lung cancer among uranium miners were associated with exposure to excessively high levels of radon daughters that existed in the 1940's and 1950's but that are no longer characteristic of the underground uranium mining operations. Thorough epidemiological studies were judged to be the best available scientific basis for establishing the relationship between exposure to short-lived radon daughters and the subsequent development of lung cancer. An accelerated Research and Development program is being implemented in accordance with an interagency plan formulated by the AEC and the Departments of HEW, Labor and Interior. Testimony relating to pathological studies on human radium exposure cases suggest the possible existence of a practical threshold level of exposure below which the risk of inducing lung cancer would be negligible during the normal life span of the individuals exposed (H L W)

1362 EFFECTS OF RADIATION ON MAN. Upton, Arthur C. (Oak Ridge National Lab., Tenn.). Annu. Rev. Nucl. Sci., 18 495-528(1968).

The literature concerning the effects of radiation on man is reviewed. For purposes of convenience, the types of radiation injuries are classified into somatic (early and late) and genetic. The injuries sustained by individual tissues and organs following exposure, the biochemical changes occurring, the concepts of lethality and recovery, and the influence of dose and dose rate on the nature of the injury sustained are also discussed. The effects of radiation on man, discussed in individual sections of the review, include the following: the effects of prenatal irradiation on growth and development and cancer incidence, the effects of radiation on longevity, effects on incidence of skin cancer, leukemia, thyroid, bone, and pulmonary tumors, and a variety of other neoplasms, effects on incidence of cataracts, and genetic effects. The evolution of radiation protection standards is also reviewed (E R B)

1363 STANDARDS FOR THE SAFETY INSPECTION OF NUCLEAR-FUEL TRANSPORT CONTAINERS. Shisetsu, Kakou Genshiryoku Iinkai Geppo, 13 No 7, 34-9(July 1968) (In Japanese).

Standards for the safety inspection of nuclear fuel transport containers are given. The standards were prepared by a subcommittee within the Committee on the Safety Standards for Fabrication Facilities. The preparation of the standards were done so that the IAEA rules and regulations concerning the transport of radioactive materials are referred to and only the items on nuclear fuel materials are treated, the shipping rules for nuclear fuel and non irradiated materials and those for used fuels are clearly established, and the methods adopted in IAEA are utilized for confirmation of the nuclear safety of transport containers (NSA of Japan)

1364 PROPOSED REVISED USA STANDARD [N6 1.1-1967 REV.] NUCLEAR CRITICALITY SAFETY STANDARD FOR OPERATIONS WITH FISSIONABLE MATERIALS OUTSIDE REACTORS. Nucl. Eng. Bull., 6-1 8p.(Jan 1968).

Guidelines for the prevention of nuclear incidents in handling, storing, processing and transporting fissionable materials are presented (H D R)

1365 PROPOSED STANDARD [ANS 8.4] STANDARD FOR SAFETY IN CONDUCTING SUBCRITICAL NEUTRON-MULTIPLICATION MEASUREMENTS IN SITU. Nucl. Eng. Bull., 6-2 4p.(Mar. 1968).

Safety criteria and practices for conducting neutron multiplication measurements on fissile material arrangements outside of specially designed experimental facilities are presented (H D R)

1366 DETERMINATION OF MAXIMUM PERMISSIBLE DOSES AS PROTECTIVE MEASURES IN AN IONIZATION RADIATION LABORATORY. Com. Naz. Energ. Nucl., Notiz., 14 No. 10, 105-12(Oct. 1968) (In Italian).

The Italian regulations on maximum permissible doses and concentrations of radionuclides using natural and artificial isotopes are presented. The maximum permissible concentrations of a radionuclide in drinking water and in the air are tabulated (J S R)

1367 (RISO-185) DOSIMETRY IN RADIOSTERILIZATION OF MEDICAL PRODUCTS. Holm, Niels W. (Danish Atomic Energy Commission, Risoe Research Establishment) Sept 1968 25p Dep

Dosimetry systems for radiosterilization of medical products were developed. Some of the work formed the basis of the dosimetry procedures included in the IAEA's recommended Code of Practice for Radiosterilization of Medical Products. Special efforts were made to develop simple and reliable calorimeters for absolute calibration of secondary dosimetry systems, and the results of the work with the thermos flask calorimeter and the oxalic acid dosimeter are reported. A number of general problems in radiosterilization dosimetry are also discussed (auth) (Denmark)

1368 (TT 67-51409/4, pp 387-92) STANDARDS FOR NATURAL RADIOACTIVE SUBSTANCES IN BUILDING MATERIALS. Afanas'ev, M K. Krisyuk, E M. Translated from Gig. Sanit., 32 No 12, 64-7(Dec 1967)

Varying amounts of naturally radioactive substances such as ^{40}K , ^{232}Th and their decay products are present in all natural materials and therefore in materials used in the construction of dwellings. The effects of both gamma-radiating isotopes and other radioactivity in building materials on the gamma-background levels in the buildings and the radon and thoron levels in the indoor air are discussed. The safety standards derived for the maximum permissible concentration of radioactive substances in building materials were 0.002 equilibrium h and V or 2×10^{-11} Ci/g of the total ^{210}Pb , ^{210}Po , ^{226}Ra , ^{228}Ra , ^{228}Th , ^{230}Th and ^{234}U (L C L)

1369 (DUN-54-77) BIOLOGICAL EFFECTS OF IONIZING RADIATION. Corbit, C D. (Douglas United Nuclear Inc., Richland, Wash.). Sept. 16, 1968. Contract AT(45-1)-18a7. 21p. (CONI-680930-1). Dep. CFSTI

From Electromagnetic Spectrum Conference Richland Wash.

The relation of dose to direct and indirect effects of γ and x radiation on man is discussed. The characteristics of ionizing radiations, reactions caused by radiation in cells and factors influencing the radiosensitivity of various tissues are reviewed. Data on the effects of radiation on blood, skin, eyes, gonads, gastrointestinal tract, lungs, nervous system, life span and tumorigenesis are summarized. Available data on injuries to man following exposure to various doses of radiation are reviewed. It is pointed out that radiation exposure limits established for the protection of the general population should not be applicable to personnel in nuclear industry since this group does not include persons below 18 yrs or over 70 yrs of age and persons working with radioactive materials are healthier than the general population. It is also pointed out that present standards for the exposure of radiation workers are based on genetic considerations and limit whole body dose to an average of 5 rems/year with a maximum dose of 3 rems/quarter of a year while standards for nonoccupational exposure for the population at large include 0.5 rems/year of whole body dose (C H)

1370 ESTIMATION OF RADIATION PROTECTION GUIDES INTERSPECIES CORRELATIONS. Richmond, C. R., Furchner, J. E. (Los Alamos Scientific Lab., N. Mex.). pp 1417-31 of Radiation Protection Part 2. Snyder, W. S.; Abee, H. H., Bur-

ton, L. K.; Maushart, R.; Bencko, A.; Duhamel, F.; Wheatley, B. M. (eds.) New York, Pergamon Press Inc., 1968

From 1st International Congress of the International Radiation Protection Assn., Rome, Italy. See CONF-660920-(Vol 2)

Values recommended for maximum permissible concentration (MPC) of radionuclides in air and water and for retention by the body and its component tissues are commonly based on data obtained from acute tracer studies in rodents. Conceptually, however, conditions of chronic exposure for human subjects are embodied in MPC calculations. Unfortunately, studies on retention of many radionuclides by human subjects are impossible or impracticable, even though the development of ultrasensitive human counters represents a significant contribution to the problem. Metabolically speaking, a 70 kg mouse or rat is sometimes regarded as a standard man. One approach to resolving this problem is to find interspecies correlations in radionuclide metabolism and ways of extrapolating to MPC values for man. During continuous ingestion of a constant amount of a material, an equilibrium level may be reached within the body. This level is predictable from acute administration studies. The integral of the effective retention function (limits of zero to infinity) is proportional to equilibrium level and has dimensions of multiples of the daily intake. The integral is also proportional to radiation dose. Interspecies correlations of the form $L = aN^b$, which relate equilibrium levels (L) obtained for mice, rats, dogs, monkeys, and men to grams body weight (X), have been developed for tritium water (HTO), ^{22}Na , ^{54}Mn , ^{65}Zn , ^{86}Rb , ^{131}I , and ^{137}Cs . The proportionality constant b differs for each element. In each case, values obtained directly from human studies agree well with values for man derived from the correlation. Equilibrium levels as a function of body surface, body weight, and metabolic rate using the power function (with and without the logarithm) and a first degree polynomial were also considered as models. The polynomial relating equilibrium level to body surface best describes cesium metabolism and accounts for shorter turnover times observed in children. (auth)

1371 ARGUMENTS FOR THE ESTABLISHMENT OF STANDARDS FOR INERT RADIOACTIVE GAS Goussev, N. G.; Kotchetkov, O. A.; Mikhailov, L. M.; Tourkine, A. D.; Troukhanova, E. S.; Philipovitch, V. P. pp 1445-53 of Radiation Protection Part 2. Snyder, W. S.; Abee, H. H.; Burton, L. K.; Maushart, R.; Bencko, A.; Duhamel, F.; Wheatley, B. M. (eds.) New York, Pergamon Press Inc., 1968. (In French).

From 1st International Congress of the International Radiation Protection Assn., Rome, Italy. See CONF-660920-(Vol 2).

Up to the present the standards of inert radioactive gases (IRG) of the isotopes such as Ar, Kr, and Xe were defined by establishing their maximum permissible concentrations (MPC) in the air of work sites and in the atmosphere of localities. In agreement with the recommendations of the ICPR the MPC is determined in this case according to the external β/γ radiation that one person receives if he is surrounded by an infinite hemispheric cloud of IRG. It is shown in the present report that in the case of release of IRG by the ventilation tube in the propagation direction of the cloud there is no strict agreement between the inert gas concentration in the air layer at ground level and the calculated dose of external γ radiation. This is why the establishment of the norms of the isotopes Ar, Kr, and Xe in atmospheric air should not be made according to the MPC but according to the yearly dose of external γ radiation produced by the cloud of radioactive gases at the surface of the earth. In this case, the maximum permissible release I, Ci/unit of time represents the principal controllable magnitude. In the air of work locations, the establishment of the norms is made according to the MPC, but in the calculation formulas it is necessary to take into consideration the volume limits of the room and the fact that the irradiation danger, practically, is determined completely by the radiation field of β particles and conversion electrons. (tr auth)

1372 USA STANDARD N5.10-1968 CLASSIFICATION OF SEALED RADIOACTIVE SOURCES USA Standards Inst. Committee N 5.4 August 29, 1967. New York, American Institute of Chemical Engineers, 1968. 14p.

A standard, to promote uniformity of purpose and to assure containment of the radioactive material within the sealed source is described. The standard establishes classifications for sealed sources according to the use. The classification is based on radiotoxicity, Curie content, and performance requirements. Design standards are left to the judgment of the supplier and user. (F S)

1373 URANIUM MINE-SAFETY CONTROVERSY Nucl. News, 12 No. 2, 24-6 (Feb 1969).

The development of health and safety standards to protect uranium miners from the carcinogenic agent radon and its decay

daughters is described. The Federal Radiation Council has recommended a current maximum exposure limit of 6 Working Level Month (WLM) in any consecutive 3 months and 12 WLM per year and that the industry should strive to improve mining conditions and monitoring practices so that by 1971 the limit can be set at 4 WLM per year. (L C L)

1374 SPECIFICATION FOR SYMBOL FOR IONISING RADIATION. British Standard 3510 1968. London, British Standards Institution, 1968. 6p. 4s.

A distinctive standard symbol to indicate the actual or potential presence of ionizing radiation is specified. (UK)

1375 ENVIRONMENTAL PLANNING A HEALTH PHYSICISTS VIEW Whipple, G. Hoyt (Univ of Michigan Ann Arbor) Amer J Public Health 58 1410-13 (Aug 1968)

Concepts, standards, and philosophy of radiation protection as they are applied to the environment are discussed, and how these principles can be applied to the problems of nonradioactive pollutants, is also considered. The standard for radiation control in the environment is 500 mrem/yr added to the natural background. This figure has resulted from years of deliberation by national and international organizations of scientists. The principal effects which it is believed radiation may produce, even at very low levels, namely, increased incidence of leukemia and genetic mutations and accelerated aging. Extensive laboratory experiments have failed to show thresholds for these effects of radiation. Environmental quality standards compatible with 500 mrem/yr are established for the amount of each radioisotope, which will produce the limiting dose rate in the body. Then, the daily intake which will maintain the body content at the level producing the limit dose rate, is calculated for each radioisotope. Daily intakes are calculated in this way for both inhalation and ingestion in both soluble and insoluble forms. Using the concepts presented, with judgment and some arbitrary assumptions, the health physicist is able to calculate the maximum rate of release for some of the radioisotopes which disperse readily in the environment, such as ^{89}Kr and ^3H . With more assumptions, he can estimate the maximum rate of nuclear power production, nuclear explosive detonations, and isotope use in industry, medicine, research, and other areas, compatible with the environmental quality standards. (BBB)

1376 CONSIDERATIONS ON METHODS OF CONSTRUCTING ISODOSE CURVES FROM MINIMUM EXPERIMENTAL DATA REPORT I. STANDARD ISODOSE CURVES FOR RECTANGULAR FIELDS IN COBALT THERAPY. Onai, Yoshio, Tomaru, Teizo (Japan Foundation for Cancer Research, Tokyo). Nippon Igaku Hoshasen Gakkai Zasshi, 27 1323-38 (Jan. 1968). (In Japanese)

Dose calculation methods described in the literature were re-investigated experimentally and theoretically to obtain the simple method of calculating isodose curves for rectangular fields. The results were as follows: 1. When the field size is defined as the area bounded by the line in air at the edge of the beam corresponding to 50 percent of the central axis dose, the effect of penumbra on the central axis depth dose can be ignored in the range 0.8-4.0 cm of geometrical penumbra at the surface. The field size defined as above is also close to the area bounded by the line in tissue at the edge of the beam corresponding to 50-60 percent of the central axis dose at all depths. 2. The central axis depth doses converted from $\text{R}^{1-\text{cm}}$ (Fitzner's equation) using the depth doses for SSD 50 cm as a standard agreed with experimental data within the errors of $\pm 5\%$ for any field and depth, provided that the source to surface distance ranged from 30 to 100 cm. Calculated values of $\text{R}^{1-\text{cm}}$ are given. 3. The area reduction factors for Co-60 γ -rays were obtained from the values of scatter dose calculated by Clarkson's method. Percentage depth doses calculated using these area reduction factors were in good agreement with the data obtained from the equivalent area at conventional x-ray qualities analyzed by Jones and Day. Analyzing these data and Sterling's method, it was found that the area reduction factor F_s is given by $F_s = 4E/(1+E)^2$, where E is elongation ratio. 4. The square field isodose crossplots method used by Evans may be most simple and speedy to calculate depth doses for points off the central axis without computer, especially for points in the penumbral region. However, when this method is applied to elongated field the errors may increase significantly in the regions outside the 15% isodose curve. In this case, it may be useful to apply the corrections derived from the concept of equivalent area to the data of square field isodose crossplots. The isodose points off central axis in the region of full irradiation by the Co-60 source can be obtained by shifting the isodose point on the central axis using the curves indicated, which is applicable to any elongated field. (auth) (NSA of Japan)

1377 IRRADIATION AND THE FETUS Weisberg, Martin G. (Mayo Graduate School of Medicine Rochester, Minn.). Minnesota Med., 50 1235-40 (Aug. 1967).

Use of diagnostic radiation procedures in obstetrics and their hazards to the fetus are reviewed. Doses received in various procedures are given. The considerable variation between some of these doses for the same examination depends primarily on the particular x-ray technique and routine used by each investigator. Radiation exposure during pregnancy always involves both genetic and somatic effects by virtue of simultaneous exposure of both maternal and fetal gonads, partial somatic maternal exposure, and partial- or total-body irradiation of the fetus. The amounts of maternal gonadal, fetal gonadal and fetal thyroid irradiation received from radioisotope placentography are described and compared with doses received from conventional soft tissue x-ray placentography. Effects of radiation on embryogenesis are briefly reviewed, as are the medicolegal aspects of prenatal irradiation. Some standards and recommendations that have been proposed relative to radiation protection of the population in general and more specifically in the management of the obstetric patient are outlined. It is recommended that whenever possible, x-ray examinations of the abdomen or pelvic areas in women of child-bearing age should be performed only during the first 10 days after a regular menstrual period (BBB).

1378 SAFE LEVELS OF RADIOACTIVITY IN AQUATIC ENVIRONMENTS Woffe, D. A., Rice, T. R. (Radiobiological Lab., Beaufort, N. C.). *Scientia* (Milan), 103 469-87 (Sept.-Oct. 1968).

The implications of radioactive waste disposal into aquatic environments and those aspects of radiation physiology, radioecology and health physics used in developing standards for the adequate protection of aquatic ecosystems and man from excessive doses of radiation are discussed. Methods for calculation of maximum permissible concentrations of ^{65}Zn in drinking water are presented. Evidence that some current assumptions on ^{65}Zn accumulation and retention are not necessarily exact for accumulation from various foods is presented. Differences in efficiency of ^{65}Zn assimilation related to transport across the mucosa that is facilitated by the presence of protein in the gut are described. Protein content of food and uptake of ^{65}Zn from different sources are tabulated. A conventional derivation of working limits (DWL) for radioactivity in the marine environment is outlined. The DWL assumes that the efficiency of accumulation and retention and also the final tissue distribution are the same whether the isotope is ingested in drinking water or food. Several DWL values derived by conventional and specific activity methods for ^{60}Co , ^{59}Fe , ^{64}Cu , ^{65}Zn , ^{137}Cs , ^{90}Sr , ^{131}I , ^{32}P , ^{35}S and ^{45}Ca are compared (BBB).

1379 SKIN AND CARBON DIOXIDE LASER RADIATION Brownell, A. S., Parr, W. H., Hysell, D. K. (Army Medical Research Lab., Fort Knox, Ky.). *Arch Environ Health*, 18 437-42 (Mar. 1969).

Dose-response relationships for the induction of thermal lesions in porcine skin by carbon dioxide laser radiation were determined and considered adequate to establish laser safety standards for skin burn injuries within the exposure time of range of 0.2 to 50 seconds. Although the data suggested that for exposure times of less than 0.2 seconds the threshold value to produce mild erythema is approximately 3 J/sq cm, caution should be exercised in extrapolating these data in this manner until further data for still shorter times become available (auth).

1380 (PHS-999-RH 35) REGULATIONS, STANDARDS, AND GUIDES FOR MICROWAVES, ULTRAVIOLET RADIATION, AND RADIATION FROM LASERS AND TELEVISION RECEIVERS. AN ANNOTATED BIBLIOGRAPHY Setter, Lloyd R., Snively, David R., Solem, Duane L., Van Wye, Rodman F. (Bureau of Radiological Health, Rockville, Md.) Apr 1969 77p. Public Health Service, Rockville, Md. Free.

An annotated bibliography of guidelines, standards, and regulations pertaining to public health protection against electromagnetic radiation from television receivers, lasers, ultraviolet radiation, and microwaves is presented. Each category of radiation is treated in a separate section. Since the terminology for regulations, standards, and guides is not uniform among Federal, State governments, municipal governments, military organizations, and nongovernmental organizations, the annotated documents are designated as Class A (established or adopted by a governmental body acting under the authority of an act, law, or statute), Class B (adopted by consensus of a committee(s) or commission(s) of technical competence in standards-setting organizations), or Class C (not adopted by a standards-setting organization, but contains information pertinent to the preparation of suitable standards or regulations). The annotations include identification of the document, type of standard, intended compiler, intended benefitter, limits and specifications, and general guidance (auth).

1381 THE USE OF IONIZING RADIATION IN FLORIDA Williams, Edwin G., Harris, Thomas W. *S. Med. J.*, 62 54-6 (Jan. 1969).

The uses of ionizing radiation in Florida and the public health programs related to them are described and discussed. The activities of the Florida State Board of Health include promulgation of regulations governing the use of ionizing radiation. It has made use of fluoroscopes for shoe fitting, illegal set up a statewide surveillance system for air water and milk, instituted a survey of x-ray machines and all radioactive materials, established a program for registration of x-ray machines and licensing of radioactive materials, developed a statewide emergency network to handle possible radiologic emergencies, and assumed protection control in 1964 of certain radioactive materials previously controlled by the U. S. Atomic Energy Commission. Present programs involving radiation include occupational exposure and environmental effects of atomic power, nondestructive testing, process control and industrial research and development, academic but nonmedical research, development and teaching, and medical programs in diagnosis, therapy, research, development and teaching. Baseline environmental studies are conducted to establish reference points as basis for future studies of nuclear power facilities. The number of licenses has increased to 483 and 20 for industrial uses. Industrial use of ionizing radiation has increased by a factor of ~10 since 1964 (BBB).

1382 INTERNATIONAL ORGANIZATIONS PRODUCING NUCLEAR STANDARDS Cottrell, William B. pp 288-93 of *Handbook of Laboratory Safety*. Steere, Norman V. (ed.) Cleveland, The Chemical Rubber Co., 1967.

A part of the second issue of the *Compilation of National and International Nuclear Standards* is reprinted. A table showing the standard organization of a number of international organizations such as CERN, EURATOM and IAEA is presented. A legal notice concerning liabilities with respect to the use of or for damages resulting from the use of apparatus or methods disclosed in the report is included (H. L. W.).

1383 LIMITS FOR RADIOACTIVE SURFACE CONTAMINATION Klein, H. F., Schmidt, G. D. pp 283- of *Handbook of Laboratory Safety*. Steere, Norman V. (ed.) Cleveland, The Chemical Rubber Co., 1967.

A compilation of recommended guides for radioactive surface contamination and limits used by U. S. Government organizations, private organizations and governments of other countries is presented. Surface contamination limits given for use in occupational areas and in non-controlled areas are applicable to skin, clothing, equipment and other surfaces, e.g. floors and benches. Tables are presented of surface contamination guides for occupational exposure and for release to non-controlled areas. From the available data it appears that the surface contamination limits in use in the United States are conservative and have been effective in minimizing radiation exposure (H. L. W.).

1384 TRANSPORTATION REGULATIONS FOR RADIOACTIVE MATERIALS Colsmann, Paul (Brookhaven National Lab., Upton, N. Y.) *Nucl. Safety*, 10 328-36 (July-Aug 1969).

The primary purpose for the regulations concerning the transport of radioactive materials is to control the potential hazards to the carriers and the general public. An evaluation of a shipment in terms of the regulatory requirements and limitations necessitates a knowledge of such factors as quantity and type of radioactivity, radiation levels and possibly criticality. It is doubtful that the average traffic manager handling such shipments has the necessary background to perform this evaluation. Guidance is generally provided by a health physicist and from this point of view that health physicist should have a working knowledge of the regulatory requirements and limitations and should have access to the most recent revisions (auth).

1385 CURIE AND THE ROENTGEN AS LEGAL UNITS OF MEASUREMENT Richardson, J. F. (Commonwealth X-Ray and Radium Lab., Melbourne) *Australas. Radiol.*, 13 103-6 (Feb 1969).

The development of the curie and the roentgen as recommended units of measurement of activity and exposure and their later adoption in Australia as legal units, in force 1st January 1966, are outlined. The present allocation of responsibility for maintenance of Australian standards of activity and exposure is outlined (Australia).

1386 (ORNL-TM-2574) DOSE RATES IN A SLAB PHANTOM FROM MONOENERGETIC GAMMA RAYS Claiborne, H. C., Trubey, D. K. (Oak Ridge National Lab., Tenn.) Apr 28 1969 27p. Dep. CFSTI.

Gamma-ray flux to dose conversion factors obtained with a philosophy consistent with that used for neutron conversion factors have not been available for use in design work. To eliminate this inconsistency and develop more realistic γ -ray conversion factors, γ -ray dose rate distributions were determined in a slab phantom of a standard man composition. Calculations

were made with the discrete ordinates code ANISN with some checks by the Monte Carlo code OGRF. Based on these results a recommended curve to convert γ -ray flux to maximum dose rate delivered to a body was prepared for design use. It was also recommended that a new unit, the maximum exposure dose (MED) be used in shield design work to express the product of the flux, dose-rate conversion factor, and quality factor for both γ rays and neutrons. (auth)

1387 (ANL-7282, pp 312-18) GAMMA RAYS FROM THE $^{55}\text{Cr}(n,\gamma)^{56}\text{Cr}$ REACTION. Kane, W. R., Mancoske, M. A. (Brookhaven National Lab., Upton, N. Y.) and Feltz, G. T. (Indiana Univ., Bloomington)

The gamma rays from the $^{55}\text{Cr}(n,\gamma)^{56}\text{Cr}$ reaction for thermal neutrons were measured for use as standards. The neutron capture energy of ^{56}Cr was determined as well as precise energies of several high-energy gamma rays. (J. W. R.)

1388 (ANL-7282, pp 326-33) PRECISION MEASUREMENTS OF STANDARD GAMMA RAY ENERGIES. White, D. H., Groves, D. J. (California Univ., Livermore, Lawrence Radiation Lab.)

A series of precision measurements of γ -ray energies using Ge(Li) detectors were performed by comparing escape-peak energies with well-measured secondary standard γ rays. The isotopes used were ^{20}Al , ^{41}Ar , ^{141}Ce , ^{60}Co , ^{51}Cr , ^{22}Na , ^{124}Sb , ^{52}V , ^{88}Y , and ^{65}Zn . (J. W. R.)

1389 DOSF, TIME, AND FRACTIONATION: A CLINICAL HYPOTHESIS. Ellis, Frank. (Churchill Hospital, Oxford) Clin. Radiol., 20, 1-7 (Jan 1969).

Based on published clinical results of radiotherapy a formula is suggested that relates total dose, number of fractions, and overall treatment time to a quantity termed Nominal Standard Dose. This quantity represents the biological effect of a given treatment regime. Using this concept it is possible to compare various treatment schedules that involve different fractionation patterns and various overall treatment times. The evidence upon which the idea is based, and also its use in routine clinical practice are discussed. (auth)

1390 RADIOLOGICAL HEALTH ASPECTS OF SPENT RADON SEEDS. Boggs, Richard F., Schmidt, Gail D., Williams, Kenneth D. (Bureau of Radiological Health, Rockville, Md.) Radiol. Health Data Rep., 10, 185-90 (May 1969)

Following three incidents of radiation exposure to jewelry contaminated with radioactivity, the Bureau of Radiological Health (BRH) examined the early development, present clinical use, and disposal of gold radon seeds, the suspected source of the contamination. The Ad Hoc committee called by the BRH to study the problem, recommended that, the State and local radiological health agencies that have regulatory authority over radon seeds be familiar with the appropriate regulations that users of radon be advised to keep an account of radon seeds procured, not to supply unused or spent radon seeds to any unauthorized person, and to return all decayed or unwanted radon seeds to the supplier or persons authorized to receive such shipments; gold refiners and processors be alerted to the possibility of receiving contaminated gold and efforts should be made to prevent such material from entering the commercial market; the BRH consider the possibility of further investigation of the extent of the problem and consider providing technical assistance through appropriate agencies, and the medical community be encouraged to investigate the feasibility of using other radionuclides for permanent implants. (auth)

1391 (NP-17851, pp 177-209) INTERNATIONAL AND NATIONAL INSTRUCTIONS, AGREEMENTS, AND STANDARDS. Nyerges, Pal. (Villamosenergiaipari Kutató Intézet, Budapest (Hungary)) (In Hungarian)

Since the end of World War II several multilateral international agreements on the field of atomic energy have been signed by a number of countries. The first one, signed on November 1945 in Washington by the United States, United Kingdom and Canada mentioned the peaceful applications of atomic energy. During 1952/53, several European countries established a research laboratory in Geneva, Switzerland for the study of cosmic radiation, high-energy particle physics and theoretical nuclear physics. A similar international research center was created by Eastern countries in 1956 at Dubna, USSR. In the same year, the International Atomic Energy Agency was established. In 1959, six western European countries created Euratom. Later that year the Security Control Convention was signed by a number of countries. This was followed by the establishment of Eurochemic and the compact on the DRAGON high-temperature gas-cooled reactor. Since that period conferences have been held on the civil responsibility for damages due to nuclear accidents. The IAEA held many symposia on the transportation and handling of special nuclear materials, isotopes, decontamination measures, health physics regulations, etc. Disposal of radioactive wastes has been

considered by panels of experts. The International Commission for Radiological Protection is involved in the establishment of health-physics standards. The Third Geneva Conference and Vienna meetings reviewed these problems. The International Standardization Organization has 4 committees on nuclear energy (ITT).

1392 (UR-49-1080) MICROWAVE STANDARDS: A COMPARATIVE ANALYSIS. Michaelson, Sol M. (Rochester Univ., N. Y., Dept. of Radiation Biology and Biophysics), Apr. 23, 1969. Contract W-7401-eng-49, 11p. (CONF-690617-1). Dep. CFSTI.

From Industrial Neurology Congress, Prague, Czechoslovakia.

Factors that must be considered in quantification of the biological response to microwaves are discussed. Recommendations for developing a more rational and realistic approach to the development of standards for human exposure to microwaves are considered. The importance of including biophysical factors in relation to functional responses of the body in the development of standards for maximum permissible exposure is pointed out. Soviet levels for maximum permissible exposures are compared with those of the United States. The importance of biomedical investigation of specific effects, engineering studies of the characteristics of the equipment, field surveys of power levels actually encountered, and development work on means of protection in establishing maximum permissible levels is pointed out. A table of recommended maximum permissible intensities for radio-frequency radiation is presented. (H. L. W.)

1393 (LIB/Trans-202) THE MAXIMUM ADMISSIBLE CONCENTRATION OF ^{222}Rn IN AIR. Hamard, Jean; Beau, Paul-Georges; Ergas, Alain. (Commissariat à l'Energie Atomique, Fontenay-aux-Roses (France), Centre d'Etudes Nucleaires). Translated by Eric R. Corran. (Australian Atomic Energy Commission Research Establishment, Lucas Heights), from report CEA-R-3583, 28p. Dep.

Problems involved in determining the maximum admissible concentration (MAC) of ^{222}Rn in inhaled air are reviewed, with emphasis on establishing MAC of radon and its daughter products ^{214}Po and ^{214}Bi in uranium mines. Values for the MAC for radon proposed by the AIEA, EURATOM, ICRP, France, and the United States are compared and criteria used for establishing the MAC values are discussed. It is pointed out that no value for the MAC of radon in air has yet been derived that is easily measured and unambiguously acceptable. It is proposed that an epidemiological study be conducted to compare the risk of lung cancer in uranium miners with that in those mining other ores. The need for more precise model of the human pulmonary system than that for adoption by the ICRP in estimations of radon retention is pointed out. (C. H.)

1394 (PHS 999-RH-37) REGULATIONS, STANDARDS, AND GUIDES PERTAINING TO MEDICAL AND DENTAL RADIOLOGICAL PROTECTION: AN ANNOTATED BIBLIOGRAPHY. Snavely, David R., Kumbier, Larry G., Thompson, Mark J., Setter, Lloyd R. (Bureau of Radiological Health, Rockville, Md.) June 1969, 73p. Dept. of Health, Education, and Welfare, Rockville, Md. Free.

An annotated bibliography of standards, regulations, and guides pertaining to medical and dental ionizing radiation protection is presented. Included are annotations of general standards, guides and recommendations, standards on the safe operation, handling, and design of radiation equipment and sources, and standards and guides pertaining to radiation measurement. Since the terminology for regulations, standards, and guides is not uniform among the Federal and State governments, military organizations, and non-governmental organizations, the annotated documents are designated as Class A (established or adopted by a governmental body acting under the authority of an act, law, or statute), Class B (adopted by consensus of a committee(s) or commission(s) of technical competence in standards-setting organizations), or Class C (not adopted by a standards-setting organization, but contains information pertinent to the preparation of suitable standards or regulations). The annotations include identification of the document, type of standard, intended compiler, intended beneficiary, limits and specifications, and general guidance. (auth)

1395 IONISING RADIATIONS: PRECAUTIONS FOR INDUSTRIAL USERS. SECOND EDITION. London, Her Majesty's Stationary Office, 1969, 72p, 5s.

The following topics are reviewed: Radiation hazards, properties of radioactive materials; basic principles of protection, legislation and codes of practice, ICRP and maximum permissible levels, general requirements applicable to regulations made under Factories Act, special requirements of the Ionizing Radiations (Sealed Sources) Regulations 1969, special requirements of the Ionizing Radiations (Unsealed Radioactive Substances) Regulations 1968, luminizing and tracer work. (UK)

1396 LECTURE ON PERMISSIBLE DOSES FOR INTERNAL RADIATION. Gaspar, Emilian. Inform. Doc. Selec., Teh. Nucl., 12: 30-44 (Jan. 1969). (In Rumanian).

A brief review is presented of basic safety standards for radiation protection, permissible doses for internal radiation, and tabulated data on toxicity classifications of radionuclides. (R V J)

1397 RADIATION QUANTITIES AND UNITS. ICRU REPORT 11. Washington, D. C., International Commission on Radiation Units and Measurements, 1968. 16p. \$1.00. GPO \$1.00.

The International Commission on Radiation Units and Measurements (ICRU), since its inception in 1925, has had as its principal objective the development of internationally acceptable recommendations regarding quantities and units of radiation and radioactivity, procedures suitable for the measurement and application of these quantities in clinical radiology and radiobiology, and physical data needed in the application of these procedures, the use of which tends to assure uniformity in reporting. The International System of Units (SI) has been adopted. Limited modifications and corrections are reported that were approved by the Commission at its 1967 meeting. (C H)

1398 RADIATION PROTECTION LAW MANDATORY. Flynn, Charles R. (Maryland State Health Dept., Baltimore). J. Md. State Dent. Ass., 12: 10-11 (Apr. 1969).

The present status of dental radiation protection in Maryland is discussed. The program of radiation protection of the Maryland State Health Department emphasizes the requirement of dentists to register all x-ray units and to submit a plan review of new dental installations. Although there are 1744 dental x-ray units registered in Maryland, the Department is still finding unregistered units. Regulations governing radiation protection which became effective on January 1, 1964 require that all new installations be registered within 30 days. Of the 3608 x-ray units registered in Maryland, 2917 have been surveyed. The most frequent items of nonconformance found during a physical survey are improper collimation filtration, and operator position. During the survey, exposure rates are measured in various areas to determine the safest operator position. The Maryland State Dental Association code on radiation hygiene is outlined. (BBB)

1399 NEUTRON DOSE DISTRIBUTIONS IN AN INFINITE SLAB OF STANDARD MAN COMPOSITION. MAXIMUM PERMISSIBLE FLUXES OF NEUTRONS. Nagarajan, P. S. (Bhabha Atomic Research Centre, Trombay, India). pp 61-78 of Radiation Protection Monitoring. Vienna, International Atomic Energy Agency, 1969.

From Regional Seminar for Asia and Far East on Radiation Protection Monitoring, Bombay, India. See STI/PUB-199, CONF-681203.

Monte-Carlo estimates of depth-dose distributions in an infinite slab phantom of standard man composition have been obtained for normal, angular and isotropic incidence of neutrons of energies ranging from thermal to 10 MeV. The results for normal incidence of neutrons are compared with those available in the literature and the agreement is found to be good within $\pm 10\%$. This study confirms the existing maximum permissible fluxes except in the intermediate-energy range. In this range higher maximum permissible fluxes are recommended. (auth)

1400 SECONDARY STANDARDS DERIVED FROM ICRP BASIC SAFETY STANDARDS. Ganguly, A. K., Pillai, K. C. (Bhabha Atomic Research Center, Trombay, India). pp 27-41 of Radiation Protection Monitoring. Vienna, International Atomic Energy Agency, 1969.

From Regional Seminar for Asia and Far East on Radiation Protection Monitoring, Bombay, India. See STI/PUB-199, CONF-681203.

The derivation of secondary standards from the basic recommendations of the ICRP is discussed. The secondary standards are evolved from maximum permissible doses to body organs taking cognizance of the physical and physiological characteristics of the standard man. The premises for derivation of secondary standards on the basis of such factors as body and organ weights, air and water (and food) intake, intake of elements, tissue concentration of elements, and other biological parameters are examined for applicability to Indian conditions. Substituting some of the above factors applicable for Indians, the values of which are available, revised MPC_w values for a few radionuclides are obtained. It is emphasized that investigations on these lines should be encouraged so that norms applicable to man living in different regions of the world could be evolved. Limitations in using secondary standards, especially MPC_w directly for occupational workers are discussed. The importance of investigating concentration factors for radionuclides in food items and their effects on MPC_w values are demonstrated. The implications of using the

specific activity concept to prescribe acceptable discharge limits are discussed. Limitations of direct radiation monitoring in the environment and the usefulness of indicator organisms for environmental monitoring are indicated. (auth)

1401 BASIS OF THE ICRP MAXIMUM PERMISSIBLE DOSES AND APPLICATION OF BASIC SAFETY STANDARDS. Dunster, H. J. (United Kingdom Atomic Energy Authority, Harwell, Eng.). pp 3-13 of Radiation Protection Monitoring. Vienna, International Atomic Energy Agency, 1969.

From Regional Seminar for Asia and Far East on Radiation Protection Monitoring, Bombay, India. See STI/PUB-199, CONF-681203.

Some of the effects on man of ionizing radiation have a long latent period (many years) and are severe, sometimes irreversible by the time they can be detected. It is thus not sufficient to assess the adequacy of a radiation protection program by direct checks on the health of the exposed workers. A more effective criterion is needed and is provided reasonably well by radiation dose. Since there is some correlation between dose and injury it is possible at least in principle, to define a maximum permissible dose by assessing an acceptable level of injury. In practice the choice is complicated by uncertainties in the dose-effect relationship and by uncertainties in the meaning of words, such as "acceptable" and "permissible." Nevertheless numerical values widely accepted were selected and recommended by the International Commission on Radiological Protection. Two aspects of the application of the maximum permissible doses are important in relation to monitoring. The limits must be used prospectively with a choice of operating procedures so that the doses are well below the maximum permissible values and they must be used retrospectively as a criterion against which to decide whether the operational procedures were satisfactory. The interpretation of monitoring results in terms of the basic maximum permissible doses should form an integral part of the design of monitoring programs both for the prospective control of exposures and for their retrospective confirmation. (auth)

1402 DEVELOPMENTS TOWARDS A CO-ORDINATED PROGRAMME OF RESEARCH ON THE USE OF NEUTRONS IN SEED IRRADIATION. Konzak, C. F., Sigurbjornsson, B. pp 35-9 of Neutron Irradiation of Seeds. Vienna, International Atomic Energy Agency, 1969.

From Panel Meeting on the Use of Neutrons in Seed Irradiation, Vienna, Austria.

From Meeting on Recommendations for a Neutron Seed Irradiation Programme, Vienna, Austria. See STI/DOC-10/76, CONF-660703, CONF-661218.

In view of the increasing number of research reactors being constructed throughout the world, plans for internationally coordinated research on effects of neutron irradiation on seeds are considered. The proposal for the coordinated research emphasizes establishment of accurate dosimetry problems in radiosensitivity and production of mutations in crop plants. IAEA panel meetings were held to make recommendations for standardization of dosimetry of protons and neutrons. Steps were taken to establish cooperation between the Division of Research and Laboratories, the Division of Life Sciences, and the Division of Nuclear Power and Reactors. Provision of a standardized seed irradiation facility to be used in reactors is discussed. Mechanisms for formal participation in the program include a research contract and a research agreement with the Agency. (H I W)

1403 DEVELOPMENT OF THE HAZARD IDFA IN THE INDUSTRIAL USE OF IONIZING RADIATIONS AND IN THE NUCLEAR INDUSTRY. Letard, H. (Electricite de France, Paris). Arch. Mal. Prof. Med. Trav. Secur. Sociale, 28: 183-5 (Jan.-Feb. 1967). (In French).

Criteria used in France for establishing the maximum permissible radiation dose for personnel in nuclear industries are summarized. Protection against the somatic effects of the cumulative radiation dose on individuals and the possible genetic effects on descendants were primary considerations. (C H)

1404 THE PROBLEM OF RADIOPROTECTION. I. PROBLEMS OF PERSONAL AND ENVIRONMENTAL RADIATION-PROTECTION IN RADIOGRAPHY DEPARTMENTS. Marceca, I.; del Buono, G.; Longo, F.; Salamanna, S. (Univ., Bari, Italy). Ann. Sanita Pubblica, 28: 123-34 (Jan.-Feb. 1967). (In Italian).

Statistical data concerning wards and sections where radioactive substances are used are evaluated. The Decree n. 185 of February 1964 is discussed, with particular reference to the concept of controlled areas for professionally exposed persons. (auth)

1405 ATTAINMENTS OF SOVIET RADIATION LABOR HYGIENE. Parkhomenko, G. M. Gig. Sanit., No. 12, 31-4 (Dec. 1968). (In Russian).

Radiation protection standards and training programs for industrial personnel using ionizing radiations and radioactive substances in the Soviet Union are reviewed. Research programs in health physics are discussed. (C H)

1406 RADIATION STANDARDS FOR URANIUM MINING. HEARINGS BEFORE THE SUBCOMMITTEE ON RESEARCH, DEVELOPMENT AND RADIATION OF THE JOINT COMMITTEE ON ATOMIC ENERGY, CONGRESS OF THE UNITED STATES, NINETY-FIRST CONGRESS, FIRST SESSION, MARCH 17 AND 18, 1969. Washington, D. C., Joint Committee on Atomic Energy, 1969. 413p. GEO 51 50.

Representative of the Atomic Energy Commission, the Federal Radiation Council, and the Departments of Labor and Interior were requested to testify at this hearing. Statements were also heard from witnesses representing the American Mining Congress, the AFL-CIO Committee on Atomic Energy and Natural Resources, the Department of Health, Education and Welfare, the United Steelworkers of America, small uranium mine operators, and various expert witnesses. Topics discussed included radiation safety requirements for uranium miners, the relation of these standards to results of epidemiological studies that provide the scientific basis for radiation safety standards for uranium miners, and the tutatory role of the Federal Radiation Council in establishing guidelines for radiation protection in uranium mining, as well as in other areas of radiation exposure. The economic feasibility and health benefits of observing maximum permissible radon exposure standards established by the Department of Labor for uranium miners was also discussed. (C H)

1407 RADIOSENSITIVITY AND SPATIAL DISTRIBUTION OF DOSE. Reports Prepared by Two Task Groups of Committee 1 of the International Commission on Radiological Protection. ICRP Publication 14 (Radiation Protection). Oxford: Pergamon Press, 1969. 122p. 35s.

Reports are presented from the two Groups, set up in 1965, under the following main headings: Task Group 1. Spatial Distribution of Radiation Dose. Basic considerations, current recommendations on non-uniform exposure, scheme for non-uniform exposure based on risk considerations, range of linearity of dose response, non-uniformity of dose within organs and tissues, additivity. Task Group 2. Relative Radiosensitivities of Different Tissues. Expression of radiation damage (tumor induction, cataract, impaired fertility, damage to bone marrow and cellular defenses, defective growth and development, life-shortening and somatic effects, genetic damage), radiosensitivities of different organs and tissues in man, relative sensitivity to different kinds of biological damage by radiation and overall assessment of radiation damage, revision of currently recommended dose limits. (UK)

1408 RADIATION PROTECTION. Med. Res. Eng., 8: 46 (May-June 1969).

New federal legislation in the field of radioprotection is briefly reviewed, and especially the Act known as the "Radiation Control for Health and Safety Act of 1968." In this Act, Congress declared that the public health and safety must be protected from the dangers of electronic product radiation. It therefore provides for the establishment by the Secretary of HFW of an electronic product radiation control program that shall include the development and administration of performance standards to control the emission of electronic product radiation from electronic products. Electronic products that may emit radiation include television sets, neutron generators, particle accelerators, electron microscopes, x-ray machines, and high voltage cathode-ray tubes, other irradiators that may emit uv, visible, ir, microwave, radio, and low-frequency radiation such as uv sources, photochemical devices, welding equipment, fluorescence equipment, as well as ir devices such as driers, ovens, and heaters, ir lamps, ir alarm systems, radiofrequency sources such as those used in diathermy, cauterizers, dessicators, signal generators, and other electro-medical equipment, extending into the microwave region. Other equipment to be subject to surveillance are radar devices, microwave ovens, and remote control garage door openers. A wide variety of lab equipment is also likely to be brought under the control and surveillance including, for example, lasers, masers, ultrasonic oscillators and cleaners, cell and tissue disintegrators, and ranging-and-detection equipment. The powers of the Secretary with regard to this law, interrelations with other agencies such as the AEC and performance standards for electronic products are also considered. (BBB)

1409 (CONF-690705) UNIVERSITIES, NATIONAL LABORATORIES, AND MAN'S ENVIRONMENT CONFERENCE HELD JULY 27-29, 1969, CHICAGO, ILLINOIS. (Argonne Universities Association, Ill.) Nov. 1969. 167p. Dep. CFSTI.

The proceedings of a conference on the role of the national laboratories and universities in the solution of environmental problems held in Chicago, July 27 to 29, 1969, are presented.

Papers were presented on social problems and the interaction of problem solving agencies, standards for and the control of environmental quality, waste disposal practices, radiation protection standards, research requirements, and automobiles and air pollution. (L C L)

1410 (ORNL-tr-1677) STUDY FOR THE ESTABLISHMENT OF STANDARDS FOR RADIOACTIVE WASTES IN HYDROBIOLOGICAL SYSTEMS. Technical Report of a Group of Experts. Translated for Oak Ridge National Lab., Tenn., from report EUR/C-1263/66. 30p. Dep. CFSTI.

The maximum limitation of radiation exposure of man constitutes an essential imperative for the protection of public health. With regard to the hazards of contamination due to the disposal of radioactive wastes in a hydrobiological system, it is evident that we can no longer simply limit ourselves to a consideration of the MPC for drinking water in order to make an objective evaluation of the possibilities of radioactive waste discharges. The formulation of the limiting radiological capacity of a hydrobiological system must consider all of the processes that modify the distribution of radioactivity in the ambient medium. The characterization and quantitative evaluation of these processes should permit a determination of this maximum quantity of radioactive substances that can be discharged into a hydrobiological system without exceeding the basic standards for the subsequent exposure dose of man. For a hydrobiological system, this radioactivity burden depends upon the routes of transfer of the radioactivity to man, the nature of the radionuclides, and the concentration factors of the radionuclides in the ambient medium. (auth)

1411 RADIATION SAFEGUARDS FOR MICROWAVE OVENS. Tibbs, C. E. (Dysona Industries Ltd., Wokingham, Eng.) Non-Ionizing Radiat., 1: 73-6 (Sept. 1969).

The safety and interference aspects of microwave ovens are discussed, together with the relevant standards. The method of field measurement in the vicinity of an oven and the user-protection devices included in the construction are described. (auth) (UK)

1412 (ARH-220) RADIATION PROTECTION STANDARD. (Atlantic Richfield Hanford Co., Richland, Wash.) Sept. 15, 1969. Contract AT(45-1)-2130. 48p. Dep. CFSTI.

The Radiation Protection Standards and Controls set forth in this manual describe the methods of controlling radiation exposure to employees and the public. Atlantic Richfield Hanford Company is contractually obligated to take all reasonable precautions to protect the health and safety of employees and the public and to minimize danger to life and property from all radiation and radioactive material under its control. The requirements necessary to safely control radiation are stated as Radiation Protection Standards. Compliance with these standards is mandatory. The standards provide information regarding contractual requirements set forth by the United States Government as administered by the U. S. Atomic Energy Commission, Contract AT(45-1)-2130. In addition, the guides include published recommendations of authoritative national and international bodies as well as instructions and guides written by the Richland Office of the AEC and other Hanford contractors. The standards are based on the knowledge and the special capabilities available at Hanford. The standards state the requirements for radiation protection within the company and are written to provide a uniform and purposeful method of compliance. Where the standards are not directly applicable, additional guidance should be obtained through consultation with the Personnel Protection Section. The interpretation of the Radiation Protection Standards and Controls is the responsibility of the Personnel Protection Section. (auth)

1413 (N-69-35968) SKIN LESION THRESHOLD VALUES FOR LASER RADIATION AS COMPARED WITH SAFETY STANDARDS. Final Report. Paar, Wordie H. (Army Medical Research Lab., Fort Knox, Ky.). Feb. 24, 1969. 15p. (AD-688871; USAMRL-813). CFSTI.

The large amount of skin surface makes this body tissue readily available to accidental and repeated exposures of laser radiation, and most laser safety programs include minimal radiation levels for skin exposure. However, the values suggested are generally those considered non-hazardous under worst case conditions and are not based on experimental evidence. This report briefly summarizes the few studies found in the open literature that might be considered pertinent towards establishing acceptable acute laser radiation levels for skin. The threshold lesion values given for both human and animal skin are discussed and compared with guideline values suggested for safe exposure levels. (auth) (TAB)

1414 NEUTRON (15-MeV TO THERMAL) FLUX-TO-DOSE RATE CONVERSION FACTORS FOR THE STANDARD MAN. Ritts, J. J., Solomito, E.; Stevens, P. N. (Oak Ridge National Lab., Tenn.). Trans. Amer. Nucl. Soc., 12: 933-4 (Nov. 1969).

The assumption is made that the relation between low level radiation doses and effects such as incidence of leukemia and several other forms of cancer is linear, that there is no threshold below which radiation has no effect, and that there is no regenerative effect at low dose rates. The data used to substantiate this assumption are cited and the statistical impact on the human

population when the data are applied is examined, as is the rationale underlying the argument for immediate reduction of the FPC's allowable dose of 0.17 rad per year to the population at large by a factor of 10. The opinions of scientists associated with the establishment of radiation standards are referred to, and serious questions are raised regarding the validity of making extrapolations from data on high dose effects to low dose effects, from data on genetic effects to somatic effects, and from data on increased incidence of some forms of cancer due to radiation exposure, as reported by the Atomic Bomb Casualty Commission, to increases in all forms of cancer due to radiation in proportion to their natural incidence. It is concluded that the possibility of confirming or refuting the existence of a linear relation between dose and effect at low radiation levels by epidemiological studies is remote. The term acceptable risk, as used in radiation standards, could mean a risk that is actually present but that cannot be demonstrated to exist by scientific studies (E R B)

1424 (MIT-952-6, pp 185-211) URANIUM MINE DOSIMETRY AND RADIATION CONTROL. (Massachusetts Inst. of Tech., Cambridge, Dept. of Physics).

Five independent approaches to the study of the problem of permissible radon daughter product concentrations in uranium miners are examined. Although no one approach can yield a fully unequivocal specification of the biological response of human beings to all different levels of concentration of airborne radon daughter products, there is an internal mutual consistency that strongly supports the interpretation that an average exposure to 12 working level months (WLM) per year, as recommended by the FRC and approved by President Johnson in 1967, is a conservative and safe standard. These five radiobiological approaches include lung model computations, the carcinogenic response of man to internal burdens of radium and mesothorium, the induction of paranasal sinus and mastoid carcinomas by skeletal deposits of radium, the absence of lung carcinomas in patients injected with Thorotrast, and the epidemiology of lung cancer among underground miners of uranium, other metals, and coal. Each of these five approaches was based on the long-term continuous irradiation of human tissue by α emitters. Each approach is discussed in detail. An extensive analysis is presented of certain aspects of the testimony of one of the witnesses at the hearings on Safety and Health Standards conducted by the Bureau of Labor Standards in 1968. A prototype of a portable instrument for determining (within 2 min) the working levels within a mine was tested. The operation of the unit is based on the analysis of air filter samples of RaA and RaC-RaC' concentrations, which are measured discretely in two α -energy channels, and measurement of RaB plus RaC concentrations in a single β channel. Internal calculation of the concentrations of the four short-lived radon daughter products is followed by computation of the working level burden in the filtered air. All calculations are done in analog fashion and analog-to-digital conversion provides digital readout of the data directly as working levels. The status of the development of a personal monitor for measuring cumulative exposure to working levels is also reported (E R B)

1425 PROBLEMS OF LEGISLATION IN THE FIELD OF CIVIL APPLICATIONS OF NUCLEAR ENERGY. Domsdorf, E. P. M. W. *Electrotechnik*, 47: 209-16 (May 1, 1969). (In Dutch)

The history of nuclear legislation is briefly described, pointing out the necessity for international control. The Netherlands are presently involved in 15 treaties and organizations. The specific problems of national nuclear legislation include the following: safety standards must be established to protect industrial workers and the population at large, safeguards and controls must be set up against the military use of radioactive materials, storage and transportation of fuels and ores must be subject to preventive measures, such as registration and licensing (TTT)

1426 (STI/PUB-246) GUIDE TO THE SAFE DESIGN, CONSTRUCTION AND USE OF RADIOISOTOPIC POWER GENERATORS FOR CERTAIN LAND AND SEA APPLICATIONS. A Report Prepared by a Joint IAEA/ENEA Working Party. Safety Series No. 33 (International Atomic Energy Agency, Vienna (Austria)). 1970. 31p. IAEA \$1.50.

A guide is presented which is intended to facilitate the establishment of an adequate standard of safety in the design, construction, installation, use and ultimate disposal of radioisotopic power generators which have a power output range from about 100 milliwatts to some hundred watts and which are designed for use on land and on or under the sea. Miniature generators for medical use, watches, etc. and generators for use in space were excluded. Two appendices are included which describe recommended fuel capsule and fuel capsule housing tests, adapted from IAEA transport regulations, which would ensure the safety of radioisotopic

generators under accident conditions, and therefore provide a margin of safety in relation to normal operating conditions (L C L)

1427 EYE. Arch. Environ. Health, 20: 197-9 (Feb 1970). From 2nd International Laser Safety Conference and Workshops, Cincinnati, Ohio. See CONI-690333.

A summary of the findings and recommendations of the workshop on the eye held at the Laser Safety Conference is presented. It was reaffirmed that the primary hazard from laser radiation is exposure to the eye. Radiation levels below those damaging to the eye pose no threat to other body tissues and organs. Data on the energy densities required to produce ophthalmoscopically visible threshold lesions on the retina are reviewed and the paucity of information on the bioeffects of laser radiation in the near infrared region is noted. The commercial availability of protective plastic films, sheet and plates suitable for fabrication into a variety of configurations was discussed and the criteria for expressing optical exposures were reexamined. The guidelines previously recommended for establishing exposure standards for laser personnel were reaffirmed. It was recommended that investigations be initiated into the effect of chronic exposure to laser radiation and into the bioeffects of near infrared radiation from lasers, especially in the 800 to 950 nm range and in the uv range from 200 to 350 nm (E R B)

1428 PLACE OF FEDERAL LAW IN LASER SAFETY. Moore, Raymond T. (Public Health Service, Rockville, Md.) Arch. Environ. Health, 20: 203-6 (Feb 1970).

From 2nd International Laser Safety Conference and Workshops, Cincinnati, Ohio. See CONI-690333.

The activities of the Bureau of Radiological Health of the Public Health Service since the enactment of the Radiation Control for Health and Safety Act in 1968 are described. These activities include laying the groundwork for development of laser radiation control procedures and development of facilities and programs for engineering and scientific research to evaluate both technological and biological aspects of laser control. The technological aspects include development of facilities to evaluate laser emissions instrumentation, protective devices and industrial safety test procedures and to make physical measurements such as laser-beam power measurements essential to the development of performance standards and criteria for laser safety codes of practice in the use of lasers and laser personnel instruction. The proposed biological investigation facilities are to be used for such activities as documentation of actual or potential laser effects on man, research in the mechanism of laser-induced eye injuries, establishment of thresholds for laser exposure and provision of an inventory of potential laser hazards. The correlation of the efforts of the Bureau of Radiological Health with the various state agencies in the administration of the laser control laws is cited along with the need for close cooperation among the many individuals, institutions and industries that either produce, supply, or use lasers. The effectiveness of federal authority through legislation, to bring about laser safety at a significant level is limited by the degree of cooperation exhibited among the people in all aspects of laser production and application (E R B)

1429 US AIR FORCE PERMISSIBLE EXPOSURE LEVELS FOR LASER IRRADIATION. Carpenter, John A.; Lehmler, David J.; Tredici, Thomas J. (Air Force School of Aerospace Medicine, Brooks Air Force Base, Tex.). Arch. Environ. Health, 20: 171-6 (Feb 1970).

From 2nd International Laser Safety Conference and Workshops, Cincinnati, Ohio. See CONF-690333.

A biomedical research program was established at the U S Air Force School of Aerospace Medicine to determine permissible human exposure levels for laser irradiation. These levels were designed to meet established standards of accuracy and safety and yet be realistic in relation to the continuance of technological progress. Ocular exposures to laser beams focused to the smallest possible spot were employed. The medical damage end point for retinal damage was an ophthalmoscopically visible lesion on the retina within 1 hr. Monkeys were used for the experiments because of their comparable optical quality to human systems. Ruby (long-pulsed and Q-switched) neodymium (long-pulsed and Q-switched), and argon (continuous wave) lasers were compared in regards to the relation between total energy (microjoules) and retinal damage probability (a statistically derived distribution relating energy levels to observed damage). Assuming a one to one relation between retinal damage in monkeys and in man, extrapolations to human values were made. From these extrapolated values, safe human exposure levels were predicted for retinal damage. Similar safe exposure levels were established for corneal damage in man. Data for these extrapolations were obtained from ocular exposures to a CO₂ laser. Rabbits were used in these exposure studies (E R B)

1430 INTERNATIONAL ASPECTS OF APPROVAL AND SUPERVISION OF NUCLEAR ACTIVITIES. Boulanger, Werner; Phuong, Ha Vinh; McCullen, John (International Atomic Energy Agency, Vienna). pp 25-38 of *Aspetti Tecnico-Procedurali della Sicurezza Nucleare e della Protezione Sanitaria per gli Impianti di Potenza e per gli Impieghi Industriali dei Radioisotopi*. Roma: Comitato Nazionale Energia Nucleare (1968).

From 13th Nuclear Conference, Rome, Italy. See CONF-680330.

The rapid increase in the number of countries operating research and power reactors and employing radioisotopes in medicine, industry, and agriculture is discussed. With this increase, the need for uniform rules and regulations on safety standards for the protection of life and property was recognized. The past and present activities of the International Atomic Energy Agency in establishing procedures for approval and supervision of nuclear activities are described. (H D R)

1431 (SWRHL-82, pp 498-507) PHILOSOPHY BEHIND THE FEDERAL RADIATION COUNCIL GUIDES. Tompkins, Paul C. (Federal Radiation Council, Washington, D C.)

Radiation Protection Guides for application to activities such as Plowshare would be derived on the basis of the philosophy of the FRC in making recommendations for the control of radioactivity associated with normal peacetime operations as given in FRC report 1 *Considerations involve a balance of benefit versus risk* for each Plowshare activity that is proposed for industrial application using potential exposures small in comparison to the basic guide of 0.17 rem per year as the primary reference condition. Alternate approaches to achieving an appropriate balance have been suggested. These include allocation of a fraction of the 0.17 rem per capita per year to each relevant activity, setting a universally applicable MPC for each nuclide of interest, and the concept of the dose commitment. Data to show the benefit in terms of the national need for the resource in question (e.g., gas production) and the risk as indicated by the amount of residual radioactivity are a prerequisite to setting guidance for using Plowshare techniques in conjunction with consumer products available to the general public. (auth)

1432 (SWRHL-82, pp 508-28) APPLICATION OF ICRP RECOMMENDATIONS RELEVANT TO INTERNAL DOSE. Cowser, K. E.; Snyder, W. S.; Strunness, E. G. (Oak Ridge National Lab., Tenn.)

Several of the basic concepts of radiation protection (with emphasis on internal dose) currently recommended by the International Commission on Radiological Protection (ICRP) are reviewed. The assumptions and methods used in the calculation of internal dose are summarized, and the practical application of the pertinent guidelines is illustrated. Two broad subject areas are considered: standards of radiation protection and bases of internal dose estimation. Topics discussed within the framework of radiation protection standards include maximum permissible dose, categories of radiation exposure, maximum permissible dose commitment, simultaneous internal and external exposure, multiple organ exposure, and size of the exposed group. Discussion of internal dose estimation is limited to selected items that include the body burden of radionuclides and the calculation of absorbed dose, the dose equivalent, the derivation of maximum permissible concentration (MPC), the relationship of stable element intake to the MPC, and short-term and chronic exposure situations. (auth)

1433 (SWRHL-82, pp 713-20) ROLE OF THE ATOMIC ENERGY COMMISSION. Oakley, W. L. (Atomic Energy Commission, Washington, D C.)

Public health aspects of nuclear explosions fall into two categories: operational safety during the conduct of the explosion, and the regulation of by-product material resulting from the explosion. By statute, the AEC has the responsibility for both assuring operational safety and regulating by-product material. Current AEC safety and regulatory practices are described, future problems or needs discussed, and relation to federal, state, and local governments outlined. (auth)

1434 RADIOTHERAPY OF UTERINE CERVIX CANCER. STUDY ON THE METHOD OF RADICAL IRRADIATION. Tazaki, Eisai; Oryu, Shinichiro. (Tokyo Women's Medical Coll., Gan No Rinsho, Suppl.; 174-9(Nov 1969). (In Japanese).

The standards for radiotherapy of cancer of the uterine cervix are discussed. The combined use of external and intracavitary irradiation is considered to be generally most effective. The standard treatment for external irradiation is to deliver 4,500 to 6,000 R fractionated in a weekly dose of 1,000 R with ⁶⁰Co or other high-voltage radiation in two-field irradiation. Various

methods of intracavitary radiotherapy including the Stockholm method, and Manchester method, as well as the one developed by the authors are outlined. The combined use of intrauterine and intravaginal irradiation is recommended in most cases. In the early stage, intracavitary irradiation proved to be more effective in contrast to the heavier use of external irradiation in the advanced stage of cancer. The clinical experiences suggested that irradiation of the total pelvic cavity should be kept to the minimum because of the subsequent disorders of the bladder and rectum. The study on the cases of intrapelvic recurrence of cancer is also briefly presented. (NSA of Japan)

1435 (KURRI-TR-68) SYMPOSIUM ON THE FUTURE OF USED FUEL TRANSPORT AND THE PROBLEMS. KUMATORI, OSAKA, 11 MARCH 1969. Katsurayama, Kosuke, Tsujimoto, Tadashi. (Kyoto Univ. (Japan) Research Reactor Inst.). 47p. (In Japanese). (CONF-690340).

The future of transport of used fuels and the associated problems, especially in large-scale commercial atomic power stations is examined. The following reports and also the panel discussion given at the Symposium, are given: present status in overseas countries, and the international problems, transport of used fuels in Japan, reprocessing of used fuels in Japan, legal procedures concerning the transport of used fuels in Japan, research, development and standards on transport containers, the future of used fuel transport in Japan, and insurance-against-loss in transport of used fuels. (NSA of Japan)

1436 (SZS-4/70) INTEGRITY OF TYPE A AND B PACKAGING FOR SHIPMENT OF RADIOACTIVE MATERIALS. Richter, D.; Birkigt, W. (Staatliche Zentrale fuer Strahlenschutz, Berlin (East Germany)). Mar 1970. 22p. (In German). Dep. CFSI (U. S. Sales Only).

On the basis of an analysis of the requirements on the integrity of packages for the shipment of radioactive materials currently in use, the relationships are outlined which allow derivation of the necessary radiological integrity (activity leakage rates) or engineering integrity (gas leakage rates) from radiation protection parameters. Some representative examples are calculated of types A and B packages for radioactive materials of medium activity. Proposals are made for more precise regulations on integrity. (tr-auth)

1437 STUDIES ON INDIVIDUAL DEVIATIONS IN DOSE DISTRIBUTION FROM THE STANDARD DISTRIBUTION. I 2- AND 4- AXIAL PENDULUM RADIATION TO THE SMALL PELVIS. Eichhorn, Hans-Juergen; Richter, Juergen. (Deutsche Akademie der Wissenschaften, Berlin) *Strahlentherapie*; 138:560-70(Nov 1969). (In German)

A study of the possible error was done by using one standard dose distribution established for a standard phantom, on a patient cross section with different dimensions, during moving beam telecobalt therapy for gynecological tumors. The influence on the dose distribution of the dimension and form of the cross-section, the axis depth, and the interposition of bone were studied with a computer. It was observed that the maximal error made was of the order of 10% with different cross sections, but of the order of 22% when the skeletal interposition was not taken in account. When standard isodose distribution was established for five different situations instead of one, the errors could be reduced to less than 8%. The dose rate at axis must, however, be estimated for each individual patient. (auth)

1438 (CEA-R-3975) VALIDITY OF RADIOACTIVE STANDARDS. Le Gallic, Yves; Thenard, Marie. (Commissariat a l'Energie Atomique, Saclay (France) Centre d'Etudes Nucleaires). Mar 1970. 52p. (In French). Dep. CFSI (U. S. Sales Only).

There are three types of radioactive standards: primary standards, secondary standards and reference sources. Primary standards have a great interest especially to provide a good reliability of the standards which are delivered by a National Laboratory. Secondary standards are the most commonly used but it is necessary to be confident in their validity. The elaboration of these standards and some considerations on various error factors are studied. Several international intercomparisons to which the IAEA takes part in show the interest of these intercomparisons to qualify a laboratory but also point out the need of primary standards. (auth) (France)

1439 (CONF-690335, pp 9-12) FEDERAL-STATE COOPERATION IN THE CONTROL OF RADIATION, PAST AND PRESENT. Wilson, E. Frank. (Arkansas Dept. of Health, Little Rock, Div. of Radiological Health).

Radiation protection programs in the U.S.A. are discussed with emphasis on the role of State and Federal government. It is pointed

out that Public Law 90-602 (Oct 1968) sets up the legal mechanism for Federal-State cooperation in protection of the population against non-ionizing radiations (C H)

1440 (CONF-690335, pp 34-8) **ROLE OF STATES AND REGIONAL OFFICES IN THE CONTROL OF RADIATION.** Hansen, Chris A. (Bureau of Radiological Health, Rockville, Md)

The role of State health agencies regional offices of the Public Health Service and the Federal Environmental Control Administration in the development of programs for radiation protection of human populations as well as other environmental control programs, is discussed. The implications of legislation enacted in 1968 (Public Law 90-602) which authorizes the Secretary of Health, Education and Welfare to establish and administer standards for the performance of all sources of non-ionizing radiation are considered (C H)

1441 (CONF-690335, pp 57-71) **PANEL: IMPLEMENTATION OF PUBLIC LAW 90-602.** Elder, R. L., McMartin, H. L., Snow, D. L., Nelson, D. J. Jr., Neill, R. H. (Bureau of Radiological Health, Rockville, Md.)

The implementation and administration of Public Law 90-602 are discussed with emphasis on provisions for cooperation between State and Federal agencies in establishing performance standards ensuring the safety of electronic equipment in regard to the emission of non-ionizing radiations that may have an adverse effect on public health. Implications of the law in regard to the responsibility of manufacturers of electronic equipment are considered. The need for standards covering protection against lasers and microwaves is discussed. The current status of a program to ensure the safety of diagnostic x-ray equipment is reviewed (C H)

1442 **DATA. SECTION II. WATER.** Radiol. Health Data Rep.; 11 251(May 1970).

Standards for gross α and β radioactivity and content of ^{226}Ra and ^{90}Sr in drinking water in the USA, based on Federal Radiation Council recommendations, are reviewed. (C.H)

1443 (CONF-690335) **CONFERENCE ON FEDERAL-STATE IMPLEMENTATION OF PUBLIC LAW 90-602, MONTGOMERY, ALABAMA, MARCH 24-26, 1969** (Bureau of Radiological Health, Rockville, Md.) Sep 1969, 163p. (ORO-69-4) CFSTI

Public Law 90-602 (1968) gives the Department of Health, Education and Welfare (HEW) the authority and jurisdiction for control of all sources of non-ionizing radiation in Federal installations or installations under Federal jurisdiction. The role of the Environmental Control Administration of HEW in carrying out the provisions of the Law is discussed including the establishment of standards for all electronic product radiation (EPR) equipment manufactured or used in the U S A and enforcement of compliance in Federal installations with appropriate provisions for mutual State participation. It is pointed out that the role of the Federal government is limited to performance standards for electronic equipment relative to radiation emissions while the States will have the responsibility for regulating the use of electronic equipment to protect the public against the hazards from electronic product radiation (EPR). Current standards for the use of electronic products are reviewed. Separate abstracts were prepared on 11 papers that discuss Federal and State programs for the protection of the public against ionizing radiations (C H)

1444 (CONF-690335, pp 77-83) **STATE-FEDERAL ROLE IN RADIATION CONTROL.** Kinsman, Simon (California Dept of Public Health, Berkeley Bureau of Radiological Health)

The role of State and Federal governments in the control of radiation exposure of human populations is delineated. It is pointed out that the Atomic Energy Commission has been delegated the authority to control and regulate radiation hazards from ionizing radiation from source by-product and special nuclear materials except those materials regulated by the States pursuant to agreement between individual States and the Atomic Energy Commission. State agencies regulate other sources of ionizing radiation under their jurisdiction. The Federal Department of Health, Education, and Welfare formulates national policy with respect to radiation sources other than source by-product, and special nuclear materials. Both the Atomic Energy Commission and Department of Health, Education and Welfare carry out research, provide training programs for radiological health personnel provide consultation services to the States and provide assistance to the States in assuming responsibility for control of ionizing radiation. The registration, licensing, inspection, countermeasures and compliance regulations concerning all radiation sources not controlled by the Atomic Energy Commission are the responsibility of the respective States. If any State does not have the resources to execute its responsibilities, it may request assistance from the

Atomic Energy Commission and/or the Department of Health, Education and Welfare. The provisions of Public Law 90-602 relevant to the control of all sources of non-ionizing radiation in installations under Federal jurisdiction and the role of the States in the development of performance standards for electronic equipment capable of generating electronic product radiation (EPR) are reviewed (C H)

1445 **CONSTRUCTIONAL AND ORGANIZATIONAL MEASURES FOR RADIATION PROTECTION IN THE RADIOLOGIC DIAGNOSIS.** von Stromberg, Goetz (Siemens Aktiengesellschaft, Erlangen, Ger.). Strahlenschutz Forsch. Prax., 7 119-31(1967). (In German).

Layout and structural material are discussed for a department of diagnostic radiology. Permissible doses for patients exposed to radiation and for personnel are internationally standardized and determine the basic layout of a radiology department. Two floor plans and a structural cross section through the building are displayed in diagrams. Shielding properties for various construction materials are tabulated. In addition, special protective measures are discussed for rooms containing unexposed films and devices used for diagnostic nuclear medicine (H B G)

1446 (ORNL-TM-2991) **CALCULATION OF NEUTRON-INDUCED PHYSICAL DOSES IN HUMAN TISSUES.** Ritts, J. J.; Solomito, M.; Stevens, P. N. (Oak Ridge National Lab., Tenn.), 22 May 1970. Contract W-7405-eng-26, 104p. Dep. CFSTI.

Improved multicolision neutron fluence-to-dose conversion factors were calculated by solving the combined neutron and γ -ray transport problems in phantom models designed to represent human beings. Also, new neutron fluence-to-kerma factors and improved secondary γ -ray yields were determined for the elements composing the slabs. The neutron and γ -ray cross-section data used in the calculation came primarily from ENDF/B and the OGRE Library, respectively. The computer code ANISN was employed in solution of the transport equation. The neutron fluence-to-kerma factors calculated herein agree very well with previous work. The results are presented for the 11 most common elements in the standard man. Multicolision neutron fluence-to-dose conversion factors were calculated for neutron sources, either beams or isotropic fluxes of energies from 15 MeV to thermal, incident on a 30 cm slab with infinite or finite transverse dimensions. The curves representing the total of the neutron and γ -ray energy deposition were found to range from approximately 6% to a factor of two lower than those previously reported. This effect is attributed primarily to the treatment of secondary γ rays and becomes more pronounced with increasing depth. Results are presented for 38 different combinations of source and geometry and for the maximums as a function of the source energy for each set of calculations (auth)

1447 **DATA. SECTION II. WATER.** Radiol. Health Data Rep.; 11 198(Apr 1970)

Water sampling programs of the Public Health Service, the Federal Water Pollution Control Administration, and other federal, state, and local agencies are discussed. Standards recommended by the Federal Radiation Council for drinking water are 3 pCi/l for ^{226}Ra and 10 pCi/l for ^{90}Sr . (H L W)

1448 **STANDARDS NEEDS IN CONTROLLING RADIATION EXPOSURE OF THE PUBLIC.** Snow, Donald L. (Public Health Service, Rockville, Md.). Amer. J. Public Health; 60: 243-9 (Feb 1970).

A number of needs were identified for standards that will minimize the public exposure to both ionizing and nonionizing radiation. Such needs include: in addition to electronic products-related standards criteria on which the standard can be based; further guidance for setting emission or exposure standards in the case of multiple number of sources of ionizing radiation exposure or electronic products emitting ionizing radiation; and further instrumentation or data collection methodology to promote uniformity and comparability of exposure data (auth)

1449 (ORNL-RSIC-25(Suppl.1)) **SHIELDING BENCHMARK PROBLEMS.** Proffo, A. E. (ed.) (Oak Ridge National Lab., Tenn.), Aug 1970. Contract W-7405-eng-26, 44p. (ANS-SD-9(Suppl.1)). Dep. CFSTI.

The Benchmark Problems Group of the American Nuclear Society Shielding Standards Subcommittee (ANS-6) has selected several "benchmark" problems for testing computational methods of radiation transport. Problems are described and solution data are presented. It is anticipated that publication of these problems will serve to focus attention so that careful work will produce solutions which are representative of the state-of-the-art. The problems will also serve to specify standard configurations so

that meaningful comparisons can be made between different calculational methods and between experimental and calculational results. Supplement 1 provides an additional solution to a problem issued previously (neutron spectrum in graphite) and presents a new problem (nucleon-meson cascade in iron) (auth)

1450 (CEA-N-1291) SAFETY-CRITICALITY RECOMMENDATIONS CONCERNING THE STORAGE OF FISSILE MATERIALS. (Commissariat à l'Energie Atomique, Paris (France)). Jun 1970. 37p. (In French). Dep. CFSTI (U. S. Sales Only).

General instructions relating to design and use of storage locations for fissile materials are given. Some standards are proposed and examples are given for storage of enriched uranium or plutonium in the form of ingots, solutions, solid waste, or fuel elements (auth) (France)

1451 (CONF-691101- pp 21-30) RECENT WORK OF THE NCRP, ICRU AND ICRP OF INTEREST TO ACCELERATOR HEALTH PHYSICISTS. Cowan, Frederick P. (Brookhaven National Lab. Upton, N. Y.).

The organizations and recent publications on accelerator health physics of the National Council on Radiation Protection and Measurements (NCRP), International Commission on Radiation Units and Measurements (ICRU), and the International Commission on Radiological Protection (ICRP) are briefly discussed. (W. H. K.)

1452 (CONF-691101- pp 31-41) RADIOLOGICAL SAFETY IN THE DESIGN AND OPERATION OF PARTICLE ACCELERATORS. Vallario, Edward J. (Atomic Energy Commission, Washington, D. C.); Howe, Harry J. (Argonne National Lab. Ill.).

The United States of America Standards Institute (USASI) Main Committee N-43, "Equipment for Non-Medical Radiation Application," examined the need for establishing radiation-protection norms for particle accelerators. A subcommittee designated as N-43.4 Particle Accelerators was established to develop a National Standard on Radiological Safety in the Design and Operation of Particle Accelerators. In undertaking this assignment, the subcommittee realized that for the purpose of the standard it was necessary to define particle accelerators in terms of energy. Differences in design considerations as well as uncertainties in radiation measurement for the high energy accelerators suggested that this standard be limited to particle accelerators having primary energies less than 100 MeV. The basic considerations included the characteristics of and controls for radiation as they affect accelerator design, operating procedures, and exposure evaluation. The radiation protection design criteria included guidance on radiation shielding, radiation damage, i.e., deterioration of insulating materials and related methods for minimizing damage, safety systems, i.e., methods by which desired protection can be achieved, and design considerations for accelerator controls, interlocks, and warning devices. Sections on Operational Health Physics, Radiation Measurements and Dose Assessment provide procedural guidance basic to radiation safety. The proposed standard has received full approval from the Main Committee and is awaiting official sanction by the USASI Nuclear Standards Boards before becoming a United States Standard. (auth)

1453 CHEMICAL RESIDUES IN MILK. SECTION VI. RADIOACTIVE CONTAMINATION. Mocquot, G., Ducluzeau, R. *Annu. Bull. Int. Dairy Fed.*, Part 5, 85-131(1968).

A comprehensive discussion of the radioactive contamination of milk is presented. The natural and artificial sources of radionuclides are defined, the transport of these nuclides through the food chain (fallout-fodder-cattle-milk-man) is described, and the incidence of ^{90}Sr , ^{131}I , and ^{137}Cs in milk at various locations is given. The repercussions on public health of radioactive milk contaminants are discussed in terms of the biological, physical, and genetic effects of radiation and the factors such as biological and physical half-life and ability to pass through the food chain that affect or modify the hazards of the presence of particular radioisotopes in milk. The existing analytical methods for detecting the presence of specific radionuclides in milk are examined and the problems inherent in sampling techniques that affect the analyses are stated. The effects of processing, manufacturing, and storing milk and milk products on the level of radioactive contamination are examined and the prevention of contamination at the production and processing level and at the consumer level is considered. The protection of the consumer is discussed in terms of the activities of responsible authorities, the means employed by these authorities, and the setting of standards (maximum permissible levels) for radioactivity in milk. (E. R. B.)

1454 BASIC APPROACH FOR SAFETY ANALYSIS AND CONTROL OF PRODUCTS CONTAINING RADIONUCLIDES AND AVAILABLE TO THE GENERAL PUBLIC. Paris; European Nuclear Energy Agency (1970). 32p. \$1.50.

A group of experts of international origin has, under the sponsorship of the European Nuclear Energy Agency (ENEA), established a guide for the safety analysis and control of consumer products containing radioisotopes. The guide deals with both general considerations and control procedures. The general considerations involve determination of the external radiation dose or dose commitment from a single product or multiple products to an individual member of the public or the population in general. The control procedures include surveillance, testing, notification or instruction and identification of product. An appendix presents a dose apportionment for products exempted from the guidelines on the basis of risk/benefit considerations. Two annexes are included that present radiation protection standards for classes of exempt products and the present status of products containing radioisotopes and are available to the general public. (E. R. B.)

1455 BIOLOGICAL EFFECTS OF MICROWAVE AND RADIO-FREQUENCY RADIATION. Cleary, Stephen F. *CRC Crit. Rev. Environ. Contr.* 1: 257-306(Jun 1970).

The biological effects of exposure to microwave and radio-frequency radiation are discussed with particular emphasis on the effects on man. The basis for the human exposures is also considered and a comparison is presented of standards that are presently in effect in several countries throughout the world. (auth)

1456 SECOND INTERNATIONAL CONGRESS OF THE INTERNATIONAL RADIATION PROTECTION ASSOCIATION, 3-8 MAY, 1970, BRIGHTON, ENGLAND. Abstracts of Papers Presented at the Congress. *Health Phys.* 19: 67-172(Jul 1970). (CONF-700505-(Absts.)).

Abstracts of the three hundred papers presented are given under the following session titles, monitoring of workers (including whole body counting and review and use of TLD and TSEE), radiation protection policy and administration (including training), symposium on plutonium problems, release of activity into the environment, operational health physics (including accelerator problems and a review of operational experience), symposium on biological recovery from radiation damage, accidents, emergency procedures and lessons, radiation effects in man, population exposure, neutron dosimetry and radiation physics, radiation protection standards, radioecology (including natural radioactivity and fallout), experimental data (including radiobiology), instrumentation and analysis, metabolism in man, occupational medicine, dosimetry; environmental monitoring. (UK)

1457 RADIATION SAFETY NORMS (NRB-69). Dibobes, I. K.; Knyazev, V. A.; Moiseev, A. A.; Moskalev, Yu. I.; Slivintsev, Yu. V.; Teverovskii, E. N.; Terman, A. V.; Shamov, V. P. *At. Energ. (USSR)* 28: 463-7(Jun 1970). (In Russian).

The radiation tolerances accept the concept of justifiable risk, which is defined as a risk less than or equal to the risk associated with the harmful effects of non-radioactive, industrial sources. The risk must be justified by the utility of radioactive sources. The allowable dose does not include the background dose or the dose received by patients in the course of medical treatment. People are divided into three categories: (A) individuals, (B) groups of people working with or living near radioactive sources, and (C) the population as a whole in estimating the radiation dose that would be of genetic significance. The maximum allowable internal and external radiation doses to individuals are as follows: 5 biological equivalent rads (ber)/yr to the whole body, gonads, and bone marrow; 15 ber/yr to the muscles, fatty tissues, liver, kidney, spleen, lungs, eyes, and other body organs; 30 ber/yr to the bone, thyroid, and skin, and 75 ber/yr to the hands, forearms, and legs. The above doses are reduced by a factor of 10 for people in category B. The limiting dose to the thyroid gland of children under 16 is 1.5 ber/yr. Individuals who may obtain 30% of the annual dose are subjected to dosimetric control and medical observation. A whole-body dose of 25 ber is considered potentially dangerous with medical observation being called for. The concept of a maximum allowable concentration of an activity is replaced by the concept of an average-annual allowable concentration of activity. For most isotopes the average-annual concentration is a factor of three greater than the maximum allowable concentration, but is a factor of 10 greater for a number of isotopes such as ^{90}Sr and ^{137}Cs . The genetic dose to the population as a whole should not exceed 5 ber over 30 years. A total of 10 to 15% of this allowable genetic dose was incurred from radioactive fallout as a result of nuclear testing. (TTT)

1458 (RISO-196) STUDIES IN NEUTRON PHYSICS. I. THERMAL NEUTRON BFAM STANDARDIZATION BY MEANS OF THE $^3\text{He}(n,p)\text{T}$ REACTION. II. THE ORDER-DISORDER TRANSITION IN BETA-BRASS STUDIED BY NEUTRON DIFFRACTION. Als-Nielsen, J. (Danish Atomic Energy Commission, Risoe, Research Establishment). Apr 1969. 82p. Dep. CFSTI (U. S. Sales Only).

Thesis. Submitted to Univ. of Copenhagen, Denmark.

A series of experimental investigations in nuclear physics and solid state physics utilizing thermal neutrons from the DR 3 reactor at Risø is reviewed. The nuclear physics experiments concern a method employing the $^3\text{He}(n,p)\text{T}$ reaction for standardization of thermal neutron beams. These experiments made up some of the investigations necessary for the recently completed measurement of the free neutron half-life. The solid state physics experiment deals with the study of order-disorder transition in beta-brass by neutron diffraction techniques. These experiments were carried out for comparison with modern theories of critical phenomena accompanying second-order phase transitions (77 references) (auth) (Denmark).

1459 (CONF 691212 pp 87-102) STANDARD MAN STANDARD PATIENT Morgan Karl Z. (Oak Ridge National Lab., Tenn.)

From Medical Radionuclides Radiation Dose and Effects Symposium Oak Ridge Tenn. Dec 8-11 1969

Characteristics of the standard man were first agreed upon at the Chalk River conference in September 1949. Today he is referred to as the reference man. Calculations making use of this man can be compared rather easily and the final conclusions evaluated with any other similarly referenced calculations. The International Commission on Radiological Protection (ICRP) reference man report and the companion report, the revised ICRP internal dose handbook, are expected to be published in 1970 and 1971 respectively. In the revised ICRP internal dose handbook, considerable use will be made of the ICRP reference man report, lung model report of P. E. Morrow et al. and the ICRP GI tract report of I. S. Eve as well as MIRD Supplements 2 and 3 by L. F. Dillman and W. S. Snyder. Much of the data in these reports regarding the characteristics of the reference man and dose calculations for some 300 radionuclides will provide guidance in estimating the dose from these same radionuclides when they are administered to the patient. The revised ICRP internal dose handbook will be more applicable for calculating patient dose than the previous report because information is provided for specific chemical compounds rather than for just soluble and insoluble compounds. When making medical application of these data, the limitations and assumed characteristics of the reference man must be recognized and appropriate account must be taken of age, sex, weight, metabolic pattern, condition of health, chemical blocking, etc. of the patient. The choice of radionuclide, its chemical form, and its method of administration to the patient are important not only in determining whether a medical procedure or treatment is successful but also from a health physics point of view in avoiding unnecessary patient exposure. The reference man reports should provide guidance in estimating dose from conventional medical applications of radionuclides to the patient and should indicate ways to avoid unnecessary patient exposure and also suggest new and better applications of radionuclides for treatment and diagnosis (auth).

1460 (CONF 691212- pp 399-411) DOSE EFFECT MODIFYING FACTORS IN INTERPRETING MEDICAL EXPOSURES Bond, V. P. (Brookhaven National Lab., Upton, N. Y.)

From Medical Radionuclides Radiation Dose and Effects Symposium, Oak Ridge Tenn., Dec 8-11 1969

Dose-effect modifying factors which must be considered in addition to absorbed dose in estimating the degree of possible effect of exposure to ionizing radiation are discussed with specific reference to diagnostic nuclear medicine. The framework and terminology used by the International Commission on Radiation Units and Measurements, the National Council on Radiation Protection and Measurements (NCRP), and similar groups to characterize dose-effect modifying factors appear to be suitable at present for use in nuclear medicine. The NCRP has recommended numerical values for the quality factor that appear to be appropriate for present use in nuclear medicine. The possible requirement for introducing additional dose-effect modifying factors to take into account dose rate, dose distribution, and chemical effects produced in the course of the disintegration of certain isotopes is discussed. It is concluded that although some of these possible factors require additional study and their use may become necessary at a later date, there is no compelling reason at present for their introduction (auth).

1461 (CONF 691212 pp 473-9) ACTIVITIES OF THE MEDICAL INTERNAL RADIATION DOSE COMMITTEE (MIRD) OF THE SOCIETY OF NUCLEAR MEDICINE Rohrer Robert H. (Emory Univ., Atlanta, Ga.)

From Medical Radionuclides Radiation Dose and Effects Symposium Oak Ridge Tenn. Dec 8-11 1969

The Medical Internal Radiation Dose (MIRD) Committee of the Society of Nuclear Medicine was formed in 1964 to serve the increasing needs of the nuclear medical community with the best estimates of the absorbed dose to patients who are administered radiopharmaceuticals. To achieve this goal, the committee proposed to develop, collect, and critically evaluate information in the following areas: formulas, units, and symbols that are consistent for absorbed dose calculations by either manual or computer techniques; physical and nuclear decay scheme data needed as input for the formulas; developed metabolic data on the distribution and lifetimes of radionuclides administered as labeled pharmaceuticals to the total body, specific organs, and suborgan regions; as well as to consider the influence of the patient's age and clinical state on these variables; chemical, radiochemical, and radionuclidic purity and stability and physical characteristics of radiopharmaceuticals when they are apt to affect the absorbed dose to the patient; accuracy of the calibration methods used for determining the activity of a radiopharmaceutical; and anatomic and physiologic data for patients of various ages and body types. The committee has adopted the absorbed fraction concept for computing absorbed dose. The first three publications of the committee contain the recommended method for calculating the absorbed dose, physical radionuclide data, and extensive tables of absorbed fractions. Many of the publications currently in preparation are directed to the estimation of absorbed dose resulting from specific radiopharmaceuticals. The work of the MIRD Committee is open-ended and will continue as long as new radiopharmaceuticals are developed (auth).

1462 (NIO-4 00(3rd Ed.)) MANUAL OF STANDARD PROCEDURES Harley John H. (ed.) (New York Operations Office (AEC) N. Y. Health and Safety Lab.), Sep 19 0. 534p. Dep. NTIS

Procedures that have been tested over an extended period of time with many samples are included. The divisions within the manual are general data section, radiation measurements, sampling, chemical procedures, fallout methods, specifications (PCH).

1463 DEFINITION OF CRITERIA FOR THE DESIGNATION OF PERSONS WORKING WITH UNSEALED RADIOACTIVE SUBSTANCES Hughes D. (Univ. of Leeds Eng.) Nature (London) 227 1151 (12 Sep 1970)

The author replies to the criticisms of Bush (Nature 2 1150 (Sept 14 1970)). With regard to the maximum activity to be handled at one time, the author states that his figures have not proved restrictive to university uses. With regard to the inhaled fraction of total activity handled, Hughes considered that his figures for ^{85}Kr and ^{135}Xe should be adjusted. With regard to maximum turnover per quarter, comments are made in the light of ICRP recommendations on individual monitoring of personnel. Further guidance on the levels at which designation is necessary is requested (Hk).

1464 RADIATION STANDARDS Bond V. P. (Brookhaven National Lab., Upton N. Y.). Trans Amer Nucl Soc 13 518-19 (Nov 1970)

From Meeting of the American Nuclear Society, Washington, D. C. See CONF-701102

1465 DEVELOPMENT OF UNIFORM STANDARDS FOR INTERNAL RADIATION PROTECTION Com. Naz. Fnerg. Nucl. Notiz 16 No 3 723 (Mar 1970) (In Italian)

The need for the development of uniform standards for internal radiation protection is discussed. The Italian standards for maximum permissible concentration (MPC) of radioisotopes in man are summarized and compared with international standards (JSR).

1466 AMERICAN NATIONAL STANDARD FOR NUCLEAR CRITICALITY SAFETY IN OPERATIONS WITH FISSIONABLE MATERIALS OUTSIDE REACTORS ANSI N16.1-1969 Revision of N16.1-1964 Hinsdale, Ill. American Nuclear Society (1970) 11p

A standard to provide guidance for prevention of criticality accidents in handling, storing, processing, and transporting fissionable materials is presented. The scope of the standard is described and terms used are defined. Other sections contain information on nuclear criticality safety practices, single-parameter limits for fissile nuclides, and multiparameter control (JRD).

1467 RADIATION STANDARDS AND PUBLIC HEALTH. Eisenbud, Merrill (New York Univ., N. Y.). Nucl. Safety; 12: 1-8(Jan-Feb 1971).

The radiation-safety record of the AEC has been good, but changes in the present regulatory system are needed to reconcile differences between public attitudes and the AEC. AEC regulations are based on the recommendations of the ICRP and the NCRP, and the standards contain extensive built-in conservatism. However, the emphasis on the maximum permissible concentrations of radionuclides in air and drinking water should be changed to specify the maximum permissible daily intake from all sources to take into consideration multiple sources and ecological factors. Further, the dual responsibility of the AEC for the development of nuclear power and the protection of the public has contributed to lack of public confidence in the AEC. Accordingly, it is recommended that responsibilities for setting radiation limits be shifted to another agency of the federal government. The same agency, in cooperation with the states, should assume responsibility for environmental monitoring in the vicinity of AEC-licensed facilities. (auth)

1468 (Y-1754) X-RAY AND NUCLEAR RADIATION FACILITIES, PERSONNEL SAFETY FEATURES. Mason, W. J.; Pipes, E. W.; Rucker, T. R.; Smith, D. N.; West, C. W. (Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant). 18 Dec 1970 Contract W-7405-eng-26. 71p. Dep. NTIS

The development and implementation of these standards are described and the general philosophy and approach to these standards are outlined. The use of a matrix (type of installation versus radiation safety feature) to facilitate equipment classification and personnel safety feature requirements is presented. Included is a set of the standards showing formats, matrices, etc., and the detailed standards for each safety feature. (auth)

1469 REVIEW OF INTERNATIONAL MICROWAVE EXPOSURE GUIDES. Swanson, Jon R.; Rose, Vernon E.; Powell, Charles H. (International Labour Office, Geneva. Public Health Service, Cincinnati). Amer. Ind. Hyg. Ass. J.; 31: 623-9(Sep-Oct 1970).

A review of microwave exposure criteria used in the United States and other western countries in the past ten yrs indicates a general acceptance of a power density exposure level of 10 mW/cm². The U.S.S.R. and Poland specify permissible levels lower by a factor of 1000 at 10 μ W/cm², while Czechoslovakia has proposed a sliding scale allowing 25 μ W/cm² for an average working day exposure. The first U. S. standards considered only the power density level of microwave energy and did not consider other factors affecting biological response such as multifrequency exposures, time of exposure, frequency used, and environmental factors such as the heat load or cooling capacity of the workplace. The effects of severe heat stress or intense cold on the body's cooling capacity were noted in the latest U. S. standards, although the definitive recommendations for applying the concepts were not provided. Future standards should reflect environmental stress as well as other factors found to affect the biological response to microwave energy. (E.E.H.)

1470 (BRH/OBD-70-3) 1969 ANNUAL REPORT TO THE CONGRESS ON THE ADMINISTRATION OF THE RADIATION CONTROL FOR HEALTH AND SAFETY ACT OF 1969, PUBLIC LAW 90-602. (Bureau of Radiological Health, Rockville, Md.). 1 Apr 1970. 95p. NTIS.

This annual report contains a thorough appraisal of the incidence of biological injury and effects, including genetic effects, to the population, a list of Federal electronic product radiation control standards, an evaluation of the degree of observance of applicable standards, a summary of outstanding problems in the administration of the Act, an analysis and evaluation of research activities and technological progress for safety, a list of completed or pending judicial actions, the extent to which technical and consumer-oriented information was disseminated, and the extent of cooperation between Government officials and representatives of industry and other interested parties. The report also contains such recommendations for additional legislation as the Secretary deems necessary to promote cooperation among the several States in the improvement of electronic product radiation control and to strengthen the national electronic product radiation control program. (auth)

1471 (BRH/DEP-70-28) PRESENT FEDERAL CONTROL OF HEALTH HAZARDS FROM ELECTRONIC PRODUCT RADIATION AND OTHER TYPES OF IONIZING RADIATION (AS OF NOVEMBER 1969) (Bureau of Radiological Health, Rockville, Md. Div of Electronic Products) Nov 1970 208p NTIS

The results of a survey that was performed during the period

from June to October 1969 to investigate the various facets of Federal radiation control are documented. The items investigated included statutory control authority, control programs and procedures, and the quantities and types of radiation-emitting electronic products and radioactive materials used by the Federal government. Thirty-three selected departments and agencies were asked to answer specific questions relating to their programs for controlling radiation from electronic products and radioactive materials. Their responses are summarized and discussed. (auth)

1472 (BRH/ORO-70-8) MODEL LEGISLATION FOR USERS OF IONIZING RADIATION IN THE HEALING ARTS. (Bureau of Radiological Health, Rockville, Md.). Oct 1970. 24p. NTIS.

This model legislation is intended for use by the individual States as a mechanism for establishing minimal educational and training requirements for all users of ionizing radiation in the healing arts. This model forbids a person to apply ionizing radiation to human beings unless he is certified either by being granted a certificate or permit. The major purposes of the model are to protect the public from excessive and improper radiation exposure and to encourage the establishment of an internal regulatory framework for certification of users of ionizing radiation that is consistent among the States. (auth)

1473 REPORT OF THE INTERNATIONAL COMMISSION ON RADIATION UNITS AND MEASUREMENTS (ICRU) TO THE INTERNATIONAL EXECUTIVE COMMITTEE ON THE XIIIth INTERNATIONAL CONGRESS OF RADIOLOGY, TOKYO, 1969. Ney, W. R. (International Commission on Radiation Units, Washington, D. C.). Health Phys.; 19: 825-30(Dec 1970).

Publications by ICRU previous to the period under review (prior to 1969), those published during the period 1965 to 69 (Report 11, Radiation Quantities and Units and Report 12, Certification of standardized radioactive sources) and those at present being prepared for publication, are listed. The establishment of the ICRU medal honoring the late L. H. Gray and the choice of the first recipient are reported. The relationship of ICRU with other international organizations is discussed and the organizations listed. The Commission finances are stated and the membership is given. The outlook for the future is reviewed. The distribution of ICRU reports 1927-1968 and ICRU materials published outside of the ICRU reports series are given in two appendices. (UK)

1474 NEW RADIOLOGICAL HEALTH LAW FOR CANADA THE RADIATION-EMITTING DEVICES ACT, 1969 Booth, A. H. (Dept. of National Health and Welfare Ottawa) Can. J Public Health; 61: 430-2(Sep-Oct 1970).

New legislation designated as Bill S-14 has recently been introduced to cover a wide range of devices that are used primarily for industrial, medical and scientific applications. The need for control in the design and sale of any apparatus emitting electromagnetic radiations is recognized. It will enable the government to establish minimum safety standards with respect to the design and construction of radiation devices of various kinds as a supplement to the work of the Atomic Energy Control Board. The radiation-emitting devices covered include X-ray machines, microwave ovens, laser generators and electronic equipment which emit radiation as an unwanted by-product of their operation. (Canada)

1475 STANDARDS OF RADIATION PROTECTION AND THEIR IMPLICATIONS FOR THE PUBLIC'S HEALTH. Eisenbud, Merrill (Environmental Protection Administration, New York). pp 73-89 of Nuclear Power and the Public. /Foreman, Harry (ed.). Minneapolis; Univ. of Minnesota Press (1970). From Nuclear Power and the Public Conference, Minneapolis, Minn. See CONF-691054.

The development of radiation standards is reviewed. The responsibilities of the U. S. Atomic Energy Commission concerning radiation standards are discussed. 17 references. (D C C)

1476 RADIATION PROTECTION DOSIMETRY. Kiefer, H. (Gesellschaft fuer Kernforschung, Karlsruhe, Ger.); Maushart, R.; Mejdahl, V. pp 557-616 of Radiation Dosimetry. Vol. III. /Attix, Frank H. (ed.). New York; Academic Press Inc. (1969).

After a brief introduction, the development and present values of radiation protection standards are presented. The dosimetry of external radiation is described in some detail. Area dosimetry, personnel dosimetry and the special requirements of dosimetry for radiation accidents are explained, the techniques and dosimeters required for handling each type of radiation are considered. Discussions of the dosimetry of internal radiation and dosimetry for the protection of the population conclude the article (225 references). (R W R)

1477 (AERE-Trans-1134) RADIATION SAFETY STANDARDS, 1969. Translated by J. E. Baker (Atomic Energy Research Establishment, Harwell, Eng.), from Normy Radiatsionnoi Bezopasnosti (NRB-69), Atomizdat, Moscow, 1970. 66p. Dep. NTIS (U. S. Sales Only). UK 45p.

Basic radiation safety standards adopted in the Soviet Union in 1969 are presented. The standards are based on the recommendations of the International Commission on Radiological Protection (ICRP) as set forth in Publication 9 (1965). (C H)

1478 RADIATION PROTECTION FOR PLANT AND WORK FIRE DEPARTMENTS. Schenk, M. Maschinenmarkt 76 1808-10(1970). (In German)

Protection against hazards originating from the application of nuclear energy must be secured in all plants using radioactive materials. The plant fire brigade is responsible for applicable technical aid. Regulations and standards for plant fire brigades are discussed based on the evaluation of past experience. (INIS)

1479 NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL. A REVIEW OF PUBLICATIONS RELATING TO MATTERS OF RADIATION HEALTH. Australas. Radiol.; 14: 451-3(Nov 1970).

Short resumes of publications of the N H and M R C are given. The publications appear in the form of codes of practice and deal with control and safe handling of sealed radioactive sources used in radiation therapy (other than teletherapy), the use of ionizing radiations in secondary schools, nursing staff exposed to ionizing radiations from radioactive substances, safe handling of corpses containing radioactive substances, minimizing radiological hazards to patients (an interim statement), revised radiation protection standards for individuals exposed to ionizing radiations, radiation hygiene in dentistry, control and safe handling of sealed radioactive sources used in industrial radiography, and notes on medical procedure for radiation accidents and radioactive contamination. All publications are oriented to the Australian situation, and are published in Canberra by the N H and M R C (Australia).

1480 BUSHWHACKING, LICENSURE, AND SENATOR BARTLETT. Donnelly, Warren H. (Library of Congress, Washington, D. C.). Radiol. Technol.; 42 248-58(Jan 1971).

The status in January 1971 of Federal legislation concerning standards for licensing x-ray technicians who operate diagnostic dental or medical equipment is reviewed. (C H)

1481 USERS' GUIDES FOR RADIOACTIVITY STANDARDS. Kahn, B.; Choppin, G. R.; Taylor, J. G. V. Washington, D. C.; National Academy of Sciences, National Research Council (1967). 43p. Available from National Academy of Sciences, National Research Council, Washington, D. C.

Short guides to chemical and counting problems for common standards are given. The guides are prepared separately for these elements: Na, Mg, P, S, Cl, K, Ca, Cr, Fe, Co, Zn, Ga, As, Br, Kr, Sr, Y, Zr, Nb, Ru, Rh, Ag, Sn, Sb, Te, I, Cs, Ba, rare earths, Au, Hg, Tl, Po, Rn, Ra, Th, U, Np, and Am. (M C G)

1482 AMERICAN STANDARD: GUIDE FOR DESIGN AND OPERATION OF SHIPPING CONTAINERS FOR IRRADIATED SOLID FUEL FROM NUCLEAR REACTORS. ANSI N 5.3 1964. New York; American Institute of Chemical Engineers (1965). 8p. Available from American National Standards Inst., New York.

A standard guide for the design and operation of containers for shipping irradiated fuel elements from nuclear reactors is presented. (L C L)

1483 STANDARD DEFINITIONS OF TERMS RELATING TO DOSIMETRY. ASTM E 170-63. Philadelphia, American Society for Testing and Materials (1965). 3p. Available from American Society for Testing and Materials, Philadelphia.

Definitions are presented for terms related to radiation dosimetry. These definitions are the same as or similar to those recommended by the International Commission on Radiological Units and Measurements (ICRU) as presented in the National Bureau of Standards Handbook 62 but attempt to define some of the terms more exactly. (C H)

1484 AMERICAN STANDARD. PRACTICE FOR OCCUPATIONAL RADIATION EXPOSURE RECORDS SYSTEMS. ANSI N 2.2 1966. New York; American Standards Association, Inc. (1966). 10p. Available from American National Standards Inst., New York.

Standards are presented that provide guidance to employers for the generation and retention of records relating to the occupational radiation exposure of personnel. Such records should enable the

employer to evaluate the effectiveness of radiation protection programs, demonstrate and facilitate compliance with contractual requirements and applicable government regulations concerning radiation protection, and enable reconstruction for legal or medical purposes of situations and conditions resulting in the radiation exposure and estimations of radiation dose received by personnel. (C H)

1485 ASSESSMENT OF THE ECONOMIC EFFECTS OF RADIATION EXPOSURE STANDARDS FOR URANIUM MINERS. FRC A-4 1970. Cambridge, Mass.; Arthur D. Little, Inc. (1970). 365p. Available from Environmental Protection Agency, Rockville, Md.

The economic effects of compliance with the standards proposed by the Interagency Uranium Mining Radiation Review Group of the Federal Radiation Council for the control of radiation exposure of miner personnel on Jan. 1, 1971, or possible alternative dates, are discussed. The economic effects of compliance with each of the three proposed exposure standards on the domestic uranium production industry, on the nuclear power industry, on the electrical power generation industry, on the retail price paid by the home consumer of electricity, and on communities dependent on the domestic uranium production industry are considered. (C H)

1486 BACKGROUND MATERIAL FOR THE DEVELOPMENT OF RADIATION PROTECTION STANDARDS. PROTECTIVE ACTION GUIDES FOR ⁸⁹Sr, ⁹⁰Sr, AND ¹³⁷Cs. FRC Report No. 7 1965. Washington, D. C.; Federal Radiation Council (1965). 44p. Available from Environmental Protection Agency, Rockville, Md.

Information is summarized that is pertinent to the development of radiation protection programs for situations involving contamination of the environment by the radionuclides strontium-89, strontium-90, and cesium-137. Two conditions of environmental contamination are examined: an acute localized contaminating event in which prompt action may be necessary to avoid the exposure that would otherwise result, and a widespread, generally increasing, low-level of contamination (from stratospheric fallout) that causes a continuous intake of radioactive materials by large numbers of people for a period of years. Special consideration is given to the situation in the arctic region where, because of unusual ecological conditions and food chains, some population groups are exposed to levels higher than those in other parts of the United States. (C H)

1487 AMERICAN STANDARD: RADIATION PROTECTION IN NUCLEAR REACTOR FUEL FABRICATION PLANTS. NATURAL (OR NORMAL) AND ENRICHED URANIUM, THORIUM, AND PLUTONIUM. ANSI N 7.2 1963. New York; American Standards Association, Inc. (1964). 32p. Available from American National Standards Inst., New York.

Standards are presented for the external radiation protection of personnel of nuclear reactor fuel fabrication plants and for control of the accumulation of radioisotopes within their bodies. Separate sections are included for natural uranium, uranium enriched in ²³⁵U, plutonium (²³⁹Pu), and thorium (²³²Th and ²³³Th). (C H)

1488 USA STANDARD. RADIATION PROTECTION IN URANIUM MINES AND MILLS (CONCENTRATORS). ANSI N 7.1 1960. New York; United States of America Standards Institute (1961). 25p. Available from American National Standards Inst., New York.

Standards are presented for preventing the overexposure of uranium mine and mill personnel to whole-body external ionizing radiations, ionizing radiation effects on the lining of the respiratory system, and the accumulation of excessive body burdens of radioisotopes. (C H)

1489 AMERICAN NATIONAL STANDARD. SUPPLEMENT TO RADIATION PROTECTION IN URANIUM MINES AND MILLS (CONCENTRATORS). ANSI N 7.1a 1969. New York; American National Standards Institute, Inc. (1970). 13p. Available from American National Standards Inst., New York.

Standards for air sampling and analysis to evaluate the effectiveness of methods of control of atmospheric concentrations of ²²²Rn daughter products (²¹⁸Po, ²¹⁴Pb, ²¹⁴Bi, and ²¹⁴Po) in uranium mines are presented. The methods are useful for the evaluation of the occupational radiation exposure of underground uranium mine personnel. (C H)

1490 X-RAY PROTECTION STANDARDS FOR HOME TELEVISION RECEIVERS. Interim Statement of the National Council on Radiation Protection and Measurements (NCRP). NCRP A-1 1968. Washington, D. C.; National Council on

Radiation Protection and Measurements (1968) 4p. Available from NCRP Publications, Washington, D. C.

The 1959 standards for protection of the human population against x radiation emitted by home television sets are reviewed and certain statements are clarified (C H)

1491 EXPOSURE TO RADIATION IN AN EMERGENCY NCRP 29 1962. Chicago; University of Chicago (1962) 91p. Available from NCRP Publications, Washington, D. C.

Standards are presented to help civil defense officials estimate the radiation exposure of human populations in the event of nuclear warfare and during the first few months post-attack. The effects of whole-body irradiation from external sources of γ radiation and injury to the skin caused by β radiation are considered (C H)

1492 NATIONAL USES AND NEEDS FOR STANDARD RADIOACTIVE MATERIALS Washington, D. C.; National Academy of Sciences (1970) 12p. Available from National Academy of Sciences, National Research Council, Washington, D. C.

An investigation of the status of and need for radioactivity standards, conducted by the Committee on Nuclear Science of the National Research Council, is reported. The uses of radioactivity standards in public health, medicine, and nuclear science are discussed. The availability of and users' complaints about standards are included. It is recommended that the US government appoint one agency, e.g., the National Bureau of Standards, as the central supplier of radioactivity standards, that agency have long-term funding to perform the research and services necessary for providing and promoting the use of standards of from 1 to 3% accuracy, and commercial suppliers should be encouraged to specialize in the preparation of custom (i.e., unusual standards, standards of from 3 to 10% accuracy, and calibrated sources (L C L)

1493 SPECIFICATION OF HIGH ACTIVITY GAMMA-RAY SOURCES ICRU Report 18 1970. Washington, D. C.; International Commission on Radiation Units and Measurements (1970) 26p. Available from ICRU Publications, Washington, D. C.

Standards for high-activity gamma sources for use in teletherapy, radiography, and research and industry and the recommended bases for source specifications are discussed. Terms to be used in specifications for these three sources and methods for standards verification are recommended (I C I)

1494 SAFE DESIGN AND USE OF INDUSTRIAL BETA-RAY SOURCES National Bureau of Standards Handbook 66. ANSI Z 54.2 1958. Washington, D. C.; National Bureau of Standards (1958) 33p. Available from Superintendent of Documents, GPO, Washington, D. C.

A guide for the safe design, manufacture, installation, use, maintenance, and disposal of sealed beta sources for industrial applications is presented (L C L)

1495 USA STANDARD CLASSIFICATION OF SEALED RADIOACTIVE SOURCES ANSI N 5.10 1968. New York, American Institute of Chemical Engineers (1968). 10p. Available from American National Standards Inst., New York.

This standard classifies sealed radioactive sources according to particular uses. The classification is based on radiotoxicity, Curie content, and performance requirements. The standard does not attempt to establish design standards, but leaves the design features to the judgement of the supplier and user, provided that the performance requirements are met (L C L)

1496 AMERICAN NATIONAL STANDARD RADIATION SYMBOL ANSI N 2.1 1969. New York, American National Standards Institute, Inc. (1970). 4p. Available from American National Standards Inst., New York.

This standard designates a radiation symbol which shall be used to signify the actual or potential presence of ionizing radiation and to identify objects, devices, materials, or combinations of materials which emit ionizing radiation. This standard does not specify the radiation levels at which the symbol is to be used (I C L)

1497 AMERICAN STANDARD GUIDE TO PRACTICE IN TRANSPORTATION OF SOURCE AND SPECIAL NUCLEAR MATERIAL BEFORE IRRADIATION. ANSI N 5.1 1962. New York, American Institute of Chemical Engineers (1962) 8p. Available from American National Standards Inst., New York.

A standard is presented which provides useful information concerning the pre-irradiation transportation of source and special nuclear material to all persons engaged in such activity including shippers, receivers, and carriers (I C L)

1498 TRANSPORTATION OF RADIOACTIVE MATERIALS Blackburn, R. W. Ottawa, Canadian Atomic Energy Control Board (1967). 45p. Available from Canadian Atomic Energy Control Board, Ottawa.

Radioactive materials transport regulations which are internationally uniform for all modes of transport are being adopted by most countries including Canada. The bases for these regulations and their applications in Canada are discussed (L C L)

1499 RADIATION AND RADIATION SOURCES INTENDED FOR USE IN THE PRODUCTION, PROCESSING, AND HANDLING OF FOOD 21 CFR 121G 1970. Washington, D. C.; Superintendent of Documents, GPO (1970). 3p. Available from Superintendent of Documents, GPO, Washington, D. C.

Standards are presented for the safe use of radiation sources in the processing, production and handling of food. Electron beam, gamma ray, radiofrequency, ultraviolet, and x-ray radiation sources are included (L C I)

1500 INDUSTRIAL RADIOGRAPHY WITH RADIOISOTOPES, Chrimes, N. W. D., Coogee, Australia, Australian Atomic Energy Commission (1970). 48p.

Sections deal with the general principles of radiography properties and production of radioisotopes, radiographic technique, interpretation of radiographs, and radiation protection dealing specifically with monitoring and shielding provisions based on local codes of practice. Characteristics of the principal radioisotopes used for radiography are tabulated and exposure techniques and instruments are illustrated. A bibliography of British and Australian codes and specifications and transport regulations is appended (Australia)

1501 DETAILED REGULATIONS GOVERNING RADIOACTIVE MATERIALS 16 CFR 116.101-100. Washington, D. C.; Superintendent of Documents, GPO (1969). 21p. Available from Superintendent of Documents, GPO, Washington, D. C.

Detailed regulations for the handling, including transportation, of radioactive materials are presented (I C I)

1502 TRANSPORTATION OF DANGEROUS ARTICLES AND MAGNETIZED MATERIALS 14 CFR 103.100. Washington, D. C.; Superintendent of Documents, GPO (1969). 1p. Available from Superintendent of Documents, GPO, Washington, D. C.

Standards for the safe transport of dangerous articles and magnetized materials including radioactive material are presented (I C I)

1503 FACILITIES HANDLING RADIOACTIVE MATERIALS, 1970. NFPA 801 1970. Boston, National Fire Protection Association (1970). 30p. Available from National Fire Protection Association, Boston.

Standards for the fire protection of facilities handling radioactive materials are presented in order to provide the fire protection specialist with certain fundamental information about radioactive materials and their handling, and to provide designers and operators of such laboratories with guidance on practices necessary for fire safety. The subjects discussed include radiation sources, nature of the fire problem, arrangement of facilities handling unsealed radioactive materials, service facilities, equipment for handling, and processing radioactive material, and protection against fire and explosion (I C I)

1504 CODE OF PRACTICE FOR THE CARRIAGE OF RADIOACTIVE MATERIALS BY ROAD. London, Her Majesty's Stationery Office (1970). 74p. £0.45 (NP 18760)

The carriage of radioactive materials by road in the UK is governed by the Radioactive Substances (Carriage by Road) (Great Britain) Regulations 1970 which are made under Section 2(2) of the Radioactive Substances Act 1948. These regulations are mainly and purposely in general terms, requiring a proper course of conduct on the part of those concerned, but do not for the most part lay down precise technical requirements. Provisions for the control of radiation doses received by road transport workers in certain circumstances are contained in the Radioactive Substances (Road Transport Workers) (Great Britain) Regulations 1970. Advice on the storage of radioactive material in transit is contained in a Code of Practice issued jointly by the Department of the Environment, the Department of Trade and Industry and the Department of Employment. This Code of Practice is intended to assist all concerned and consignors in particular to discharge their obligations under the law. Although many provisions of the Code are explicitly dealt with in the Regulations, the Code does not purport to be the Regulations nor to give a legal interpretation of them. But, with that reservation

the Code is commended to those concerned as a proper standard by which to determine their course in order to fulfill their statutory obligations. The Code conforms generally to the International Atomic Energy Agency's Regulations for the Safe Transport of Radioactive Materials as amended in 1967 (UK)

1505 INSTITUTE OF OCCUPATIONAL HYGIENE IN THE URANIUM INDUSTRY. Decrees No. 15 and 16 of the Czechoslovak Ministry of Health, 1968) Vestn. Min. Zdrav., 16 Nos. 7-8, 76-7 (Jun 1968). (In Czech).

The decrees represent the basic regulations concerning health aspects in the uranium industry. The powers of the chief hygienist are delegated to the Institute of Occupational Hygiene for all questions pertaining to the uranium industry. The Institute carries out research for protecting employees engaged in production work involving uranium. Its responsibilities cover matters of labor hygiene and radiation toxicology. Detailed regulations concerning the working conditions are issued by the representative of the chief hygienist in consultation with local authorities. Due attention is paid to the protection of the environment. These decrees replace the June 2, 1960 decree of the Ministry of Health concerning sanitary inspections in uranium plants (TTT)

1506 LEACH TESTING OF IMMOBILIZED RADIOACTIVE WASTE SOLIDS. A PROPOSAL FOR A STANDARD METHOD. Hespe, F. D. (International Atomic Energy Agency, Vienna). At. Energy Rev. 9 No. 1, 195-207 (Apr 1971)

A tentative preliminary to the disposal of radioactive waste is its solidification and incorporation into a stable medium from which the radioactive components cannot readily be leached by waters that may come in contact with the waste after disposal. In order to test the quality of any solidified form of waste and to compare various products from different processes or different laboratories it is desirable to have a standard method of measuring the leach rate by water of the radioactive components in the solid waste. Two leach rate tests are presented that were the result of recommendations by a panel of experts convened by the International Atomic Energy Agency in August 1969. One method is for intercomparison purposes and the other to approximate the behavior of an immobilized solid under the conditions of the storage environment. The details of the methods include specimen preparation, leachant containers, leachant specifications, experimental conditions, and reporting of results. Extrapolation of test results to a disposal program is discussed (auth)

1507 CODE OF PRACTICE FOR THE STORAGE OF RADIOACTIVE MATERIAL IN TRANSIT. London: Her Majesty's Stationery Office (1970). 21p. £0.20 (NP 187C1)

This Code of Practice is intended to assist those who may be responsible for the temporary storage or warehousing of radioactive material which is in transit and not on the premises of the consignor or the consignee of the material. It is recommended to those responsible as a guide by which to determine their practice in order to avoid the risk of over exposure to radiation of persons and damage to goods of other parties. The Code conforms generally to recommendations made by the International Atomic Energy Agency and has been approved by the Radioactive Substances Advisory Committee (UK)

1508 CODE OF PRACTICE FOR THE STORAGE OF RADIOACTIVE MATERIAL IN TRANSIT. London: Her Majesty's Stationery Office (1970). 15p. Available from British Information Service, New York

Regulations in the United Kingdom for the storage of radioactive materials in transit are presented. A discussion of the hazards of radioactive materials and standards for the packaging, labeling and storage of radioactive materials during shipment are included (LCL)

1509 ECOLOGICAL STANDARDS, ENERGY NEEDS AND EMISSION CHARACTERISTICS. Lieberman, Joseph A. (Environmental Protection Agency, Rockville, Md.). Trans. Amer. Nucl. Soc., 14 No. 1, 73-4 (Jun 1971)

From 17th Annual Meeting of the American Nuclear Society, Boston, Mass. (13 Jun 1971). See CONF-710606

1510 HISTORICAL REVIEW OF RADIATION PROTECTION AND CONTROL CONCEPTS AND REQUIREMENTS. pp 1-20 of Applied Radiation Protection and Control Vol 1 / Fitzgerald, J. J. New York, Gordon and Breach, Science Publishers, Inc. (1969)

The history of radiation protection and control concepts and requirements is briefly discussed. Included in the discussion are early concepts, the function of radiation protection organizations, and the development of codes, standards, and regulations

The administrative, technical and scientific and legal and regulatory aspects of a radiation protection and control program are discussed. The need for specialized educational programs in radiation protection and control, the support of the AEC in these programs, the role of the Public Health Service, and the expansion of earlier educational programs are also discussed (ERB)

1511 RADIATION PROTECTION AND CONTROL GUIDES. pp 21-197 of Applied Radiation Protection and Control Vol 1 / Fitzgerald, J. J. New York, Gordon and Breach, Science Publishers, Inc. (1969)

Guidelines or working standards for establishing and applying effective radiation protection and control procedures are presented. An attempt is made to develop a balanced program by supplementing the current national and international standards with additional guides and working standards. Included in the discussion are areas of encounter and control standards, significant properties of radionuclides, radiation protection and control measures, and policy and guidelines for all aspects of encounter with radiologically hazardous elements (ERB)

1512 RADIOACTIVITY STANDARDS AND THE ENVIRONMENT. Garfinkel, S. B. (National Bureau of Standards, Washington, D. C.). Trans. Amer. Nucl. Soc., 14 No. 1, 124 (Jun 1971)

From 17th Annual Meeting of the American Nuclear Society, Boston, Mass. (13 Jun 1971). See CONF-710606

1513 NOMINAL STANDARD DOSE AND THE RFT. Livermore, W. F. (Charing Cross Hospital, London). Brit. J. Radiol., 44 No. 522, 477-8 (Jun 1971)

The Ellis formula for establishing a unit of biologically effective dose (the RFT) is criticized and reviewed with reference to tumors which do not fit the formula, including squamous cell carcinomas of the skin. Emphasis is made on the need to define the specific biological effect being measured (UK)

1514 RADIATION PROTECTION STANDARDS. Taylor, Lauriston S. (National Academy of Sciences, Washington, D. C.). CRC Crit. Rev. Environ. Contr., 2 No. 1, 81-124 (Apr 1971)

The evolution of radiation protection standards is reviewed with emphasis on the role of the National Council on Radiation Protection (NCRP) in the U.S.A., the International Commission on Radiation Units (ICRU) and the International Commission on Radiation Protection (ICRP). The contributions of other organizations in the development of radiation protection standards are reported. The contents of a number of reports covering various aspects of radiation protection issued by the NCRP are summarized briefly (CH)

1515 PROTECTION OF THE PATIENT IN X-RAY DIAGNOSIS. A REPORT PREPARED BY A TASK GROUP OF COMMITTEE 3 OF THE INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION. RADIATION PROTECTION ICRP Publication 16, 1969. New York, Pergamon Press (1970). 46p. Available from Pergamon Press, Inc., Elmsford, N. Y.

Basic physical and biological concepts pertinent to the protection of patients from x-radiation during diagnostic radiography are reviewed. The long term genetic and somatic effects of radiation on human populations as a function of energy absorbed in the body, dose rate, the tissue exposed, the cumulative radiation dose, and the age and sex of the patient are considered. Data on the annual frequencies of diagnostic radiographic examinations in 12 representative countries and data on the radiation dose to the bone marrow and gonads during various radiographic examinations are presented. General recommendations applicable to radiation protection of the patient and specific recommendations for protection during fluoroscopic examinations of the chest, during heart catheterization, during pregnancy, during mammography, and during dental radiography are included (CH)

1516 RADIOSENSITIVITY AND SPATIAL DISTRIBUTION OF DOSE. RADIATION PROTECTION ICRP Publication 14, 1969. New York, Pergamon Press (1969). 118p. Available from Pergamon Press, Inc., Elmsford, N. Y.

Data pertinent to the establishment of radiation dose limits for the occupational exposure of personnel and for the exposure of the human population are presented. The data represent the contributions of two task groups, one of which considered the spatial distribution of radiation dose in tissues and the other the relative radiosensitivity of different tissues. The limitations of various methods for deriving dose limits for exposure are discussed. It was concluded that somatic radiation effects that should be considered when setting dose limits for occupational exposure include induction of cataracts and tumors, impaired fertility, and defective development of the fetus (CH)

1517 REPORT OF COMMITTEE IV ON PROTECTION AGAINST ELECTROMAGNETIC RADIATION ABOVE 3 MeV AND ELECTRONS, NEUTRONS, AND PROTONS. RECOMMENDATIONS OF THE INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION. RADIATION PROTECTION. ICRP Publication 4 1962. New York; Pergamon Press (1964). 44p. Available from Pergamon Press, Inc., Elmsford, N. Y.

Recommendations are presented for the protection of personnel working with electromagnetic radiations above 3 MeV, electrons, protons and neutrons with energies up to 1000 MeV. The special risks involved in working with high-energy radiation and heavy particles are reviewed. Recommendations for monitoring the area around generators and general recommendations as to the installation and shielding of sources of high-energy radiation and heavy particles are included. (C H)

1518 RECOMMENDATIONS OF THE INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION. RADIATION PROTECTION. ICRP Publication 9 1965. New York; Pergamon Press (1966). 27p. Available from Pergamon Press, Inc., Elmsford, N. Y.

The basic principles underlying the ICRP radiation protection recommendations for personnel and the general public are reviewed. It is pointed out that since an exposure may involve a degree of risk, it is recommended that all doses be kept as low as is readily achievable while taking economic and social considerations into account. Recommendations for radiation dose limits are intended for planning the design and operation of facilities leading to foreseeable conditions of radiation exposure. When the source of radiation exposure is uncontrolled, as in the case of nuclear weapon explosions or reactor accidents, the exposure can only be controlled by remedial measure which in themselves may be more hazardous than the risks from the unplanned exposure. The decision to take remedial action will have to take account of the particular circumstances that prevail, the risks involved, and the social consequences of the remedial action. The setting of standards for radiation dose levels at which various countermeasures should be considered would be the responsibility of the health physics department in the case of reactor accidents and of national authorities in the case of nuclear weapon explosions. (C H)

1519 PUBLIC HEALTH SERVICE DRINKING WATER STANDARDS. Public Health Service Publication No. 956 1962. Washington, D. C.; Department of Health, Education, and Welfare (1969). 61p. Available from Superintendent of Documents, GPO, Washington, D. C.

Standards for drinking water supplies in the U S A are presented. Data are included on maximum permissible concentrations of ^{131}I , ^{226}Ra , ^{89}Sr , and ^{90}Sr acceptable in water for human consumption. (C H)

1520 RADIATION PROTECTION IN SCHOOLS FOR PUPILS UP TO THE AGE OF 18 YEARS. RADIATION PROTECTION. ICRP Publication 13 1968. New York; Pergamon Press (1970). 7p. Available from Pergamon Press, Inc., Elmsford, N. Y.

Science courses in schools often include demonstrations and experiments involving the use of sources of ionizing radiations. The radiation dose limits recommended for exposure of children up to 18 years of age are: gonads and red bone marrow 50 mrem/yr, skin, bones and thyroid gland 300 mrem/yr, hands, forearms, feet, and ankles 750 mrem/yr, and other single organs 150 mrem/yr. It is recommended that compliance with these dose limits be assured by the design and operation of equipment for school demonstrations. A radiation safety plan for the guidance of school administrators and teachers is included. (C H)

1521 HEALTH PHYSICS OPERATING EXPERIENCES IN THE VICINITY OF E.N.E.L. NUCLEAR ELECTRIC CENTERS. Antonucci, L. (ENEL, Garigliano, Italy); Bramati, L.; Fiorentino, F.; Malossi, S. *Minerva Fisicochim.* 14: 74-8 (Apr-Jun 1970). (In Italian). (CONF-680535-31)

From fourteenth national conference of the Italian Association for Health Physics and Protection from Radiation; Formia, Italy (29 May 1968).

The health physics experiences acquired during the operation of the E.N.E.L. nuclear electric centers are summarized. The guidelines followed in the application of protection standards for personnel in the treatment of the liquid and gaseous effluents in the maintenance and refueling operations and in the transport of radioactive materials are emphasized. (tr-auth)

1522 AUTHORIZED PROTECTION STANDARDS OR CRITERIA ON THE RADIOACTIVE CONTAMINATION OF FOOD AND DRINKING WATER IN JAPAN. Urakubo, Goro, Kido, Yasumasa. (National Inst. of Hygienic Sciences, Tokyo). Sho-

kuhin Eiseigaku Zasshi, 11 No. 5, 396-404 (Oct 1970). (In Japanese).

The need for standards for the maximum permissible concentration of radioactivity in food and water supplies in Japan is discussed. Values based on standards of the USA and Great Britain have been used in the past. (TSS) (Japan)

1523 RADIATION PROTECTION TRENDS IN THE UNITED STATES. Taylor, Lauriston S. (National Council on Radiation Protection and Measurements, Washington, D. C.). *Health Phys.* 20 No. 5: 499-504 (May 1971)

Following the last major change in radiation protection standards introduced by the National Council on Radiation Protection and Measurements (NCRP) in 1957, the basic protection criteria have been under continuous review. During the ensuing period no breakthrough has occurred in our fundamental knowledge that justifies any significant changes in protection standards. New data tend to show that standards adopted two decades ago were overly conservative although not sufficiently to warrant upward revisions now. The 1970 report on Basic Radiation Protection Criteria will show some minor adjustments, mainly in the direction of numerical simplification. In spite of the fairly well stabilized position of radiation protection philosophy, especially in comparison with other environmental pollutants, radiation hazard is a headline catcher continues to flourish in the U.S. This caused undue alarm and concern among patients reading death-calculation stories about radiation and fosters an undesirable and even dangerous public fear of radiation. Improvement in the efficiency of radiation usage is nevertheless progressing in an orderly manner, but vast numbers of professional man-hours are being wasted fighting radiation hazard windmills instead of performing useful work. An important trend in the U.S. is toward governmental control of all uses of radiation. Applied rationally, this promises to be useful, but radiation control is already better than for most pollutants and there is dubious need for continued frenetic attacks on the problem. (auth) (UK)

1524 CODE OF PRACTICE FOR THE USE OF IONIZING RADIATIONS IN SECONDARY SCHOOLS. AAEC A-10 1965. Canberra, Australia: National Health and Medical Research Council (1965). 4p. Available from National Health and Medical Research Council, Curtin, Australia.

A Code of Practice to ensure the protection of children against ionizing radiations used for demonstrations in schools is presented. The use of x-ray generators in general schools is forbidden in Australia. (C H)

1525 CODE OF PRACTICE FOR THE CONTROL AND SAFE HANDLING OF SEALED RADIOACTIVE SOURCES USED IN INDUSTRIAL RADIOGRAPHY. AAEC A-6 1968. Canberra, Australia: National Health and Medical Research Council (1969). 28p. Available from National Health and Medical Research Council, Curtin, Australia.

A Code of Practice for the safe handling of sealed γ sources used in industrial radiography is presented. Design criteria for sources and holders are summarized. The requirements for transport and storage of sources to ensure the protection of personnel and the public are outlined, methods for radiation monitoring of the sources are described, and working rules and emergency procedures for personnel using the sources are included. (C H)

1526 CODE OF PRACTICE FOR THE CONTROL AND SAFE HANDLING OF SEALED RADIOACTIVE SOURCES USED IN RADIATION THERAPY (OTHER THAN TELETHERAPY). AAEC A-8 1962. Canberra, Australia: National Health and Medical Research Council (1962). 15p. Available from National Health and Medical Research Council, Curtin, Australia.

A Code of Practice for the safe handling of sealed radiation sources used for therapy is presented. Such sources may emit β or γ radiations singly or in combination to give a prescribed dose of radiation to tissues within a prescribed time. Procedures to ensure the radiation protection of the patient, medical personnel, and the public are included. (C H)

1527 NURSING STAFF EXPOSED TO IONISING RADIATIONS. AAEC A-9 1969. Canberra, Australia: National Health and Medical Research Council (1969). 13p. Available from National Health and Medical Research Council, Curtin, Australia.

A Code for the radiation protection of medical personnel during the insertion of sealed radiation sources in patients and during the subsequent care of the patients is presented. Such sources may emit β or γ radiations singly or in combination and may be used singly or in combination to give a prescribed dose of radiation to tissue in a prescribed time. (C H)

1528 CONDITIONS CONCERNING THE TRANSMISSION OF RADIOACTIVE MATERIAL BY POST Australia Postmaster-General's Department (1970) 15p Available from Atomic Energy Attache Australian Embassy Washington D C

Radiation protection standards for the shipment of radioisotopes by mail in Australia are presented Radioisotopes are classified into groups for transport purposes Requirements for packaging and labeling for each group are discussed (C H)

1529 REVISED RADIATION PROTECTION STANDARDS FOR INDIVIDUALS EXPOSED TO IONISING RADIATION A AFC 4-5 1967 Canberra Australia National Health and Medical Research Council (1967) 10p Available from National Health and Medical Research Council Curtin Australia

A Code of Practice for the radiation protection of personnel in Australia using radiation sources or radioactive substances is presented The Code is based on recommendations of the International Commission on Radiological Protection and was revised in 1967 to incorporate the most recent recommendations (C H)

1530 PACKAGING OF URANIUM HEXAFLUORIDE FOR TRANSPORT ANSI N14.1 1971 New York: American National Standards Institute (1971). 51p. Available from American National Standards Institute, New York.

This standard provides criteria for packaging of UF_6 for transport Specific information on design, fabrication, inspection, cleanliness, and in-service requirements for the UF_6 packaging is included Also included are cylinder loadings, shipping details, and requirements for valves and valve protectors (auth)

1531 REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS. Safety Series No. 6 1967. Vienna: International Atomic Energy Agency (1967) 117p. (STI/PUB-148) Available from UNIPUB, Inc., New York

An up-to-date edition of the IAEA regulations for the safe transport of radioactive materials by land, sea and air is presented In addition to the developments on packaging design and testing and on nuclear safety criteria published in the 1964 revised edition, it incorporates new detailed provisions for the transport of large radioactive sources A few other amendments have also been made The regulations also include limitation of external dose rate, general accident provisions, storage and carriage, labels and placards, tables give classification of radioisotopes, flux equivalents, safe distances and separations, maximum permissible contamination levels, etc The regulations were prepared with the aid of panels of experts and representatives of international organizations and should facilitate the acceptance of packages by the authorities concerned Further revision is not envisaged for a few years (auth)

1532 DATA. SECTION II WATER Radiol. Health Data Rep., 12: No. 4, 209-10 (Apr 1971).

Extensive water quality and analysis programs are being conducted for surface, ground, and treated water Most of these programs include determination of gross α and gross β radioactivity and specific radionuclides The Public Health Service drinking water standards set the limits for approval of a drinking water supply containing ^{226}Ra and ^{90}Sr at 3 pCi/l and 10 pCi/l, respectively In the absence of ^{90}Sr and α particle emitters, the gross β activity limit is 1000 pCi/l except when additional analysis indicates that concentrations of radionuclides are not likely to cause exposure greater than the limits indicated by the radiation protection guides Data are given on the ^{90}Sr concentrations in New York City tap water during 1955 through June 1970 (E. E. H)

1533 RADIOACTIVE CONTAMINATION OF SURFACE WATERS IN THE EUROPEAN COMMUNITY. Smets, J (EURATOM, Brussels). pp 49-62 of Water for Tomorrow Milan, Federazione delle Associazioni Scientifiche e Tecniche (1969).

From International conference on water for tomorrow, Milan, Italy (18 Apr 1968). See CONF-680475.

The rapid expansion in the use of nuclear energy, especially through the construction of nuclear power plants, poses an increasing problem of radioactive waste disposal In the interests of public-health protection the reckless contamination of the hydrosphere and particularly of the surface waters with radioactivity is at present kept to a minimum in the European Community by a number of legal and technical provisions The high population density in Western Europe, with the growing demand for fresh water on the one hand and the rapid development of nuclear energy on the other, calls for a special effort to find satisfactory solutions to the problems that arise, both in the economic field and from the public-health standpoint Euratom's activities in this sector underline the importance of international co-operation for this purpose, its activ-

ities during the past ten years have demonstrated this in every respect Legislation and standards relating to the protection of the public health in EURATOM countries against ionizing radiations are reviewed In general it can be said that the development of the health and safety side has at least kept pace, both technically and administratively, with the exceedingly rapid development of nuclear technology, so that it is possible to face the future with every confidence (auth)

1534 BASIC SAFETY STANDARDS FOR RADIATION PROTECTION Safety Series No 9 1967 Vienna International Atomic Energy Agency (1967) 79p (STI/PUB-147) Available from UNIPUB Inc New York

This first revision of the Basic Safety Standards was approved by the IAEA Board of Governors in September 1965 It was prepared with the assistance of a panel of experts representative of several international organizations It was recommended that the national regulations of Member States should conform as far as is practicable, to the revised Standards Topics discussed include definitions of terms used, limitations of doses for exposure from controllable sources, maximum permissible radiation doses and intakes of radioactive materials through external and internal exposure, fundamental operational principles and other data related to radiation protection (C H)

1535 RADIATION PROTECTION STANDARDS FOR RADIO-LUMINOUS TIMEPIECES Safety Series No 23 1967 Vienna International Atomic Energy Agency (1967) 37p (STI/PUB-167). Available from UNIPUB Inc New York

The recommendations of a joint group of experts set up by the IAEA and the European Nuclear Energy Agency of the Organization for Economic Co-operation and Development (OECD), approved in 1966, to provide adequate protection against the hazards of ionizing radiations for users of radioluminous timepieces are presented Included are an explanation of terms used, control procedures for radioluminous timepieces, the selection of radionuclides to be used in radioluminous timepieces, radiation protection considerations, and maximum permissible activities of radionuclides recommended for radioluminous timepieces (C H)

1536 (CONF-710801-Vol 1) pp 1-24) HOW ABNORMAL IS NORMAL. Sisler, James A (Department of Transportation, Washington, D. C.).

From third international symposium on packaging and transportation of radioactive materials, Richland, Wash (16 Aug 1971)

In Proceedings of the third international symposium on packaging and transportation of radioactive materials

National and international transport regulations specify numerous test conditions which packages of radioactive and other hazardous materials must be capable of withstanding The tests were developed by many groups usually to solve some specific problem This presentation raises several questions regarding how well the tests represent the transport environment and what should be done to improve our understanding of this environment in order that package tests may be improved A study for the Department of Transportation by General American Research Division (GARD) has just been completed—a survey of the testing methods and practices currently employed for evaluation of packages Results of this study are reviewed Other needed studies are identified (auth)

1537 DOUBTS ABOUT THE NOMINAL STANDARD DOSE. Probert, J. C. (Stanford Univ., Calif.). Brit. J. Radiol.; 44 No. 524, 648-9 (Aug 1971).

Doubts are expressed as to the general application of the nominal standard dose (NSD) concept Variations in results using $D = NSD \times N^{0.24} \times T^{0.11}$ could be due to the volume factor of the tumor and number of fractions It is pointed out that the NSD concept is based on early reactions, but the most important normal tissue reactions are usually late The equation is based almost entirely on the response of one sort of tissue (subcutaneous connective) Doubts are also expressed as to the equation $D = NSD \times N^{0.24}$ always being independent of time, regardless of how the doses are fractionated (UK)

1538 (UCRL-72848) SUGGESTED GUIDELINE FOR LOW-DOSE RADIATION EXPOSURE TO POPULATIONS BASED ON BENEFIT-RISK ANALYSIS. Cohen, Jerry J. (California Univ., Livermore, Lawrence Radiation Lab.). Jun 1971 21p. (CONF-710710-8). Dep. NTIS.

From sixteenth annual Health Physics Society meeting, New York, N Y (12 Jul 1971)

The basis for standards set by the International Commission on Radiological Protection (ICRP), the National Council on Radiation Protection (NCRP), and the Federal Radiation Council (FRC) for the maximum permissible radiation dose of the general human

population is critically reviewed. It is suggested that the recommendation of a maximum average radiation dose of 170 mrem/yr for human populations be abolished and replaced by the use of a new unit called the Mer. The Mer is defined as that amount of benefit required to justify an exposure to one rem. It is postulated that application of some form of benefit-risk analysis in deriving radiation guidelines would have the effect of placing low-dose exposure risks into commonly comprehensive perspective. (26 references) (C H)

1539 AMERICAN NATIONAL STANDARD DOSIMETRY FOR CRITICALITY ACCIDENTS. ANSI N13.3-1969. New York: American National Standards Institute, Inc. (1969). 16p. Available from American National Standards Institute, New York.

Presented are criteria applicable to operations with fissionable materials in which accidental criticality may occur and cause the exposure of personnel to acute, external, and penetrating radiation doses exceeding the maximum doses recommended for normal practice. The dosimetry systems covered by the standard are those capable of providing dose information down to about 10 rad. The standard provides criteria for a system capable of measuring the doses received by personnel involved in a criticality accident. Systems using physical detectors, biological samples, or combinations may conform to the standard. The dose information is intended to: (1) Assist the management of exposed individuals; (2) Provide a basis for correlating man's radiation dose to his biological response; (3) Contribute to the maintenance of integrated exposure records. The standard specifies dosimetric capability and performance in rads. The quality factor for the conversion of absorbed dose from neutrons (rad) to dose equivalent (rem) for criticality accident is assumed to be between one and two. (auth)

1540 (ICRU-18) SPECIFICATION OF HIGH ACTIVITY GAMMA-RAY SOURCES. (International Commission on Radiation Units and Measurements, Washington, D. C.) 15 Oct 1970. 33p. ICRU, Washington, D. C. \$2.50.

Specifications related to the quantity of radioactive material used and the radiation emitted are presented for sealed gamma sources. The sources are those primarily used in teletherapy and industrial radiography. Information is included on methods of specifying gamma sources: basis for source specification, teletherapy sources, and industrial radiation sources. (J R D)

1541 CRITERIA FOR THE ASSESSMENT OF LEAKTIGHTNESS AND SHIELDING PROPERTIES IN PACKAGING FOR THE TRANSPORT OF RADIOACTIVE MATERIALS. Lukishov, G. I., Shcheglov, K. V., Shcherbenok, G. V., Smirnova, N. V., Arbaeva, E. S. (State All-Union Research Inst., Moscow). pp 185-92 of Tests on Transport Packaging for Radioactive Materials. Vienna, International Atomic Energy Agency (1971). (In Russian).

From Tests on transport packaging for radioactive materials seminar, Vienna, Austria (8 Feb 1971). See STI/PUB 285, CONF-710210.

Since the Agency's "Regulations for the Safe Transport of Radioactive Materials" do not contain recommendations on criteria for assessing the leaktightness and shielding properties of packaging, methods of testing packages have been developed in the USSR on the basis of definite quantitative values for permissible leakage of radioactive materials, quality of shielding and durability of the properties of the packaging. The values adopted for these criteria need further refinement, however, and should be analyzed by all countries so that a common, unified set of recommendations on criteria for leaktightness and shielding properties of packaging can be worked out and applied on an international scale. (auth)

1542 TESTS FOR INTEGRITY OF CONTAINMENT AND SHIELDING AND CRITERIA FOR REJECTION OF PACKAGING. Neider, R. (Bundesanstalt fuer Materialpruefung, Berlin). pp 193-216 of Tests on Transport Packaging for Radioactive Materials. Vienna, International Atomic Energy Agency (1971).

From Tests on transport packaging for radioactive materials seminar, Vienna, Austria (8 Feb 1971). See STI/PUB-285, CONF-710210.

The tests prescribed in the IAEA Regulations make severe demands on the shielding and containment of the different types of packaging for radioactive materials. To ascertain that these requirements are met, "tests on tests" are necessary. These comprise the radiation leakage and contents leakage tests. A contents leakage test is not described in the Regulations and, hence, criteria for rejection of packaging because of bad containment are missing. The following tests are described: a contents and radiation leakage test proposed by ISO/TC 85/SC4, the bubble test, the pressure rise test, the leak tests, and the back pressurizing test. The applicability and sensitivity of these tests are compared, and different criteria for rejection are discussed. It is proposed that maximum

permissible leak rates be defined in quantities which are useful for engineering methods of leak testing and which correspond to the activity leak rates given in the Third Revised Draft of the IAEA Regulations. (auth)

1543 QUALITY CONTROL. IMPLEMENTATION OF SOME INSPECTION, TEST, AND CERTIFICATION REQUIREMENTS OF SECTIONS C-6 AND C-7 OF THE IAEA REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS. Messenger, W. De L. M. (United Kingdom Atomic Energy Authority, Risley, Eng.). pp 423-32 of Tests on Transport Packaging for Radioactive Materials. Vienna, International Atomic Energy Agency (1971).

From Tests on transport packaging for radioactive materials seminar, Vienna, Austria (8 Feb 1971). See STI/PUB-285, CONF-710210.

Quality control of actual packaging and packages (as opposed to testing designs and having them approved by competent authorities) is discussed. Six distinct requirements of the present regulations are examined and include: containment vessel material specifications and tests before manufacture; inspection of packaging by competent authorities during manufacture; submission of inspection certificates by consignors to competent authorities after manufacture; consignors' test of packaging before first use, covering containment, shielding, heat transfer and nuclear safety; submission of inspection certificates by consignors to competent authorities in support of large radioactive source shipment approval; and consignors' tests of large radioactive source packaging before each shipment. Maintenance in service (a projected requirement) is also discussed. Certain practical difficulties are brought to light and give rise to a number of questions, to some of which practical solutions are proposed. Others require further study. (auth)

1544 (A/CONF.49/P-429) BASIC RESULTS OF THE WORK ON DEVELOPMENT OF THE RADIATION SAFETY SYSTEM IN THE USSR. Burnazyan, A. I., Gorodinski, S. M., Il'in, L. A., Kozlov, V. M., (and others) (Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, [Moscow]). Jun 1971. 19p. (CONF-710901-355). Dep. NTIS (U. S. Sales Only).

Prepared for 4th international conference on the peaceful uses of atomic energy, Geneva, Switzerland (6 Sep 1971).

Radiation protection standards in the USSR are implemented by legislation. The basic concepts of the standards based on the recommendations of the ICRP for the protection of personnel in industry and research using radiations and the general population are reviewed. (C H)

1545 STANDARDS FOR PROTECTION AGAINST RADIATION. Taylor, Lauriston. pp IV 1-18 of Nuclear Power and the Environment. Madison, Wis., Univ. of Wisconsin (1970).

From Conference on nuclear power and the environment, Madison, Wis. (3 Apr 1970). See CONF-700415.

The development of early domestic and international radiation protection standards is discussed and the establishment of the ICRP, ICRU, and ICR is briefly described. The establishment of the JCAE and the NCRP is also discussed and their activities described. The need for further study of the relation between dose and effect especially in the low dose range is cited and a plea to refrain from panic reactions regarding radiation and the environment is made. (F R B)

1546 DERIVATION AND APPLICATION OF LIMITS AND REFERENCE LEVELS FOR ENVIRONMENTAL RADIOACTIVITY IN THE UNITED KINGDOM. Bryant, Pamela M. (United Kingdom Atomic Energy Authority, Harwell, Eng.). pp 634-43 of Health Physics Aspects of Nuclear Facility Siting. Vol. III. /Voilleque, Paul G. (comp.). Idaho Falls, Idaho; Burton R. Baldwin, Publications Chairman (1971).

From fifth annual midyear topical symposium on health physics aspects of nuclear facility siting, Idaho Falls, Idaho (3 Nov 1970).

The basic ICRP Dose Limits for members of the public can seldom be used directly when evaluating the significance of routine discharges of radioactivity into the environment. Secondary standards, expressed in terms of the rate of release of radionuclides or activity concentration in environmental materials, are now in general use in the United Kingdom. These standards are termed "Derived Working Limits (DWLs)", their calculation is described and examples are given to illustrate how their use facilitates the control of releases and the interpretation of environmental monitoring programs. When uncontrolled releases of radioactivity occur as a result of accidents the radiation exposure of members of the public can be regulated only by countermeasures. "Emergency Reference Levels (ERLs)" of dose and environmental radioactivity were adopted in the United Kingdom as guides to assist in both emergency preplanning and executive decisions on the practi-

cal implementation of countermeasures. Their status and applications are described and their derivation given with particular reference to the choice of standard values for dosimetric metabolic and agricultural parameters. (auth)

1547 CONDITIONS IN CONNECTION WITH THE POSSIBLE SION, ACQUISITION, AND DISPOSAL OF, USE AND (ONV) - ANCE OF RADIOACTIVE NUCLIDES. Regulation Gazette No. 1031 1968. Pretoria, Government Gazette (1968). 16p. (In English and Afrikaans). Available from Atomic Energy Board, Pretoria.

Radiation protection regulations of the Union of South Africa are presented. The regulations cover the acquisition, possession, uses, transportation and disposal of radioactive materials. (C H)

1548 RADIATION STANDARDS AND RADIOACTIVE WASTE. Soule, Harvey F. (Atomic Energy Commission, Washington, D C) pp 656-66 of Health Physics Aspects of Nuclear Facility Siting. Vol. III /Voilleque, Paul G. (comp.) Idaho Falls, Idaho, Burton R. Baldwin, Publications Chairman (1971).

From fifth annual midyear topical symposium on health physics aspects of nuclear facility siting, Idaho Falls, Idaho (3 Nov 1970).

National and international radiation standards are essentially performance codes (stating exposures that are not to be exceeded) rather than specification codes (stating how radiation work is to be accomplished). Rational planning thus requires analysis of the established standards against the work to be done. The standards relative to interim and long-term storage of radioactive wastes, particularly nuclear fuel reprocessing wastes and plutonium-contaminated solid wastes are considered. (auth)

1549 CRITICAL REVIEW OF THE ASSUMPTIONS INVOLVED IN ESTABLISHING THE MPD AND MPC'S IN AIR AND WATER. Miller, Carl R., Inclan-Suarez, Manuel. (Georgia Inst of Tech., Atlanta) pp 667-75 of Health Physics Aspects of Nuclear Facility Siting. Vol. III /Voilleque, Paul G. (comp.) Idaho Falls, Idaho, Burton R. Baldwin, Publications Chairman (1971).

From fifth annual midyear topical symposium on health physics aspects of nuclear facility siting, Idaho Falls, Idaho (3 Nov 1970).

A critical review is made of the assumptions and methods used by the International Commission on Radiological Protection, the National Council on Radiation Protection, the Federal Radiation Council, the Atomic Energy Commission, and the Public Health Service in establishing values of maximum permissible doses (MPD) due to ionizing radiation and maximum permissible concentrations (MPC) of radionuclides in air and water to which the human body can be exposed. Critiques of the MPD and MPC values are made in regard to the following: the term maximum safety factors included in the calculations, their past downward trend in magnitude, evidence regarding safeness of the values, the accuracy of the data used in their determination, the factor 1/30 versus 1/100, the different methods used in their determination, and the legal control on environmental limits. It is concluded that there is a high probability that in the future the present MPD and MPC levels will be found to be too high; these levels are not to be considered dumping limits, and if the actual dumping limits are allowed to approach those levels, a good understanding of the MPC limits and their methods of determination as well as extreme caution must be utilized. (auth)

1550 RADIOACTIVE-WASTE DISPOSAL INTO THE SEA. Safety Series No. 5 1961. Vienna: International Atomic Energy Agency (1961). 174p. (STI/PUB-14). Available from UNIPUB, Inc., New York.

The IAEA ad hoc panel on radioactive waste disposal into the sea made a preliminary study of the possible contamination effects of such waste disposal by considering the magnitude of radioactive waste problems, the nature of the marine environment, maximum permissible exposure to radiation from radioactive waste disposal into the marine environment, and control measures. Recommendations, based on these studies, are offered which could serve as a basis for international agreement to ensure that any disposal of radioactive waste into the sea involves no unacceptable degree of hazard to man. Nine appendixes of technical information related to sea-disposal of radioactive wastes are included. (L C L)

1551 HAZARDOUS MATERIALS REGULATIONS OF THE DEPARTMENT OF TRANSPORTATION INCLUDING SPECIFICATIONS FOR SHIPPING CONTAINERS. Tariff No. 23 1969. Washington, D C: Department of Transportation (1969). 394p. Available from R. M. Graziano, Agent, Washington, D C.

Regulations of the US Dept. of Transportation related to the shipping of hazardous materials by rail or highway are presented. Information is included on individual US carriers affected, rule-making procedures of the Hazardous Materials Regulations Board,

restrictions covering the acceptance and transportation of explosives and other dangerous articles, itemized list of hazardous materials and the labeling required for shipping of each, specific requirements for rail freight, rail express, and rail baggage service carriers and for motor vehicle transport within municipalities and on public highways, and specifications for shipping containers and tank cars. (L C L)

1552 CODE OF PRACTICE FOR CONVEYANCE THROUGH PORTS OF RADIOACTIVE MATERIALS. London: Ministry of Transport (1966). 25p. Available from British Information Service, New York.

A guide for the safe handling of all radioactive materials including fissile materials in ports, docks, and harbors in the United Kingdom is presented. (auth)

1553 AMERICAN NATIONAL STANDARD GUIDE TO SAMPLING AIRBORNE RADIOACTIVE MATERIALS IN NUCLEAR FACILITIES. ANSI N13.1 1969. New York: American National Standards Institute, Inc. (1969). 39p. Available from American National Standards Institute, New York.

A standard is presented which sets forth the principles that apply in obtaining valid samples of airborne radioactive materials, and prescribes acceptable methods and materials for gas and particle sampling. The scope of the standard is limited to the collection of samples and does not embrace the measurement of the radioactive materials collected. The scope is further limited to guides for sampling airborne radioactive materials in installations where work with radioactive materials is conducted, with the primary emphasis on the need to protect the radiation worker and includes sampling effluent gases prior to or at the point of release to the atmosphere from the installation. Although the scope thus excludes certain sampling techniques such as some of those used in environmental and free atmosphere sampling, the principles defined and most of the methods discussed are in most cases generally applicable. (auth)

1554 DANGEROUS GOODS BY FREIGHT TRAIN AND BY PASSENGER TRAIN OR SIMILAR SERVICE. LIST OF DANGEROUS GOODS AND CONDITIONS OF ACCEPTANCE. BR 22426 (Revised) 1966. London: British Railways Board (1966). 244p. Available from British Information Service, New York.

Regulations of the British Railways Board for marking, packing, aging, handling, and transporting dangerous goods carried on freight or passenger trains are presented. These goods are categorized as explosives, gases, inflammable liquids, inflammable solids, oxidizing substances, organic peroxides, toxic substances, infectious substances, radioactive materials, corrosives, and miscellaneous dangerous substances. (L C L)

1555 USA STANDARD GUIDE FOR ADMINISTRATIVE PRACTICES IN RADIATION MONITORING (A GUIDE FOR MANAGEMENT). USAS N13.2 1969. New York: United States of America Standards Institute (1969). 13p. Available from American National Standards Institute, New York.

This standard provides guidance for the administrative practices associated with the monitoring of ionizing radiation in and about installations where there is a potential for radiation exposure. It considers the management aspects of an effective radiation monitoring program. (auth)

1556 (CONF-711104-1) PROPER USE OF INFORMATION ON ORGAN AND BODY BURDENS OF RADIOACTIVE MATERIAL. Morgan, Karl Z. (Oak Ridge National Lab., Tenn.) (1970). 22p. (SM-150/50). Dep. NTIS.

From Symposium on the assessment of radioactive organ and body burdens, Stockholm, Sweden (22 Nov 1971).

Applications of data on the uptake and retention of various radioisotopes by human body organs and tissues in establishing maximum permissible values for internal radiation doses are discussed. Criteria used in the development of radiation protection standards by the International Commission on Radiological Protection (ICRP) since 1934 are reviewed. It is postulated that changes in values of maximum permissible concentrations of a number of radioisotopes will be incorporated in the 1973 edition of the ICRP Internal Dose Handbook on the basis of new uptake and retention data. (C H)

1557 (ORNL-TM-3544) OAK RIDGE NATIONAL LABORATORY RETURNABLE TYPE B GAS SHIPPING PACKAGE. Seagren, R. D. (Oak Ridge National Lab., Tenn.) Oct 1971. Contract W-7405-eng-26. 33p. Dep. NTIS.

An analytical evaluation of the ORNL Returnable Type B Gas Shipping Package was made to demonstrate its compliance with the regulations governing packages in which radioactive mate-

rial is shipped. Comparative data were used to demonstrate the structural integrity and thermal behavior of the packaging with respect to the general standards for packaging, structural standards, standards for normal conditions of transport, and the standards for the hypothetical accident conditions. The results of this evaluation show that the packaging complies with all applicable regulations. (auth)

1558 SPECIFICATION FOR SYMBOL FOR IONIZING RADIATION British Standard 3510 1968 London, British Standards Institution (1968). 6p. Available from American National Standards Institute, New York.

British standards for a basic symbol to denote the actual or potential presence of ionizing radiations are presented. For the purpose of this standard ionizing radiations include α and β particles, high-speed electrons, γ and x rays, protons, and other ionizing particles. (C H)

1559 METHODS FOR THE ASSESSMENT OF PACKAGING FOR THE TRANSPORT OF RADIOACTIVE MATERIALS. PART 1. MATERIALS OTHER THAN LARGE RADIOACTIVE SOURCES AND FISSILE MATERIALS. BS 3895 Pt. 1 1965 London, British Standards Institution (1965). 12p. Available from American National Standards Institute, New York.

A standard is described in which methods used to test the suitability of radioactive materials packaging for transport are specified. (J R D)

1560 METHODS FOR THE ASSESSMENT OF PACKAGING FOR THE TRANSPORT OF RADIOACTIVE MATERIALS. PART 2. FISSILE MATERIALS AND LARGE SOURCES. BS 3895 Pt. 2 1968 London; British Standards Institution (1968). 56p. Available from American National Standards Institute, New York.

Methods that may be used to test for vibration and pressure suitability of packaging for the transport of radioactive materials are specified. In particular, packaging used for large radioactive sources and for fissile materials complying with the criteria for Fissile Class I and Class II in the IAEA regulations is discussed. (P C H)

1561 FUNDAMENTAL PRINCIPLES FOR PROTECTION IN THE DESIGN AND CONSTRUCTION OF INSTALLATIONS FOR WORK ON UNSEALED RADIOACTIVE MATERIALS ISO R 1710 1970(E) International Organization for Standardization (1970). 10p. Available from American National Standards Institute, New York.

Recommendations are made for the safe design and construction of facilities for working on unsealed radioactive materials of high, medium, or low activity. Information is included on general radiation protection principles, arrangement of work areas, ventilation, handling of radioactive wastes, monitoring and health physics equipment and facilities, selection and use of materials, and general safety provisions. (L C L)

1562 CODE OF PRACTICE FOR THE PROTECTION OF PERSONS EXPOSED TO IONISING RADIATIONS IN RESEARCH AND TEACHING London; Her Majesty's Stationery Office (1968). 64p. Available from Pendragon House, Redwood City, Calif.

A code of Practice to assure the radiation protection of personnel of research establishments using ionizing radiations in Northern Ireland is presented. The Code is based on the standards of the International Commission on Radiological Protection and the Committee on Protection against Ionizing Radiations of the United Kingdom Medical Research Council. General principles of radiation protection are reviewed and guidance for protection when using x-ray equipment and particle accelerators, sealed radiation sources, and unsealed radioactive substances is presented in detail. Emergency procedures for use in case of accidents resulting in exposure of personnel or contamination of surfaces, instructions for the storage of sealed radiation sources and unsealed radioactive materials, and precautions to be taken during the transport of radioactive materials and in the disposal of radioactive waste are summarized. (C H)

1563 RECOMMENDATIONS FOR THE ASSESSMENT OF SURFACE MATERIALS FOR USE IN RADIOACTIVE AREAS. PART 1. METHOD OF TEST FOR EASE OF DECONTAMINATION. BS 4247 Pt. 1 1967 London; British Standards Institution (1967). 5p. Available from American National Standards Institute, New York.

A standard method is presented for testing surface materials to be used in radioactive areas for ease of decontamination. Information is provided on the test materials, preparation of test samples, contaminants, decontaminants, counting equipment, test procedures, and method for reporting results. (L C L)

1564 RECOMMENDATIONS FOR THE ASSESSMENT OF SURFACE MATERIALS FOR USE IN RADIOACTIVE AREAS. PART 2. GUIDE TO THE SELECTION OF MATERIALS. BS 4247 Pt. 2 1969 London, British Standards Institution (1969). 7p. Available from American National Standards Institute, New York.

Recommendations are presented which provide a guide to assist in the selection of surface materials for use in areas likely to be subjected to radioactive contamination. These recommendations apply to surface materials which may be accidentally or deliberately contaminated with radioactive substances and from which the contaminant is required to be removed or to have its concentration reduced to an acceptable level. The surfaces involved include the floors, walls, ceilings, and working surfaces of radioactive areas. (L C L)

1565 IONISING RADIATIONS. PRECAUTIONS FOR INDUSTRIAL USERS. New Series No. 13 1969 London, Her Majesty's Stationery Office (1969). 72p. Available from Pendragon House, Redwood City, Calif.

The risks associated with the precautions necessary in the industrial uses of x-ray machines and other apparatus which emit ionizing radiations and uses of sealed and unsealed radioactive substances are presented. The types of radiations concerned with are alpha particles, beta particles, gamma rays, x rays, bremsstrahlung, and neutrons. The most common industrial uses of ionizing radiations include gamma and x-ray radiography, x-ray fluoroscopy, static elimination, density level, and thickness gaging, package inspection, luminizing, and tracer work. Information is presented on principles of protection against external and internal radiation, international standards for radiation protection, safety requirements under the British Factories Act of 1961, and the equipment and methods for radiation protection associated with specific uses of radiation sources. (L C L)

1566 LABELLING AND MARKING OF PACKAGES AND CONTAINERS FOR THE TRANSPORT OF RADIOACTIVE MATERIALS. AECP 1030 Issue No. 2 1969 Risley, Eng., United Kingdom Atomic Energy Authority (1969). 29p.

A Code of Practice is presented which amplifies the provisions embodied in various regulations and codes for the safe transport of radioactive materials, relating to the labeling of packages of such materials, and to provide detailed instructions that will ensure fulfillment of the relevant requirements. It was assumed that those using the Code will be familiar with the international and national transport regulations, which are based on the IAEA Regulations and that these users will have experience with transport procedures. Information is included on regulations for the labeling of inland (UK) and overseas postal packages and of packages transported by train or aircraft. (L C L)

1567 PROVISION OF TRANSPORT PACKAGING FOR RADIOACTIVE MATERIALS. AFCEP 1042 Issue No. 1 1969 Risley, Eng., United Kingdom Atomic Energy Authority (1969). 23p.

The safe transport of radioactive materials is governed by various regulations which are based on the 'IAEA Regulations for the Safe Transport of Radioactive Materials, 1967 Edition'. A supplement to the regulations is presented for the purpose of advising designers of packaging on the technical features necessary to conform to the regulations and of outlining the procedure for obtaining approval of packaging designs from the competent authority. Standards for the design, construction, and certification of industrial, Type A, and Type B packaging used in the UK for transporting radioactive materials other than irradiated fuel elements are described. (L C L)

1568 LABELLING OF ROAD VEHICLES CARRYING RADIOACTIVE MATERIALS. AECP 1040 Issue No. 1 1968 Risley, Eng.; United Kingdom Atomic Energy Authority (1968). 5p.

A UKAEA Code is presented which gives guidance on the labeling requirements for vehicles carrying radioactive materials by road in Great Britain and on the continent of Europe. This code deals with exterior labeling of road vehicles in Great Britain and on the continent and the interior labeling of the vehicle cab. (L C L)

1569 FISSILE MATERIAL TRANSPORT PACKAGING. PART I. REQUIREMENTS FOR TIMBER AND CADMIUM USED IN WOOD/CADMIUM SHIELDING. AECP 1023 Part 1 Issue No. 1 1965. Risley, Eng.; United Kingdom Atomic Energy Authority (1965). 6p.

Standards for timber and cadmium used in wood/cadmium shielding for packaging fissionable material are presented in two sections. The first covers the quality, determination of density, method of construction, and inspection of timber used for shield-

ing in transport packaging for fissionable material. The second covers the purity and form of the metal, method of construction, corrosion prevention, and inspection for cadmium embodied as a neutron absorber in transport packaging for fissionable material (L C L)

1570 IONIZING-RADIATION STANDARDS FOR POPULATION EXPOSURE Lieberman, Joseph A. (Environmental Protection Agency, Winchester, Mass.) Phys. Today, 24 No. 11, 32-8 (Nov 1971).

The role of the Environmental Protection Agency in the development of radiation protection standards for population exposure is discussed. The impact of nuclear power generation anticipated by the year 2000 on the radiation dose to the population of the USA is estimated. Data are summarized on the radiation dose to the population from natural background, medical diagnostic exposure to x radiation, weapons test fallout, and nuclear power production during 1960 and 1970 and the dose from each source is estimated for the year 2000. Factors that must be considered in establishing environmental standards for radiation exposure of the population are considered (C H)

1571 PRINCIPLES OF CRITICALITY SAFETY IN HANDLING AND PROCESSING FISSILE MATERIALS ISO R 1709 1970(F) International Organization for Standardization (1970) 4p. Available from American National Standards Institute, New York.

These criticality safety principles apply to all operations with fissile materials outside the cores of nuclear reactors but within the boundaries of nuclear establishments. They are concerned with the limitations which must be imposed on processes and equipment because of the unique nuclear properties of these materials by which they can support nuclear chain reactions. These principles apply to quantities of fissile materials in which nuclear criticality can be established. This ISO Recommendation states the factors and technical criteria which form the basis on which the procedures relating to criticality safety should be established. It does not cover details of equipment design or of operational procedures, nor does it refer to the effects of radiation on man or materials or to sources of such radiation, either natural or the result of nuclear chain reactions. Transport of fissile materials outside the boundaries of nuclear establishments should be governed by appropriate national and international regulations (auth)

1572 GUIDE ON RADIATION SAFETY CONSIDERATIONS IN THE PREPARATION OF LICENSE APPLICATIONS AEC Licensing Guide 1970. Washington, D C, Atomic Energy Commission (1970) 34p. Available from Government Printing Office, Washington, D C.

Information is presented which is intended to provide general guidance to persons wishing to apply for an AEC license authorizing the use of sealed radioactive sources in industrial radiography. AEC regulations which apply to radiography and which should be used in conjunction with this guide are listed. Information is included on radiography personnel and required qualifications, training program, the limited radiography license, operating and emergency procedures, internal inspection system, organization of the radiography program, leak testing, and radiographic operations in Agreement States (L C L)

1573 FISSILE MATERIAL SYMBOL. ANSI N12.1 1971. New York, American National Standards Institute (1971). 4p.

A standard is presented which specifies the symbol to be used to signify the presence of fissile material. Since fissile material is radioactive, the symbol inherently signifies the presence of radioactive material. This symbol also signifies the presence of any associated radioactive material. It does not specify the quantity of fissile or associated radioactive material which require use of this symbol (auth)

1574 (BNL-16255) STANDARDS, STATISTICS AND STERN-GIASS' GUILT BY ASSOCIATION Hull, Andrew P. (Brookhaven National Lab, Upton, N. Y.) Shore, Ferdinand J. (Queens Coll, New York) [1971] 54p (CONF-711119-2) Dep. NTIS. From sixth annual topical symposium on radiation protection standards, Richland, Wash. (2 Nov 1971).

Existing radiation protection standards have been criticized on the grounds that radiation effects have been under-evaluated by the standards setting bodies. It has been postulated that the added risk at the presently permitted maximum exposure rate (500 mR/y) will lead to an additional 61,800 deaths per million children born, and that concurrent increases in effluent releases from several nuclear facilities and in infant mortality in adjacent counties and/or states (as compared with that for more distant ones) provides evidence that low-level radiation may have already

produced more serious effects than believed possible when radiation standards were formulated. It is concluded that the above argument uses an extreme interpretation of data from studies by Stewart and Kneale and ignores data from other contrary studies. The effluent release and infant mortality data appear to be selected to the exclusion of other data leading to opposite conclusions. Such effluent produced doses as have been considered have been misrepresented. When examined in the context of the actual or calculated average effluent doses to the populations at risk and of other sources of exposure, the claimed effects cannot reasonably be related to effluent releases. Most appear to be insignificant statistical variations about long term trends. Other more plausible causes for infant mortality can be adduced (auth)

1575 (I A DC-12746) HUMAN VALUES IN STANDARD SETTING. Otway, Harry J. (Los Alamos Scientific Lab., N. Mex.), [1971]. Contract W-7405-eng-36. 24p. (CONF-711119-3). Dep. NTIS.

From sixth annual topical symposium on radiation protection standards, Richland, Wash. (2 Nov 1971).

1576 DERIVED WORKING LIMITS FOR β/γ SURFACE CONTAMINATION INCLUDING LOW ENERGY β EMITTERS Wasson, M. M. (Central Electricity Generating Board, Essex, Eng.) pp 248-255 of Protection Against Low Energy or Short Range Radiations and the Biological Effects of Radiation. Le Vesinet, France. Service Central de Protection Contre les Rayonnements Ionisants (1971).

From first European congress on radiation protection and exhibition on equipment using low energy and short range radiation dosimetry, Menton, France (9 Oct 1968). See CONF-681013.

The derived working limits (DWL) for β/γ surface contamination at present in use in relation to the actual hazard represented by various contaminants at these levels are considered. They prevent the basic dose limits of ICRP from being exceeded. It is concluded that particularly for low energy β emitters the levels are unrealistically high and a system of derived working limits which takes into account the energy of the contaminant is proposed. Possible dangers present in some methods of monitoring for β/γ surface contamination based on the assumptions used to calculate DWLs in the past are also considered and a method which overcomes these dangers is described (France).

1577 DEVELOPMENT OF CURRENT RADIATION PROTECTION PRACTICES IN DIAGNOSTIC RADIOLOGY Boshong, Stewart C. (Baylor Coll., Houston, Tex.) CRC Crit. Rev. Radiol. Sci., 2 No. 3, 337-425 (Sep 1971).

The development of radiation protection standards and radiation control practices in diagnostic radiology is reviewed from the time of Roentgen's discovery to the present. The development has spanned several eras of experience which are distinct, yet difficult to identify chronologically. The first era covers the time of the pioneers through approximately 1915. During this time, x rays were a novelty in the hands of physicists and physicians. Many radiation injuries, including deaths, were reported and untold numbers of injuries were unreported. For the most part, the injuries were acute and easily observed, and included most frequently skin erythema, desquamation and epilation. The most severe injuries were malignant changes that often led to disfiguring surgical operations and death. During this time, only low kVp and low mA equipment was available which resulted in excessive exposure times and excessive differential patient dose relative to film exposure. The second era covers the time period from approximately 1915 to the 1940's. It was during this time that radiation protection standards were first developed in an official manner and that radiation control practices were established at the local level. These standards and practices were instituted initially because of the early radiation injuries and the martyrdom that befell so many early roentgen pioneers. With the institution of high capacity x-ray machines, reports of more subtle x-ray injuries appeared in the literature. These reports were primarily associated with the hematologic system and ranged from transient leukopenia to leukemia. The radiation standards and practices of this second era were established on the assumption of a threshold-type dose-response relationship. It was generally accepted that if one worked within the recommended levels of exposure, no deleterious effects would ensue to either the patient or the operator. The emphasis of radiation control procedures was still focused on maintaining acceptable exposures to the individuals involved in each examination and at each facility. Radiation research directed to genetic damage resulted in linear nonthreshold type dose-response relationships. These findings produced suspicion that other effects were also nonthreshold which led to a reevaluation of the theoretical basis for radiation protection. Many radiation scientists became convinced that the basis for radiation control at that time was false.

If, in fact, long-term latent effects followed a linear nonthreshold type relationship, then radiation exposures should be maintained at an even lower level than was at that time acceptable. The non-threshold hypothesis gained acceptance and continues to the present time. The final era of time covered by this review extends from the 1940's to the present day. During this time, acceptable radiation exposure levels have been reduced still further. The concern for radiation injury is no longer primarily directed to identifiable individuals, but rather to society at large, or at least population groups within society. Scientific reports relating identifiable human radiation injuries to diagnostic roentgenological activities have been virtually absent for 20 years. They have been replaced, however, by large-scale epidemiological investigations that have attempted to show effects at the population level following diagnostic levels of radiation. The current radiation protection standards and radiation control practices are based on consideration of not only the earlier human injuries but also the current epidemiological evidence. (C.H.)

1578 DIAGNOSTIC RADIATION AND THE PROTECTION OF THE PATIENT. Weeks, J. L. (Whiteshell Nuclear Research Establishment, Pinawa, Manitoba). *Ind. Med.*, 40 No. 5, 24-8 (Aug 1971).

The reasons for current views on radiological protection are discussed in relation to medical practice. The need for careful evaluation of diagnostic procedures involving the use of ionizing radiation is emphasized, together with the need for achieving and maintaining high standards of radiological techniques. (auth)

1579 (NP-19171) CODE OF GOOD MANUFACTURING PRACTICE FOR THERAPEUTIC GOODS. (National Biological Standards Lab., Canberra (Australia)). Aug 1971. 19p. Dep. NTIS (U.S. Sales Only).

Special provisions concerning the technical and administrative procedures to be applied in radiation sterilization of medical supplies and pharmaceuticals are detailed under the headings: sterilizing dose, validation and microbiological control of manufacturing and sterilizing process, radiation facilities, requirements for radiation safety, irradiation process control, irradiation dosimetry and irradiation records. (Australia)

1580 (BNWL-SA-3906, pp 108-29) AEC ACCIDENT RECORD AND RECENT CHANGES IN AEC MANUAL CHAPTER 0529. McCluggage, W. C. (Division of Operational Safety (AEC), Washington, D. C.). 1971.

From third international symposium on packaging and transportation of radioactive materials; Richland, Wash. (16 Aug 1971).

Tabulated data are presented on AEC experience for the period from 1949 to 1971 with transportation accidents involving radioactive materials, including those that are fissionable. Recent changes in the AEC Manual 0529, "Safety Standards for the Packaging and Radioactive and Fissile Materials", are reviewed. The most significant of these changes is the inclusion of approval requirements and procedures for Type B packaging. (L.C.L.)

1581 RADIATION SAFETY STANDARDS FOR APPROVAL OF RELEASE OF RADIOACTIVE MATERIALS. PART II. APPROVAL PROCEDURE FOR EFFLUENT WATER AND AIR. Schwibach, J. *Atomwirt., Atomtech.*; 17 No. 4, 196-8 (Apr 1972). (In German).

Release of radioactive material from nuclear installations is approved by agencies only under the condition that specified maximal limits will not be exceeded. In addition to these maximal limits that were specified in regulations resulting mostly from ICRP recommendations, the BRD uses in approval procedures other standards which restrict emissions as far as possible and which are lower than the ICRP recommendations. Those restrictions create an additional safety factor for the radiation burden to the population. Radiation safety recommendations and regulations are discussed, and approval procedures are described. (tr-auth)

1582 MAXIMUM PERMISSIBLE LEVELS OF EXPOSURE TO IONIZING RADIATION. Morgan, Karl Z. (Oak Ridge National Lab., Tenn.). pp 7-68 of *Radiation Dosimetry*. Vol. 1. /Miric, I (ed.). Belgrade, Boris Kidric Inst. of Nuclear Sciences (1971).

From International summer school on radiation protection, Cavtat, Yugoslavia (21 Sep 1970).

Criteria used for establishing standards for maximum permissible radiation exposure for the general human population and for occupational exposure of personnel are discussed. Changes in maximum permissible values for occupational exposure from 1925 to 1970 are reviewed and data used as the basis for present maximum permissible exposure values are summarized. It is

pointed out that the principal source of radiation exposure of the general population in developed countries is diagnostic medical procedures. Problems in establishing standards for the radiation exposure of the general population resulting from the release of radioisotopes to the environment are discussed. It is suggested that the most realistic approach to the development of standards would be based on the determination of critical radioisotopes, critical population groups, and critical environmental factors that influence the radiation dose and dose rate, rather than standards based on maximum permissible concentrations of radioisotopes in the atmosphere. (C.H.)

1583 RECOMMENDATION FOR DATA ON SHIELDING FROM IONIZING RADIATION. PART 1. SHIELDING FROM GAMMA RADIATION. METRIC UNITS. BS 4094, Part 1-1966. London, British Standards Institution (1966). 61p.

The main purpose of this recommendation is to provide data adequate for the calculation of shielding barriers against gamma radiation. Section One deals with the calculation of barriers against primary gamma radiation, and Section Two provides the data that permit the calculation to be carried out. Appendix A gives methods and data for the calculation of primary barriers in cases where insufficient data are given in Section Two. Appendix B is concerned with the calculation of the secondary barriers that are required against leakage and scattered radiation. (W.D.M.)

1584 WOMEN'S PROFESSIONAL EXPOSURE TO IONIZING RADIATION AND PARTICULAR PROBLEMS OF RADIOPROTECTION. Ghislandi, E., Bazzano, E. (CISE, Milan). *Med. Nucl. - Radiobiol. Lett., Suppl.*, No. 3, 510-18 (1968). (In Italian).

From ninth national conference of the Italian Association of medical radiobiology. Varese, Italy (20 Sep 1968).

The problem of the exposure of working women to ionizing radiations is considered within the framework of Italian laws and taking into account the recommendations of ICRP adopted in September 1965. A short review of regulations protecting working women in general in Italy is given and the contributions of industrial medicine to the study of physiopathology of working women is mentioned. An approximate numerical evaluation is given of the female nuclear labor force in industry, scientific research and medicine in Italy. Considering in detail regulations and recommendations of radioprotection proposed in national and international field for women, the importance is emphasized of adopting the maximum permissible doses suggested by ICRP corresponding to 1-3 rems over a period of 13 weeks at the abdomen for the professional exposure of females during the whole reproductive age. In this way protection is assured for the embryo when pregnancy is still unknown to the mother herself and thus avoiding a drastic and anachronistic exclusion of women from work with radiations during the reproductive age. (auth)

1585 CLASSIFICATION OF UNIRRADIATED PLUTONIUM SCRAP. ANSI N15.10-1972. New York, American National Standards Institute, Inc. (1972). 25p.

A standard is presented for classifying scrap material containing the element Pu. This standard provides a classification system with inherent flexibility which will provide a means for facilitating activities in the nuclear industry relevant to the classifications. The classification codes are defined, and the coded classifications are given for Pu-containing materials in the following categories: unalloyed metals, alloyed metals, compounds, combustibles, noncombustibles, solutions, and process residues. (L.C.L.)

1586 RADIATION PROTECTION STANDARDS FOR THE LICENSING OF RELEASE OF RADIOACTIVE MATERIAL. III. Schwibach, J. *Atomwirt., Atomtech.*; 17: No. 5, 280-2 (May 1972). (In German).

The release of radioactive material from nuclear installations will be licensed by agencies only when certain maximal limits are not exceeded. In addition to established limits, which mostly follow ICRP recommendations, the German Federal Republic uses standards in its licensing practice which are significantly lower. These standards, representing an additional safety factor for the population, are described in detail. (tr-auth)

1587 WALLS SHIELDING AGAINST IONIZING RADIATION: LEAD BRICKS. DIN 25 407-1971. Berlin; Fachnormenausschuss Kerntechnik (1971). 6p. (In German).

Standards are given for lead bricks used in wall shielding against ionizing radiation. Specified are basic forms, measurements, types, and terminology. Also specified are required

properties, raw material, and surface coating. The standards represent pre-norms which can be used but may require later adjustments. Significant parts correspond to EURATOM specifications. In 10 months, the pre-norms will be compared with practical experience and, if justified, will be converted into normal standards (H.B.G.)

1588 (NLCO-1089) STEEL BANDED WOODEN SHIPPING CONTAINERS FOR SLIGHTLY ENRICHED URANIUM BILLETS, INGOTS, AND FUEL CORES. Dunaway, D. L. (National Lead Co. of Ohio, Cincinnati). 17 Apr 1972. Contract AT(30-1)-1156, 18p. Dep. NTIS.

The design and design standards for two general types of steel-banded wooden containers for shipping slightly enriched (up to 2.1% ^{235}U) uranium are described. One type includes boxes with lids for shipping fuel cores. The other type includes pallets with covers for shipping uranium metal billets and ingots (L.C.L.)

1589 EXPOSURE STANDARD IN THE ENERGY RANGE 0.3 TO 3.0 MeV. Rao, P. S., Gupta, U. C., Govindarajan, K. N. (Bhabha Atomic Research Centre, Trombay, India). pp 229-35 of Proceedings of the National Symposium on Radiation Physics Bombay, Bhabha Atomic Research Centre (1971).

From National symposium on radiation physics, Bombay, India (24 Nov 1970). See CONF-701138.

The Exposure Standard that has been established in the energy range 0.3 to 3.0 MeV using a graphite cavity ionization chamber and the Townsend balance system for the charge measurement with a vibrating-reed electrometer as the null indicator is described. The accuracy of the standard is estimated to be $\pm 2\%$ and the relevant correction factors viz. the correction for wall attenuation, scattering from surroundings and supports etc., are also discussed (auth).

1590 SPECIAL STATE STANDARD FOR THE UNIT OF RADIONUCLIDE ACTIVITY IN GASES. Isaev, B. M.; Bregadze, Yu. I.; Zhdanova, N. F.; (and others) Meas. Tech. (USSR) (Engl. Transl.); 14 No. 11, 1629-32 (Nov 1971).

Translated from Izmer. Tekh.; 14 No. 11, 8-10 (Nov 1971).

Investigations of the standard of the unit of radionuclide activity in gases show that the standard ensures the reproduction of the activity unit with an error of 1 to 2% in the activity range 10 to 20×10^4 dps/m³. With the help of working standards using gaseous radioactive sources, the transfer of the activity unit to test measuring instruments is ensured, from these to working measuring instruments through a planned verification scheme follows (auth).

1591 PRIMARY STANDARDS LABORATORY FOR THE METROLOGY OF IONIZING RADIATIONS. Le Gall, Y. (CEN de Saclay, Gif-sur-Yvette, France) Bull. Inform. Sci. Tech. (Paris); No. 163, 11-18 (Oct 1971). (In French).

The objectives of the primary standards laboratory are to manufacture and store primary standards, to produce secondary standards, to improve measurement methods, and to determine fundamental constants (decay schemes, half-lives, etc.). Consideration is given to all these aspects, the problem of coordination on the national scale being given particular attention (France).

1592 COMPLIANCE WITH FEDERAL ENVIRONMENTAL ACTS. Steinfeld, Jesse L. (Public Health Service, Washington, D.C.) Trans. Amer. Nucl. Soc.; 15: No. 1, 72 (Jun 1972).

From eighteenth annual American Nuclear Society conference, Las Vegas, Nev. (18 Jun 1972). See CONF-720607.

1593 NATIONAL STANDARDS FOR PHOTON DOSIMETRY. Guiso, J. P. (CEN de Saclay, Gif-sur-Yvette, France). Radio-protection; 7: No. 1, 3-12 (1972). (In French).

A coherent photon dosimetry system of national references was established. Gamma sources (^{137}Cs and ^{60}Co) were used to produce reference photon beams. Their decay/time characteristics being determined. The dimensions of the radiation source, the characteristics of the collimator, and the environment were studied. In particular the effect of the various geometric parameters of the collimator on the spectral distribution of the incident photons was investigated. The exposure due to the photon beams was determined, their energy fluence is currently being investigated. The references for the absorbed dose rates will be defined (France).

1594 STANDARD BLACK BODY AT 10 000°K (HIGH PRESSURE PLASMA ARC). Peyturaux, R.; Goldbach, C.; Nollez, G. (CNRS, Paris). pp 65-75 of Proceedings of the Meeting on Metrology. Paris: Bureau National de la Metrologie (1971). (In French). (CONF-701151-1).

From Meeting on metrology, Paris, France (17 Nov 1970).

Research was conducted to produce a radiation standard corresponding to temperatures in excess of 5000°K. Theoretical studies postulate that a 10-cm argon plasma subjected to a pressure of 100 bars and brought to a temperature of 10,000°K would radiate as a black body. In order to achieve such conditions, a stabilized arc was developed involving a 5-cm-long plasma operating under a pressure of 50 atm. At atmospheric pressure, the electronic temperature is 1600°K (for dissipated 16 kW). Although the determination of the electron temperature poses problems at high pressures (reabsorption of radiation), it appears that the electron temperature decreases with pressure (for constant dissipated power) while the brightness temperature increases and tends to remain constant over a large spectral range (France).

1595 ADEQUACY OF PRESENT STANDARDS OF RADIATION EXPOSURE. Morgan, Karl Z. (Oak Ridge National Lab. Tenn.) Environ. Aff. 1: No. 1, 91-139 (Apr 1971).

The standards for maximum permissible radiation exposure levels for man set by national and international organizations are reviewed. It is pointed out that these levels assume a linear relationship between dose and effect, or that radiation injury is proportional to the accumulated dose and that there is no dose or dose rate so low that the radiation damage is zero. Since natural background radiation is a component of man's environment he has been subjected to radiation damage throughout his existence and any additions to this background radiation level merely increase the probability that man will suffer radiation damage during his lifetime or pass on genetic damage to future generations. General exposures of the human population from man-made sources of ionizing radiation have been very small, with medical diagnostic radiography contributing the greatest exposure. It is pointed out that AEC operations and other nuclear energy facilities are among the safest of all modern industries and the radiation risks to personnel and to the general population are very small. It is concluded that the present radiation protection standards are adequate, but should be kept under constant surveillance by the ICRP, NCRP, and other responsible agencies and all available data on the effects of ionizing radiation should be examined periodically and permissible exposure levels should be adjusted whenever warranted. In evaluating the radiation risks associated with nuclear power production it is pointed out that the risks from the release of sulfur oxides, nitrogen oxides, and hydrocarbons to the environment, should fossil fuel plants be built in lieu of presently planned nuclear power facilities, might be greater than those from ionizing radiation and that the public will gain by eliminating both as environmental pollutants insofar as is practicable (C.H.).

1596 SAFETY STANDARDS: PRINCIPLES AND PRACTICE. Dunster, H. J. (National Radiological Protection Board, Harwell, Eng.); Preston, A. Int. At. Energy Agency Bull., 14 No. 2, 19-25 (1972).

A summary of methods used in the UK to control releases of radioactive materials is presented. Information is included on dose limits, waste management, and principal fission product wastes (J.R.D.).

1597 (TID-25857, pp 92-103) PUBLIC AND RADIATION FROM NUCLEAR POWER PLANTS. Bond, Victor P. (Brookhaven National Lab., Upton, N.Y.). 1972.

In Environmental and ecological forum, 1970-1971.

The development of radiation protection standards in the USA is reviewed. It is pointed out that in the mid fifties the National Academy of Sciences established a series of committees to investigate the biological effects of ionizing radiations and in 1956 the committee on genetic effects issued its report that included the recommendation that on the basis of potential genetic effects, the total human population should receive no more than 10 rem over a 30-yr period which was taken as the mean reproductive age of human beings. The value of 10 rem was intended to cover exposure from all man-made radiation sources including medical uses of radiations. Half of this value, or 5 rem over a 30-yr period, was later allocated to all sources of radiation other than medical. This value of 5 rem during a 30-yr period yields a value of 0.17 rem/yr recommended as the average maximum exposure dose for man. This value is approximately equal to the amount of natural background radiation to which human beings are exposed in the USA. It is pointed out that the amount of natural background radiation varies considerably over the face of the earth and very large human populations have existed from earliest known times in the presence of levels of background radiation 10, 20, or more times that experienced in the USA and that no detrimental effects have been observed. Recommendations of the Federal Radiation Council (FRC) (1960) set an upper radiation dose limit of 0.5 rem per year for exposure to the individual which is more restrictive than the 0.17 rem average dose per year. A principal AEC guide

for radiation exposure from nuclear power reactors is based on the FRC (now incorporated into the Environmental Protection Agency) value of 0.5 rem per year exposure to an individual at the boundary of a reactor site. Because of the rapid dispersion of material coming from the reactor stack and because of the decay of radioisotopes present in the effluent this dose decreases rapidly with distance from the reactor site so the individual 50 miles from the reactor site would receive a dose of about 0.0005 rem per year, and the average dose to the entire U.S. population would be far below this figure. Data on the estimated average radiation exposure of the U.S. population during 1970 show that the principal source of exposure came from diagnostic medical x-rays (50 to 150 millirem per year) and exposure from all other sources (including fallout from nuclear weapons testing, color TV sets, jet travel, and radioactive luminous paints) was very low, with the operation of 15 nuclear power plants contributing approximately 0.001 millirem (or 0.00001 rem) per year (C.H.).

1598 (TID-25857, pp 104-30) ADEQUACY OF PRESENT RADIATION STANDARDS. Morgan, Karl Z. (Oak Ridge National Lab., Tenn.) 1972

In Environmental and ecological forum, 1970-1971

The development of radiation protection standards in the USA is reviewed and the adequacy of present standards is evaluated. Data available on the biological effects on man following whole-body exposure to various doses and dose rates of γ and x radiation and of chronic internal irradiation following the uptake of radioisotopes are summarized. Extrapolated data indicate that the dose from natural background radiation may reduce the average life span of man by about 10 days. Data on the present average radiation dose per year to man from man-made sources of radiation are compared with values established for the maximum permissible radiation dose for the whole-body and various organs of man. The pathological consequences of diagnostic x-ray exposure presently received by the US population are compared with the consequences of a hypothetical exposure of 0.85 mrem/yr from all nuclear industries. The consequences of an extremely rare hypothetical accident involving a nuclear power reactor for the human population are postulated (C.H.).

1599 (TID-25857, pp 168-86) WHAT WE DO KNOW ABOUT LOW-LEVEL RADIATION. Taylor, Lauriston S. (National Council on Radiation Protection and Measurements, Washington, D.C.) 1972

In Environmental and ecological forum, 1970-1971.

The criteria of the National Council on Radiation Protection and Measurements (NCRP) used for setting radiation protection standards in the USA are reviewed. It is pointed out that dose-effect relationships for man in the dose range of 100 rems upward delivered at high dose rates can be regarded as well established on the basis of clinical and experimental data. However, while a tremendous effort has been made to discover significant deleterious effects of very low dose level and dose rate radiation on man, all results have been convincingly negative. The range considered covers an acute exposure to 1 or 2, or even a few more, rads received all at once and not frequently repeated, larger doses of 10 to 20 rads received all at once and rarely repeated, and chronic exposure to levels of millirads or less per day over long periods of time and totaling some 5 or 10 rads distributed over a lifetime. In spite of the lack of observable effects from low-level radiation doses, the NCRP has maintained the basic philosophy that there could be deleterious effects in the low dose range proportional to those observed at vastly higher doses. The upper limit of 170 mrem/yr average recommended for the human population for exposure from all man-made radiations, other than medical applications, is some hundred times lower than the lowest dose that has been shown to cause a statistically significant pathological change in man. This population dose limit is at least some hundred times higher than the average dose to the population estimated for the operation of all the nuclear power plants expected to be built up to the year 2000, assuming no improvements in production technology. It is emphasized that ionizing radiation, including its effects on man and the environment, is probably the most widely studied, best understood, and most widely used agent found essential to human health and well being. While it is true that radiation cannot be felt, seen, or tasted it can be detected and measured instantly at levels well below those levels of natural background radiation to which mankind has been exposed throughout his existence (C.H.).

1600 ADEQUACY OF PRESENT STANDARDS OF RADIATION EXPOSURE. Morgan, Karl Z. (Oak Ridge National Lab., Tenn.). Environ. Aff., 1 No. 1, 91-139 (Apr 1971).

Energy is discussed as a source of pollution and more specifically the effects of ionizing radiation as a pollutant and the adequacy of present standards of radiation exposure are considered

The following topics are covered: the basic assumptions of the International Commission on Radiological Protection (ICRP) in setting radiation protection standards, recommended dose limits radiation exposure experience, comparison of radiation risks with other risks, and the possible consequences of present radiation exposure limits (M.H.R.).

1601 BACKGROUND INFORMATION FOR THE DEVELOPMENT OF A RADIATION STANDARD FOR TRITIUM IN NUCLEAR-STIMULATED NATURAL GAS. Moghissi, A. A., Patzer, R. G., McNelis, D. N., Carter, M. W. (Western Environmental Research, Lab., Las Vegas, Nev.). pp 228-35 of Radiation Protection Standards Quo Vadis. Vol. I. Howell, Wallace P. (ed.). Richland, Wash., Health Physics Society (1972).

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971).

The development of a radiation standard for tritium in natural gas requires the knowledge of the relationship between the tritium concentration in the gas and the annual dose received by the people resulting from the usage of the gas. Although this relationship can be calculated, the uncertainties associated with the input parameters are so large that the results could have a range of 10^3 or higher. Consequently, laboratory experiments were carried out to better estimate this ratio. In the first set of experiments, the transfer of tritium from natural gas into food cooked under realistic conditions was determined. In a second set of experiments, the contribution of heating with tritiated gas in an area with limited ventilation, to the tritium body burden was experimentally determined. Under the selected experimental condition it was found that a natural gas concentration of 1 nCi/l (STP) would result in tritium concentration in body water of 14 nCi/l (auth).

1602 RADIATION PROTECTION STANDARDS QUO VADIS. VOLUME I. Proceedings of the Sixth Annual Health Physics Society Topical Symposium, Richland, Washington, November 2-5, 1971. Howell, Wallace P., Corley, John P. (comps.). Richland, Wash., Health Physics Society (1972). 263p (CONF-711119-(Vol.1)).

1603 ROLE OF THE NCRP IN THE DEVELOPMENT OF RADIATION PROTECTION STANDARDS. Taylor, Lauriston S. (National Council on Radiation Protection and Measurements, Washington, D.C.). pp 16-32 of Radiation Protection Standards Quo Vadis Vol. I. Howell, Wallace P. (ed.). Richland, Wash., Health Physics Society (1972).

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971)

The National Council on Radiation Protection and Measurements has, for over 40 years, played a key role in the development of radiation protection standards in the U.S. and, in fact, internationally. It dedicated itself to the safer use of radiation for many years before the subject became a popular and political problem. At the same time it feels that proper and productive uses of radiation must not be needlessly curtailed even if some slight risk is involved—virtually nothing is without some element of risk. The NCRP does not regard itself as a "standards setting" body in the strict sense, it develops "recommendations" on protection standards and practices, expecting these to be utilized or modified to meet special needs. Input to its recommendations are primarily scientific or technical, but other considerations enter as needed. Council membership and operating procedures are designed to maximize the diversity of knowledge and organizational affiliations and minimize the possibility of any group, small or large, dominating its policies and recommendations. Council recommendations represent its best judgment based on information up to the sign-off date of a report, it does not necessarily wait for that new data that is just around the corner. It does not attempt to fully document its statements nor does it present its reports as treatises. Its recommendations are those of the Council members, to every one of whom every report is submitted for approval before release. It is anticipated that the NCRP will broaden its radiation protection activities during the foreseeable future. (auth)

1604 AMERICAN NATIONAL STANDARDS INSTITUTE AND NUCLEAR STANDARDS. Fleckenstein, D. C. (General Electric Co., Schenectady, N.Y.). pp 33-49 of Radiation Protection Standards Quo Vadis. Vol. I. Howell, Wallace P. (ed.). Richland, Wash., Health Physics Society (1972).

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971).

The history and organization of the American National Standards Institute (ANSI) is summarized. Procedures for the development

of American National Standards are described. Nuclear standards activities in general, and radiation protection standards programs in particular, are used as examples of ANSI operations and will provide the current status of these efforts. ANSI affiliation with the International Organization for Standardization (ISO) is reported. ISO technical committees of interest are described. Some ANSI future plans and programs in the nuclear standards area are given. (auth)

1605 DESCRIPTION OF THE AMERICAN NUCLEAR SOCIETY'S INFORMATION CENTER ON NUCLEAR STANDARDS (ICONS) RADIATION PROTECTION STANDARDS. QUO VADIS. Voigt, Keith L.; DuTemple, Octave J.; Brown, Roberta S. (American Nuclear Society, Hinsdale, Ill.). pp 50-9 of Radiation Protection Standards. Quo Vadis. Vol. I. Howell, Wallace P. (ed.). Richland, Wash.; Health Physics Society (1972).

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971).

The American Nuclear Society recently organized an Information Center on Nuclear Standards (ICON). The reasons for its establishment, its purpose, goals and services are described in detail. Considerable background information concerning the concept of Information Analysis Centers (IAC), their organization and usefulness is discussed. A step-by-step description of the mechanics for setting up an IAC is given. Sources of data, input, storage, retrieval, analysis of data and output of ICONS' information are identified. The purpose and role of the Technical Advisor is explained along with the relationship of ICONS to other standards writing organizations. A new IAC dimension was added with the establishment of ICONS. In addition to providing the traditional services of an IAC, ICONS will periodically take on assignments of a special nature. For example, a thorough examination of the possibility of organizing a nuclear industry-sponsored standards and codes enforcing agency similar to the air- and marine-industry will be made. ICONS, through its Technical Advisors, will take on the task of evaluating, analyzing, and describing why a nuclear industry-sponsored standards and codes enforcing agency is needed, if indeed it is needed, suggest how such an organization could be organized and supported, who could direct this agency, what its purpose and functions should be, and, other considerations important to the development of a preliminary working model. A discussion of the marketing plan for ICONS is included. (auth)

1606 ROLE OF THE HEALTH PHYSICS SOCIETY IN THE DEVELOPMENT OF RADIATION PROTECTION STANDARDS. Vallario, E. J. (Health Physics Society Standards Committee, Washington, D. C.). pp 60-9 of Radiation Protection Standards Quo Vadis. Vol. I. Howell, Wallace P. (ed.). Richland, Wash.; Health Physics Society (1972).

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971).

The Health Physics Society Standards Committee (HPSSC) is a permanent committee of nine Society members assigned to represent the Society to the Board of Directors on matters concerned with standardization of practices in radiation protection. Its multi-phased role is to advise the officers and members of the Society on new developments in the field of standardization, examine the need for new standards, establish expert working groups under the HPSSC to develop priority standards and maintain liaison with other standard making organizations to accomplish these objectives effectively. An ancillary function is to provide the Board of Directors technical assistance to establish a Society position on major issues involving new radiation protection standards. (auth)

1607 RECENT ACTIVITIES IN THE DEVELOPMENT OF SURFACE CONTAMINATION STANDARDS. Gallagher III, F. E., Evraets, J. C., Tschaeché, A. N., Willis, C. A. (Health Physics Society, Richland, Wash.). pp 206-15 of Radiation Protection Standards Quo Vadis. Vol. I. Howell, Wallace P. (ed.). Richland, Wash.; Health Physics Society (1972).

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971).

The Standards Committee of the Southern California Chapter, Health Physics Society, has prepared a "Position Paper on Surface Contamination Standards for Radioactive Materials." It was written to discuss the need for these standards and to establish the basic criteria for their development, because of the widespread disagreement among health physicists concerning many of the important details. The paper was reviewed by the Health Physics Society Standards Committee in November, 1970, and a revised version, dated January 15, 1971, has been accepted. As a result of this activity, the Health Physics Society Standards Committee has recently established a subcommittee to write surface contamination standards, using the position paper's criteria as background material. A summary of the paper's final version is presented here. (auth)

1608 RADIATION PROTECTION STANDARDS. QUO VADIS. VOLUME II. Proceedings of the Sixth Annual Health Physics Society Topical Symposium, Richland, Washington, November 2-5, 1971. Howell, Wallace P., Corley, John P. (comps.). Richland, Wash.; Health Physics Society (1972). 244p. (CONF-711119-(Vol.2))

1609 APPLICATION OF RADIATION EXPOSURE STANDARDS IN THE AEC CONTRACTOR PROGRAM. Ross, Donald M. (Atomic Energy Commission, Washington, D. C.). pp 309-15 of Radiation Protection Standards Quo Vadis. Vol. II. Howell, Wallace P. (ed.). Richland, Wash.; Health Physics Society (1972).

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971).

The AEC radiation protection guides applicable to contractor operations are embodied in AEC Manual Chapter 0524. The basic guides have been derived from the recommendations of the Federal Radiation Council (FRC) whose functional responsibilities have recently been incorporated into those of the newly established Environmental Protection Agency (EPA). In those areas that remained uncovered by the FRC, the AEC follows the recommendations of the National Council on Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP). (auth)

1610 AEC REGULATORY PROGRAM. Gamertsfelder, Carl C. (Atomic Energy Commission, Washington, D. C.). pp 316-21 of Radiation Protection Standards Quo Vadis. Vol. II. Howell, Wallace P. (ed.). Richland, Wash.; Health Physics Society (1972).

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971).

The Commission's regulation entitled "Standards for Protection Against Radiation," (10 CFR Part 20) establishes standards for external radiation exposure and permissible concentrations in air and water which are based on the recommendations of the NCRP, ICRP, and the FRC. There are also implementing provisions and procedures to assure that every reasonable effort is made to maintain radiation exposures as far below the specified limits as practicable. Other parts of the regulations provide the framework for dealing with byproduct, source and special nuclear materials, and certain nuclear facilities. In these parts, the basic standards are applied in more detail through the requirement for specific licenses which are issued after thorough review of the facilities and the procedures to be used. Control over other activities, of a more routine nature or of more limited scope, are provided by general licenses. In some certain cases, usually related to a specific product or class of products, for which it can be shown that individuals are not likely to be exposed to more than a few percent of the dose limits, the use of the products may be exempted from regulatory control. The Commission recently revised its regulations for the licensing of nuclear power reactors to include requirements for keeping radioactive effluents as low as practicable and is in the process of defining numerical guidance on what can be considered to be as low as practicable. (auth)

1611 APPLICATIONS OF RADIATION PROTECTION RECOMMENDATIONS IN THE DEVELOPMENT OF FEDERAL RADIATION STANDARDS FOR ELECTRONIC PRODUCTS. Snow, Donald L.; Little, Marshall S.; Snavely, David R. (Bureau of Radiological Health, Rockville, Md.). pp 322-43 of Radiation Protection Standards Quo Vadis. Vol. II. Howell, Wallace P. (ed.). Richland, Wash.; Health Physics Society (1972).

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971).

Experiences are reviewed in applying radiation protection recommendations of voluntary standards-setting organizations in the development of regulations to control radiation emissions from electronic products. The impact of voluntary standards on regulatory standards is discussed from such standpoints as (1) enforceability aspects of standards, (2) needs for documenting the development of the regulatory standards, and (3) conversion of radiation exposure criteria to radiation emission criteria for specific electronic products. The responsibility of a regulatory agency to establish safety factors for emission criteria, based on reasonableness and technical feasibility considerations, is discussed. Also considered are those difficulties which develop when (1) no prior consideration has been given by voluntary standards groups to a problem area, or (2) there is no available information on the technical or scientific bases for recommendations from national or international groups. Factors which may cause a regulatory agency to deviate in whole or part from an accepted national or international recommendation are reviewed to develop further understanding as to where improvements may be possible at every level of the standards development process. (auth)

1612 EPA ROLE IN RADIATION PROTECTION. Palmiter, C. C. (Environmental Protection Agency, Rockville, Md.). pp 352-6 of Radiation Protection Standards Quo Vadis Vol. II. Howell, Wallace P. (ed.). Richland, Wash.; Health Physics Society (1972).

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971).

The President's Reorganization Plan No. 3 transferred to the Environmental Protection Agency, all the functions of the former Federal Radiation Council to provide Guidance to Federal agencies and from the Atomic Energy Commission the responsibility for setting generally applicable environmental standards. As a result of this transfer, the EPA is now responsible for completing the general review of the guidance issued by the FRC in 1960. It recently issued guidance which limits the exposure of underground uranium miners to the short-lived progeny of radon-222 to 4 WLM per year. It also solicited comments from other Federal agencies regarding the adoption by the Federal Government of all or part of the new recommendations made in NCRP Report No. 39. (auth)

1613 STANDARDS AND STATE REGULATORY CONTROL PROGRAMS. Moen, Arnold J (Washington State Div. of Health, Olympia). pp 357-61 of Radiation Protection Standards Quo Vadis. Vol. II. Howell, Wallace P. (ed.). Richland, Wash., Health Physics Society (1972)

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971).

The evolution of regulatory control programs from standards through custom, tradition, and fear is discussed. Problems of establishing regulations to meet the standards and to control major sources of exposure not covered by standards are explored. Establishment of uniformity among states' regulations to avoid unnecessary limitation of interstate activities complicate regulations. These complications make regulations difficult to understand or interpret when locally applied. Enforcement of state regulations is hampered by lack of inherent pressures of custom or tradition. Familiarity through use of radiation, development of bad habits, and lack of knowledge or concern are discussed as deterrents to compliance. Practical problems of establishing motivation to comply through enforcement of regulations are discussed. Lack of involvement of users and states in the standard setting procedures creates problems in establishing regulations and in enforcement of compliance. (auth)

1614 USE AND ABUSE OF STANDARDS Tschaech, A. N (General Electric Co., San Jose, Calif.) pp 48-64 of Radiation Protection Standards Quo Vadis Vol. II. Howell, Wallace P. (ed.). Richland, Wash., Health Physics Society (1972)

From 6th annual topical symposium on radiation protection standards quo vadis, Richland, Wash. (2 Nov 1971).

The growing need for formulating standards is discussed with respect to freeing the plant and laboratory health physicist for more creative and productive work on unique problems. Various types of documents e.g., material specifications, testing methods, standard terminology, and safety rules are used to illustrate the important differences between standards as rules and standards as guides or models. The abuse of standards, e.g., improper application and blind incorporation in regulations, is illustrated. A method of applying standards to the solution of particular radiation measurement and protection problems is proposed toward stimulating the production of effective standards. (auth)

1615 (CONF-720627-- pp 8.1-35) RADIOACTIVE WASTES IN THE URANIUM MINING INDUSTRY. Melouney, H. F. (Mary Kathleen Uranium Ltd., Melbourne).

From Symposium on the role of nuclear energy in Australia's development; Canberra, Australia (1 Jun 1972).

Radioactive and chemical waste handling in the uranium mining and milling industry is discussed with particular reference to health hazards, standards, and the Australian experience at Rum Jungle, Radium Hill, and Mary Kathleen as well as experience in Canada and the U.S.A. An outline is given of environmental impact regulations and their development in the U.S.A. and these are related to the Australian situation. (Australia)

1616 STATE PRIMARY STANDARD FOR THE UNIT OF EXPOSED DOSE OF X-RAY AND GAMMA RADIATION. Yudin, M. F.; Ostromukhova, G. P.; Kononova, R. F.; Kochina, M. P. Meas. Tech. (USSR) (Engl. Transl.); 15: No. 2, 185-90 (Feb 1972). Translated from Izmer. Tekh.; 15: No. 2, 4-7 (Feb 1972).

Comparisons were made of measurements of the unit of exposed dose of x and γ radiation for member countries of the Council for Mutual Economic Aid. Results showed that the deviation of the measurements did not exceed 1.5 to 2%. Information is included on composition of the standard and procedure for reproduction of the unit of exposed dose. (J.R.D.)

1617 STERILIZATION OF PACKAGED GOODS. AS 1079 1971. North Sydney, Australia; Standards Association of Australia (1971). 9p. (NP-19409).

Parameters are given for the sterilization of packaged goods using dry heat, moist heat, ethylene oxide, or ionizing radiation. Data on the radiation stability of rubbers, thermoplastics, thermosets, textiles, adhesives, oils, and greases as published by the UKAEA are included. (Australia)

1618 (NP-19420) SAFETY AND ENVIRONMENTAL ASPECTS OF NUCLEAR POWER. Crancher, D. W. (Australian Atomic Energy Commission). Jun 1972. 32p. Dep. NTIS (U. S. Sales Only).

The nuclear industry has been carefully regulated to comply with strict health standards. All radioactive wastes are carefully controlled and audited and their discharges into the environment are permitted at levels which comply with national and international health standards. These are considered with respect to radioactivity and health, permissible levels of exposure, sources and control of radioactive waste, measures taken to protect against accidents, environmental aspects of discharge, and air pollution from alternative energy sources. (Australia)

1619 COMMITTEE ON THE MEASUREMENT REFERENCE STANDARDS FOR IONIZING RADIATIONS. SECTION 2. RADIO-NUCLIDE MEASUREMENTS. Paris; Bureau International des Poids et Mesures (1972). 20p. (In French). Offilib, Paris.

The new committee structure is presented. The program proposed for Section II is given. The special problems to be studied are described: absolute (or exact) measurements, nuclear parameters, international comparisons, and miscellaneous problems. The organization of different research groups studying special problems is discussed, the plans adopted by these groups being represented. (France)

1620 SUBSTANTIATION OF THE PERMISSIBLE STANDARD VALUES OF SOLUBLE COMPOUNDS OF ^{232}Th , NATURAL THORIUM, ^{226}Ra , AND ^{228}Th IN THE AIR OF INDUSTRIAL PREMISES. Lyarskii, P. P.; Pavlovskaya, N. A.; Kapitanov, Yu. T. (Inst. of Hygiene and Occupational Disease, Moscow). Gig. Sanit.; No. 8, 53-7 (Aug 1972). (In Russian).

Substantiation and verification of a number of parameters are discussed, such as the efficient energy, the efficient periods of half-removal, and the parts of radionuclides passing into the critical organs. The values received served for the calculation of the standard levels of ^{232}Th , ^{226}Th , ^{226}Ra and natural thorium in the air of industrial premises in case of work dealing with soluble noncomplex compounds of thorium. The data received prove the standard values to depend on the dispersion of aerosols and, for a mass median diameter equalling 1 μm , for ^{232}Th they may be taken 6-7 times as high. The standards for the soluble ^{226}Ra compounds should be decreased 40 times. (auth)

1621 (UCRL-51282) COST-BENEFIT RELATIONS IN AIR QUALITY STANDARDS. BIOMEDICAL RESEARCH FOR ASSESSING THE HEALTH COSTS OF AIR POLLUTION. Watson, Donald E. (California Univ., Livermore. Lawrence Livermore Lab.). 27 Sep 1972. Contract W-7405-Eng-48. 15p. Dep. NTIS.

MISCELLANEOUS

1622 (KAPL-M-FW-4) THE DETERMINATION OF HAFNIUM IN ZE-4 AND ZE-6 ZIRCONIUM METAL STANDARDS BY THE STABLE ISOTOPE DILUTION AND NEUTRON ACTIVATION METHODS F W Walker (Knolls Atomic Power Lab, Schenectady, N Y) Dec 21, 1961 Contract W-31-109-Eng-52 26p

Two methods are described for the determination of hafnium in zirconium metal standards, namely stable isotope dilution analysis and neutron activation analysis. Hafnium values obtained for ZE-4 and ZE-6 standards are 77.4 ± 3.9 (tentative value) and 166 ± 17 ppm, respectively, by the stable isotope dilution technique, and 77.5 ± 8 and 155 ± 16 ppm, respectively, by the neutron activation technique (auth)

1623 (DEG-Report-248) THE PREPARATION OF URANIUM-235 ISOTOPIC STANDARDS BY BLENDING A N Hamer and B R Grundy (United Kingdom Atomic Energy Authority Development and Engineering Group, Capenhurst, Ches., England) Oct 1, 1962 44p

Recommended procedures are described in detail, which enable uranium isotopic standards to be prepared with precisions approaching 1 part in 10^4 . The stoichiometry of uranium oxide (U_3O_8) and the weighing process are discussed. Factors affecting the accuracy of weighing solid uranium oxide are discussed, and suitable methods for handling small quantities of material by solution methods are described, together with experimental verification of their reliability. Numerical examples are given of the method of calculating the sensitivity of the balance, the weighing of an object, and the calibration of a set of weights. Sources of error are summarized and the preparation of blends used to calibrate a uranium standard in this laboratory is described (auth)

1624 THE PREPARATION OF STANDARD SAMPLES FOR THE SPECTRAL ANALYTICAL DETERMINATION OF SMALL BORON CONCENTRATIONS IN REACTOR GRAPHITE E Golling (Siemens Schuckertwerke A G Erlangen, Ger.) Nukleonik 3 233-6 (Nov 1961) (In German)

The ashing of reactor graphite in the presence of a trace carrier and the chemical composition of the residue are reported. A method for the preparation of suitable standard samples is given. It is shown that in the standard sample the basic material and the boron admixture must be the same compounds as in the ash (the other ash fractions can be ignored). If these conditions are not fulfilled, a systematic error occurs which can show boron concentrations higher by a factor of 2 to 3 (tr-auth)

1625 PRIMARY STANDARD OF LENGTH K M Baird and D S Smith (National Research Council Ottawa) J Opt Soc Am 52 507-14 (May 1962)

The primary standard of length is defined in terms of the unperturbed $2p_{10}-5d_5$ radiation of Kr^{86} . New measurements of the perturbations due to the conditions of excitation necessary for its practical realization are reported.

Results confirm that the recommendation of the International Committee of Weights and Measures yields the defined standard to an accuracy of better than $1 \cdot 10^{-8}$. An improvement by about an order of magnitude may be realized by more exact specification (auth)

1626 NEW SCALE OF NUCLIDIC MASSES AND ATOMIC WEIGHTS Edward Wichers (National Bureau of Standards Washington D C) Nature 194 621-4 (May 19 1962)

A discussion is presented of the situation which led to the existence of the chemical scale (atomic weight of element O = 16) and the physical scale (atomic weight of principal O isotope = 16) and of the considerations that led to their replacement by a new scale. In 1959, the International Commission of Atomic Weights recommended the adoption of C^{12} as the reference species with assigned relative mass of 12 since this isotope was acceptable to both chemists and physicists. The International Union of Pure and Applied Physics and the International Union of Pure and Applied Chemistry adopted this recommended scale. A table of atomic weights developed from a complete review of experimental data on the basis of the new scale is presented together with a separate table for radioactive elements (D L C)

1627 THE CARBON-12 SCALE OF ATOMIC MASSES Abbas Labbauf (Texas Agricultural and Mechanical Coll., College Station) J Chem Educ 39 282-6 (June 1962)

The adoption of a unified atomic weight scale based on the use of C^{12} as the reference mass scale is discussed. Topics covered include the concept of atomic weight, the rise and coexistence of two scales, proposals for unification of the two scales, and adoption and use of C^{12} unified scale. A comparison is presented of the atomic and molecular weights of some nuclides and substances in terms of the chemical, physical, and C^{12} scales in order to show what changes in molecular properties can be expected (M C G)

1628 VALUES FOR TRACE ELEMENTS IN G-1 AND W-1 WITH NEUTRON ACTIVATION ANALYSIS. II Mo Sn, Ta, W. Hiroshi Hamaguchi, Rokuro Kuroda, Tsuneo Shimizu, Iwao Tsukahara, and Ryuichi Yamamoto (Tokyo Univ. of Education), Geochim. et Cosmochim. Acta, 26 503-5 (Apr. 1962) (In English)

Neutron activation analyses were made of Mo, Sn, Ta, and W in standard rocks G-1 and W-1. The amounts of the elements were estimated by comparing Mo^{99} (67 hr), Sn^{121} (27.5 hr), Ta^{182} (111 d), and W^{187} (23.9 hr) β activities isolated from the sample with those from the monitor. A correction for the contribution of Mo^{99} from uranium fission was made for the estimation of Mo. The results are tabulated (P. C H)

1629 THE CONTENTS OF SEVERAL TRACE ELEMENTS IN THE STANDARD ROCKS G-1 AND W-1 Maria C Clark and D. J. Swaine (Commonwealth Scientific

and Industrial Research Organization Chatswood, New South Wales, Australia) *Geochim et Cosmochim Acta*, 26 511 14(Apr 1962) (In English)

The contents of approximately 20 trace elements in the standard rocks G-1 and W-1 are given. These were determined by a spectrographic method, using the powdered sample and anode excitation in a d-c arc (auth)

1630 (EANDC(E)-36L) THE ISOTOPIC COMPOSITION OF SAMPLES ORIGINATING FROM DIFFERENT STOCKS OF BORON STANDARD USED IN LABORATORIES OF THE EANDC AREA AS BASES FOR NEUTRON MEASUREMENTS G H Debus (European Atomic Energy Community) Aug 1962 4p

Results of comparative studies on the isotopic composition of natural B samples used by various research groups as standards are presented. The samples were obtained from Argonne Fontenay and the Euratom Central Bureau for Nuclear Measurements (J R D)

1631 PLUTONIUM SULFATE TETRAHYDRATE A PROPOSED PRIMARY ANALYTICAL STANDARD FOR PLUTONIUM Charles E Pietri (U S Atomic Energy Commission New Brunswick N J) *Anal Chem* 34 1604 6(Nov 1962)

Stoichiometric plutonium sulfate tetrahydrate has been prepared by controlled crystallization from sulfuric acid solution. The formula of the tetrahydrate was found by chemical and thermogravimetric analysis to be $\text{Pu}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$. The compound is stable showing no significant change in plutonium content or weight for at least 28 months. Changes in relative humidity below 75% had little effect on the material. The plutonium sulfate tetrahydrate prepared meets many of the requirements for a primary standard (auth)

1632 (CERN 63-3(p 81 93)) BEAMS OF PARTICLES OF FINITE LIFETIME E Malamud (European Organization for Nuclear Research Geneva)

A theoretical limitation is added to complete a discussion of beam transport. Beams of particles of finite lifetime are considered. The previously developed theory is applied to a beam of mesons (K^-) with mean life $\tau = 1.2 \times 10^{-8}$ sec. A table of miscellaneous facts concerning magnets and figures on the standard CERN magnets is included (C E S)

1633 SUMMARY OF SULFUR ISOTOPIC STANDARDS Wayne U Ault (Hawaiian Volcano Observatory Hawaii National Park) and M L Jensen p 16-29 of "Biogeochemistry of Sulfur Isotopes" New Haven, Yale University 1962

A review is presented of the primary standards which have been used for sulfur isotopic analyses. Tables are presented of the primary standards and of the $\text{S}^{32}/\text{S}^{34}$ ratios for seawater sulfate. The conclusions of a committee from the symposium are outlined. It was agreed to adopt Canon Diablo troilite sulfur as the basic primary standard with an arbitrary $\text{S}^{32}/\text{S}^{34}$ ratio of 22.220 for which $\delta\text{S}^{34} = 0$ (D L C)

1634 SULFUR ISOTOPE METEORITE STANDARDS RESULTS AND RECOMMENDATIONS M L Jensen and N Nakai (Yale Univ New Haven) p 30-5 of "Biogeochemistry of Sulfur Isotopes" New Haven Yale University 1962

Several meteorites from the Yale collection were analyzed for their $\text{S}^{32}/\text{S}^{34}$ ratio by three different chemical techniques. The results show a remarkable similarity of the δS^{34} composition of sulfide sulfur in meteorites. Possible errors in the chemical techniques are discussed. The quality and choice of standards are discussed (D L C)

1635 NEW ZEALAND SULFUR STANDARDS IN RELATION TO METEORITIC SULFUR J R Hulston (McMaster Univ Hamilton Ont) p 36-41 of "Biogeochemistry of Sulfur Isotopes" New Haven Yale University, 1962

The discrepancies between the New Zealand sulfur isotopic standards and these used elsewhere are discussed. The standards were recalibrated on the basis of the Canon Diablo troilite and they agree better with these of the Laumont and Yale groups. The conversion of δS^{34} values for sea water and Merck working standards to δS^{34} values for Canon Diablo meteoritic standard is discussed (D L C)

1636 SULPHUR ISOTOPIC VARIATIONS IN NATURE PART 1 A RECOMPARISON OF THE NEW ZEALAND SULPHUR STANDARD WITH THE METEORITIC SULPHUR STANDARD J R Hulston and Jeanette Beauchamp (Nuclear Sciences Inst Lower Hutt N Z) *New Zealand J Sci* 6 157 62(Mar 1963)

A comparison was made of the New Zealand $\text{S}^{32}/\text{S}^{34}$ working standard and Troilite from the Canyon Diablo meteorite. Conversion formulas for previous New Zealand results are given and the cause of discrepancies in previous measurements is discussed (C H)

1637 THE 1958 He^4 TEMPERATURE SCALE J R Clement (Naval Research Lab Washington D C) *Temp Meas Control Sci Ind* 3 Pt 1 67 74(1962)

The establishment of a temperature scale based on He^4 for use between 1 and 5°K is described (T F H)

1638 DICESIUM PLUTONIUM HEXACHLORIDE, A PROPOSED PRIMARY STANDARD FOR PLUTONIUM F J Miner R P DeGrazio and J T Byrne (Dow Chemical Co Golden Colo) *Anal Chem* 35 1218 23(Aug 1963)

The salt Cs_2PuCl_6 is suggested as a primary standard for Pu. It can be easily prepared in a pure state and with a constant composition. It is stable, has a high equivalent weight, and is readily soluble in dilute acids (P C H)

1639 (EANDC-28(L)) TECHNICAL MINUTES OF THE FIFTH MEETING OF THE COMMITTEE FEBRUARY 4-8, 1963, A E C L CHALK RIVER, CANADA R Batchelor comp (United Kingdom Atomic Energy Authority Weapons Group Atomic Weapons Research Establishment Aldermaston Berks England and European-American Nuclear Data Committee) July 1963 47p

Minutes are presented for the fifth meeting of the European American Nuclear Data Committee. The following items are discussed: program and facility status reports, research activities, discrepancies in neutron cross sections, measurements on fissile and other nuclei, target and foil preparation, and standards. Lists are given of documents which were submitted at the meeting and several letters are reprinted (D L C)

1640 (AD 59031) ATOMIC MAGNETIC TAPE RECORDING STANDARDS PROJECT VELA UNIFORM Ben S Melton (Air Force Technical Applications Center Washington D C) Oct 25 1962 11p

Magnetic tape is to be used as a primary recording system for seismic data in VELA UNIFORM projects. Standards including basic requirements and time code standards, are given for use in such magnetic tape recording (D L C)

1641 (NBL-204(p 47 57)) MULTIGRAM PREPARATION OF $\text{Pu}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ AND $\text{Pu}(\text{SO}_4)_2$ FOR EVALUATION AS ANALYTICAL STANDARDS C E Pietri and A W Wenzel (New Brunswick Lab AEC N J)

Homogeneous lots of approximately 400 grams each of plutonium sulfate tetrahydrate and anhydrous plutonium sulfate were prepared as candidate materials for the evaluation of primary analytical standards for plutonium. The plutonium assay of the compounds indicated that these materials were stoichiometric in composition within experimental limits. The impurity assay revealed that both compounds were of relatively high purity although prepared from plutonium metal of about 99.8% purity. An overall yield of 99.8% for the tetrahydrate and 99% for the anhydrous salt was obtained. The processing of multigram

amounts of material and some of the problems encountered in the preparation are described (auth)

1642 (KY 456) ISOTOPIC EVALUATION OF SECONDARY GENERATIVE URANIUM STANDARDS R F Smith, R F Fby, and C W Turok (Paducah Gaseous Diffusion Plant Ky) Mar 20 1964 Contract W 7405 eng 26 29p

Two uranium isotopic standards designated as Secondary Generative Materials by the National Bureau of Standards were evaluated. A value of 0.01750 ± 0.00003 wt % ^{235}U was obtained for the Depleted Secondary Generative Standard by averaging the results from three independent analytical methods. The assay obtained for one batch of the Enriched Secondary Generative Standard was 94.532 ± 0.007 wt % ^{235}U ; however, a value of 94.536 was adopted because of minor assay differences between available batches (auth)

1643 DETERMINATION OF SCANDIUM, YTTRIUM, SAMARIUM AND LANTHANUM IN STANDARD SILICATE ROCKS G-1 AND W-1 BY NEUTRON ACTIVATION ANALYSIS H B Desai, R Krishnamoorthy Iyer, and M Sanku Das (Atomic Energy Establishment Trombay India) Talanta 11 1249-55 (Aug 1964)

Neutron activation analysis results for four rare earth elements in standard silicate rocks G-1 and W-1 are reported. An ion exchange method for the separation of scandium, yttrium, samarium, and lanthanum in good radiochemical purity was developed. The method is based on the chromatographic elution of these elements from a Dowex 1 x 8 (nitrate form) resin column using methanol nitric acid mixtures. The results obtained by this method were compared with values already available (auth)

1644 (DP 904(p 29 33)) INTERSITE EXCHANGE OF TUNGSTEN STANDARD SAMPLES R S Wood, Jr (Du Pont de Nemours & Co Savannah River Plant Aiken, S C)

Tungsten diffraction standards were prepared by J P LeGeros of the Savannah River Plant for x-ray diffraction and were presented to members of the Preferred Orientation Committee at the December 1961 meeting. Each member was asked to diffract six planes and calculate a standardized value for each plane. There were wide and statistically significant differences between data from the various sites. Data were tested by the t test, however, and the hypothesis that the data came from the same population is at least 85% correct. More work in intersite standardization of methods is needed if meaningful intersite exchange of data is to be accomplished (auth)

1645 (LA DC 6723) STATUS OF THE U S PROGRAM TO ESTABLISH A PRIMARY STANDARD FOR PLUTONIUM Glenn R Waterbury and Charles F Metz (Los Alamos Scientific Lab N Mex) [1963] Contract [W 7405 eng 36] 21p (CONF 805 1) Dep (mn) \$1 00 (cv) 1(mn) OTS

For presentation at European American Nuclear Data Committee Meeting Brussels Jan 1965

The present status of the U S program to establish a primary standard for plutonium is reviewed. Of the many plutonium containing materials considered three salts are undergoing testing. These salts are anhydrous plutonium sulfate, plutonium sulfate tetrahydrate, and dicesium plutonium hexachloride. Preliminary results indicate that these materials may not prove to be entirely satisfactory as plutonium standards. Plutonium metal packaged in an inert atmosphere is serving satisfactorily as the plutonium primary standard at this time (auth)

1646 (MLM 1212) POTASSIUM PLUTONIUM SULFATE D R Rogers and W B Brown (Mound Lab Miamisburg Ohio) July 31 1964 Contract AT(33 1) Gen 53 13p Dep , \$1 00(cy) 1(mn) OTS

Potassium plutonium-238 sulfate ($\text{K}_4\text{Pu}(\text{SO}_4)_4 \cdot 2\text{H}_2\text{O}$) is prepared by reacting plutonium-238 sulfate in $2\text{M H}_2\text{SO}_4$ with a saturated solution of K_2SO_4 . The solution is heated to boiling and allowed to stand for 12 hours. The resulting green crystals are filtered off, washed with 50% ethanol and air dried for 24 hours. This double sulfate compound is being investigated for use as a primary standard for

plutonium 238. A solubility study was performed to establish the optimum conditions for preparation. The solubility product constant was determined to be 10^{-18} . The compound was stable for at least three months when stored in a tightly capped stainless steel bottle which served as a heat sink. Potassium plutonium sulfate which dissolves easily in 2M HNO_3 has been used to prepare radioactive standards for 2π , 4π and low geometry counting techniques (auth)

1647 NEUTRON ACTIVATION DETERMINATIONS OF BROMINE IN SOME GEOCHEMICAL STANDARDS R H Filby (Univ of Oslo) Geochim Cosmochim Acta 29 49-51 (Jun 1965)

A neutron activation method was developed for accurate determination of bromine in rocks with a sensitivity of 4×10^{-10} g bromine. Some bromine determinations in international geochemical standards are described (M C G)

1648 (KY 481) PURITY DETERMINATION OF A URANIUM METAL STANDARD B H Whiteaker, J C Gillespie, and P E Dill (Paducah Gaseous Diffusion Plant Ky) Mar 1 1965 Contract W 7405 eng 26 29p Dep \$2 00(cy) 1(mn) CFSTI

High purity uranium metal is evaluated for use as a standard sample. Samples in the form of 5 gram metal cubes obtained from a regular high purity production run prepared by the magnesium bomb reduction method were submitted by the Paducah Gaseous Diffusion Plant to the laboratories of the Oak Ridge and Portsmouth Gaseous Diffusion Plants and the Y 12 Plant at Oak Ridge. The purity of the metal was established by analyzing for the impurities and subtracting them from 100. A compilation of the data received resulted in a tentative purity value of $99.9865\% \pm 0.0043\%$. Analyses of the five elements not included indicated a possible additional impurity content of as much as 300 ppm. However, there is every reason to believe that they should be entirely absent. Therefore, this value has been assigned to the metal and will be used as the reference standard in the resolution of analytical differences between laboratories (auth)

1649 RARE EARTH ABUNDANCES IN THE STANDARD GRANITE G-1 AND STANDARD DIABASE W-1 David G Towell, Regina Volfovsky, and John W Winchester (Massachusetts Inst of Tech Cambridge) Geochim Cosmochim Acta 29 569-72 (May 1965)

The lanthanide elements (except Gd and Er) were determined in the standard granite G-1 and standard diabase W-1 by neutron activation and a chemical procedure consisting of pre-irradiation separation of the rare earth group and post-irradiation column chromatography of individual lanthanides using bis(2-ethylhexyl)orthophosphoric acid. The logarithm of abundance normalized to the corresponding abundance in chondritic meteorites decreases linearly with Z for G-1 from ^{57}La to ^{65}Dy by an abundance ratio of 35 and for W-1 from ^{57}La to ^{71}Lu by a ratio of 3.0. Relative to the trend of normalized abundances for the other lanthanides, Eu is singularly low by a factor of 0.7 in G-1 but is normal in W-1 (auth)

1650 ABSOLUTE DETERMINATION OF THE ACTIVITY OF TWO C-14 DATING STANDARDS Karlén Ingvar, Olsson Ingrid U, Kallberg Per, Kilicci Serap (Uppsala Univ) Arkiv Geofysik 4 465 71 (1965)

An absolute determination of the activity of the two most common ^{14}C standards (oxalic acid from NBS and "Wilhelm") was made with the proportional counter and electronic equipment that was previously used in the determination of the half life of ^{14}C . Additionally, a series of relative measurements giving the ratio of the activities of the two standards was made using another proportional counter (D C W)

1651 THE ZINC CONTENTS OF SOME GEOCHEMICAL STANDARDS BY NEUTRON ACTIVATION AND X-RAY FLUORESCENCE ANALYSIS Ball, T K, Filby, R H (Univ of Oslo) Geochim Cosmochim Acta, 29 737-40 (July 1965)

Zinc contents of G-1 and W-1 were studied by two independent methods in order to establish the zinc contents with more certainty, in addition to providing data on the zinc contents of some other geochemical standards. Both methods used in the study were subject to interferences and these had to be evaluated and corrected. The neutron activation method was subject to interference mainly from fast neutron reactions $^{69}\text{Ga}(n,p)$, ^{69}mZn and $^{72}\text{Ge}(n,\alpha)$, ^{69}mZn

The major interference with the x ray fluorescence method was the absorption effect with increasing iron contents. (F.J.H.)

1652 SPECTRAL ANALYTICAL TRACE DETERMINATION IN UO_2 NUCLEAR FUEL ELEMENTS USING RADIOCHEMICAL CONTROLLED STANDARD PROBES. Golling, E., Neeb, K. H. (Siemens-Schuckertwerke AG, Erlangen, Ger.). Nukleonik, 7: 217-20 (May 1965). (In German).

For the preparation of standards for trace determination in UO_2 fuel elements, the impurity was added generally, to pure UO_2 powder using aqueous solutions. The impurity was fixed on the surface of the powder by drying and glowing. In the to-be-analyzed samples the trace elements, however, are built in the crystal lattice. In order to deter systematic errors conditioned by the type of introduction of the trace elements, radiochemically controlled standards with definite contents of Cd, Co, Cr, Cu, Fe, Pb, and Zn in the UO_2 lattice were prepared. The spectral comparison of the standard series thus prepared gave significant differences in the sensitivity factors. Standards prepared using aqueous solutions of the traces can falsify an analytical result by a factor of 10 (tr-auth)

1653 ACTIVATION ANALYSIS PROGRAM AND FACILITIES AT THE NATIONAL BUREAU OF STANDARDS. DeVoe, James R., Smith, Gilbert W. (National Bureau of Standards, Washington, D. C.). 21p. (CONF-650405-8). Gmelin, AED-CONF-65-040-21.

From International Conference on Modern Trends in Activation Analysis, College Station, Tex.

In order to meet the requirements of the Standard Reference Materials Program, it was necessary that activation analysis techniques be developed to provide maximum accuracy and precision. The concepts and plans for meeting these requirements are discussed. The facilities of the National Bureau of Standards for activation analysis are described (M C G)

1654 ELECTROCHEMICAL PREPARATION OF THIN METAL FILMS AS STANDARDS ON PYROLYTIC GRAPHITE. Vassos, Basil H.; Berland, Francis J.; Neal, Thomas E.; Mark, Harry B. Jr. (Univ. of Michigan, Ann Arbor). Anal. Chem., 37: 1653-6 (Dec. 1965).

Gold, silver, copper, and cobalt were deposited quantitatively in microgram to milligram amounts on disks of pyrolytic graphite. Electrochemical plating conditions and the electrode pretreatment procedures that provided for the most uniform and strongly adhering metal film deposit are described. The procedures employed make use of both potentiometric and amperostatic electrochemical deposition techniques. The linearity of plating deposits, as a function of time, concentration, and current, is discussed together with other parameters affecting the deposition. With the use of operational amplifiers in the control circuits, the film deposits prepared showed an internal precision that was within $\pm 2\%$ when checked by a number of independent methods, including activation analysis. Potential application of such quantitatively prepared disks to neutron flux monitoring and to other analytical methods is discussed (auth)

1655 (AAEC/TM-294) SPECTROGRAPHIC COMPARISON OF BERYLLIUM OXIDE STANDARDS. Dale, L. S. (Australian Atomic Energy Commission Research Establishment, Lucas Heights). July 1965. 22p. Dep. mn.

Details of a spectrographic comparison of two sets of beryllium oxide standards are given. For most elements satisfactory agreement was obtained, the exceptions being Pb, Cu, Mg, Si (below 100 ppm), and Al (blank correction). (auth)

1656 (ALO-1) ALO STANDARD STRUCTURE FOR MANAGERIAL DATA. Neuman, Elmer A. (Albuquerque Operations Office (AEC), N. Mex.). Nov. 1965. 63p. Dep. mn; CFSTI \$3.00 cy, \$0.75 mn.

The ALO Standard Structure for managerial data and its actual and projected uses are described. The ALO Standard Structure is the framework for a broad management system covering many forms of managerial information for the multi-plant industrial complex, which is the weapons production system of the Albuquerque Operations Office of the USAEC. The Standard Structure is described, and information is given on the input operating budget, general plant projects and capital equipment budgets,

analysis of complex major construction projects, and other uses of the Standard Structure (P C H)

1657 ASA 1964 COMPILATION OF U. S. NUCLEAR STANDARDS. Nucl. Safety, 6: 354-67 (Summer 1965)

The compilation includes listings of sponsoring organization and standards committee, chairman addresses, codes and standards activities, and status and date of standards (J R D)

1658 NEUTRON-ACTIVATION ANALYSIS BY STANDARD ADDITION AND SOLVENT EXTRACTION. Alian, A.; Parthasarathy, R. (Atomic Energy Establishment, Trombay). Anal. Chim. Acta, 35: 69-73 (May 1966).

In an approach to activation analysis chemical yield determinations are avoided by selective extraction of the required element in conjunction with the standard addition technique. The principle and its application to the determination of traces of uranium in aluminum and the standard granite (G 1) are given. The advantages of this method are its simplicity and rapidity (auth)

1659 (ORNL-NSIC-11) 1965 COMPILATION OF UNITED STATES NUCLEAR STANDARDS. 2nd Edition, 1965. Cottrell, Wm B. (Oak Ridge National Lab. Tenn.). Dec. 1965. Contract W-7405-eng-26. 94p. Dep. mn. CFSTI \$4.00 cy, \$0.75 mn.

All United States nuclear standards activities and regulations known to this committee are presented in simple tabular form. The standards activities of all organizations including technical societies, as well as relevant regulations established by government agencies, are listed in alphabetical order by organization, etc. in instances where that organization itself undertakes the development of nuclear standards. Included as an appendix is a special report on the transportation of radioactive materials. This appendix attempts to identify the pertinent criteria and/or regulations for the transportation of various forms of radioactive substances by any of the several transportation media (M O W)

1660 CONTENT OF RARE EARTHS IN THE STANDARD IGNEOUS ROCKS G-1, W-1, AND G-B. Aleksiev, E.; Boyadjieva, R. (Geological Inst., Sofia). Geochim. Cosmochim. Acta, 30: 511-13 (May 1966).

The results of determinations of rare earth elements in granite G-1, diabase W-1, and Bulgarian granite G-B are given. The x-ray fluorescence method was used after chemical enrichment of the samples (auth)

1661 USE OF A STANDARD IN THE SOLID PHASE FOR QUANTITATIVE ARGON DETERMINATION BY THE METHOD OF ISOTOPE DILUTION. Artemov, Yu. M.; Knorre, K. G.; Strizhov, V. P. (Vernadskii Inst. of Geochemistry and Analytical Chemistry, Moscow). Geokhimiya, No. 3, 349-51 (Mar. 1966). (In Russian).

Data are given to show that additions of argon in the solid phase may be used as a standard in the isotopic dilution determination of argon (tr-auth)

1662 DETERMINATION OF INDIUM IN STANDARD ROCKS BY NEUTRON ACTIVATION ANALYSIS. Johansen, O.; Steinnes, E. (Institutt for Atomenergi, Kjeller, Norway). Talanta, 13: 1177-81 (Aug. 1966).

A rapid neutron activation method for determination of indium in rocks based on 54-min ^{115m}In , is described. The method was applied to a series of geochemical standards including granite G 1 and diabase W 1. The precision is better than $\pm 5\%$ for samples containing more than 5×10^{-10} g indium. Good agreement with previously published values for G 1 and W-1 was obtained (auth)

1663 DETERMINATION OF TRACE AMOUNTS OF TELLURIUM IN STANDARD REFERENCE MATERIALS BY NEUTRON ACTIVATION ANALYSIS. Becker, Donald A.; Smith, Gilbert W. (National Bureau of Standards, Washington, D. C.). 25p. (CONF-650405-24). ORAU. Gmelin, AED-CONF-65-431-1.

From International Conference on Modern Trends in Activation Analysis, College Station, Tex.

For the first time neutron activation was used for elemental analysis of NBS Standard Reference Materials at the National Bureau of Standards. The reference materials were of two general types: cartridge brass and white cast iron and were analyzed for their tellurium content. Utilizing the nuclear reaction $^{130}\text{Te}(n, \gamma)^{131}\text{Te} \xrightarrow{\beta^-} ^{131}\text{I}$ the samples were irradiated and the ^{131}I separated by a de-

structive distillation and solvent extraction technique. Chemical yields were obtained through the use of ^{125}I tracer. Tellurium concentrations of 2 to 800 ppm were determined, and the results compared to the results on identical samples obtained by polarography and emission spectroscopy (auth)

1664 URANIUM, THORIUM, AND POTASSIUM IN SIX U.S.G.S. STANDARD ROCKS. Morgan, J. W.; Heier, K. S. (Australian National Univ., Canberra). *Earth Planet. Sci. Lett.*, 1: 158-60 (July 1966).

Six standard rocks, andesite AGV-1, basalt BCR-1, dunite DTS-1, granite G2, granodiorite GSP-1, and peridotite PCC-1, distributed by the United States Geological Survey, were analyzed for uranium, thorium, and potassium using the techniques of gamma-ray spectrometry, flame photometry, and neutron activation analysis. Results are shown, and standard-deviation errors for the gamma spectrometric measurements are given (M J T.)

1665 (ORNL-NSIC-18) COMPILATION OF NATIONAL AND INTERNATIONAL NUCLEAR STANDARDS (EXCLUDING U.S. ACTIVITIES). 2nd Edition, 1966. (Oak Ridge National Lab., Tenn.). June 1966. Contract W-7405-eng-26. 39p. Dep. mn. CFSTI \$2.00 cy, \$0.50 mn.

The national nuclear standards activities for Australia, Austria, Belgium, Canada, France, Germany, India, Israel, Japan, Netherlands, Norway, Pakistan, Republic of South Africa, Sweden, United Kingdom, and Yugoslavia are outlined. The nuclear standards activities of international organizations are outlined also (M O W.)

1666 PRODUCTION OF A HOMOGENEOUS BIOLOGICAL MATERIAL FOR INTERCOMPARISON OF ELEMENTARY ANALYSES BY DIFFERENT LABORATORIES. Bowen, H. J. M.; Cawse, P. A. (Atomic Energy Research Establishment, Wantage, Eng.). pp 149-51 of *Activation Analysis, Principles and Applications*. Lenihan, J. M. A., Thomson, S. J. (eds.). New York, Academic Press, 1965.

Preparation of leaf tissue from Marrow Stem Kale (*Brassica oleracea*) as a biological standard for interlaboratory comparison of analyses is discussed in detail. (P C S.)

1667 PRIMARY ANALYTICAL STANDARDS FOR PLUTONIUM. QUANTITATIVE SEPARATION OF PLUTONIUM FROM DICESIUM PLUTONIUM HEXACHLORIDE. Miner, F. J. (Dow Chemical Co., Golden, Colo.). *Analyst*, 91: 464-5 (July 1966).

Separation of plutonium from dicesium plutonium hexachloride, proposed as a primary analytical standard for plutonium, was studied using the slurry-column procedure. Removal of cesium with HCl before separation and recovery of plutonium eliminated the difficulties that are inherent in the use of dicesium plutonium hexachloride. Stirring for 20 min before adding to the ion exchange column produced no breakthrough of plutonium during washing to remove cesium. Recovery of plutonium was 99.99% with a standard deviation of 0.03% (P C S.)

1668 NECESSITY OF BIOLOGICAL STANDARDS FOR ACTIVATION ANALYSIS. Bowen, H. J. M. (Atomic Energy Research Establishment, Wantage, Eng.). pp 199-210 of *Radioactivation Analysis and Its Applications in Biological Sciences*. Paris, Presses Universitaires de France, 1964. (In French).

Biological materials suitable for use as standards in activation analysis are discussed in detail. These include such materials as blood, algae, and muscles (P C H.)

1669 URANIUM CONTENT OF SOME INTERNATIONAL STANDARDS. Hamilton, E. I. (Radiological Protection Service, Sutton, Eng.). *Earth Planet. Sci. Lett.*, 1: 317-18 (Sept. 1966).

The U contents of six USGS standard rocks, three NBS samples, and two IAEA biological standards were determined by the delayed neutron method. Interference from delayed neutrons from Th was taken into account in the USGS samples by estimating the Th content by the thoronol method after preliminary chemical extraction of Th. (F S.)

1670 INSTRUMENTAL NEUTRON-ACTIVATION ANALYSIS OF STANDARD ROCKS. Brunfelt, Arild O. (Univ. of Oslo); Steinnes, Eiliv. *Geochim. Cosmochim. Acta*, 30: 921-8 (Sept. 1966).

The granite G-1, diabase W-1, and seven new "standard rocks" distributed by the U S Geological Survey were analyzed by neutron activation and γ spectrometry. Data for the following elements are given: chromium, cobalt, lanthanum, manganese, samarium, scandium, and sodium. The values obtained for G-1 and W-1 are in reasonable agreement with previous published data (auth).

1671 NATIONAL AND INTERNATIONAL NUCLEAR CODES, STANDARDS, AND REGULATIONS. Cottrell, Wm. B. *Nucl. Safety*, 7: 415-17 (Summer 1966).

The need for the more rapid development of nuclear codes, standards, and regulations both nationally and internationally is emphasized. The Compilation of U S Nuclear Standards set up by the ASA is discussed. Countries and international organizations which have reported nuclear standards activities are listed (B G D.)

1672 (NYO-4700(Rev.) (Suppl. 3)) MANUAL OF STANDARD PROCEDURES (Health and Safety Lab., New York Operations Office (AEC), N Y) Sept 1966. 57p. Dep. CFSTI \$3.00 cy, \$0.75 mn.

Additions and corrections made to the Health and Safety Laboratory Manual of Standard Procedures include chemical procedures, fallout methods, specifications, semiconductor detectors, α and β emitters, and aerosol properties (M C G.)

1673 (JAERI-1112) PREPARATION OF JAERI U_3O_8 SPECTROCHEMICAL STANDARDS. Motojima Kenji (Japan Atomic Energy Research Inst., Tokyo) May 1966. 44p. (In Japanese) Dep. mn.

A series of U_3O_8 standard samples for spectrochemical analysis were prepared. A matrix oxide was obtained by thermal decomposition of high-purity uranyl acetate. Known amounts of 16 elements (Ag, Al, B, Ca, Cd, Co, Cr, Cu, Fe, Li, Mg, Mn, Mo, Ni, P, and Si) in solutions were added to the matrix oxide. The oxide to which these impurities were added was diluted with the matrix for preparing the standard series. A homogeneity test was performed on the prepared standards by spectrochemical method. Co-operative chemical and spectrochemical analyses were carried out under the auspices of the Advisory Committee on Analytical Chemistry of Nuclear Fuels and Reactor Materials of JAERI. Analytical results of 12 elements, statistically treated, are given in this report. Determinations of boron by isotope dilution mass spectrometry and the curcumin spectrophotometric method are also reported in an appendix (auth).

1674 A CRITICAL REVIEW OF NUCLEAR CODES AND STANDARDS AVAILABLE AND UNDER DEVELOPMENT IN THE UNITED STATES. Chalker, Ralph G. (Atomics International, Canoga Park, Calif.). *Trans. Amer. Nucl. Soc.*, 9: 408-9 (Oct.-Nov. 1966).

1675 THE DETERMINATION OF BARIUM IN G-1 AND W-1 [ROCK STANDARDS] BY ISOTOPE DILUTION. Schnetzler, C. C.; Thomas, H. H.; Philpotts, J. A. (Goddard Space Flight Center, Greenbelt, Md.). *Geochim. Cosmochim. Acta*, 31: 95-6 (Jan. 1967).

Serious analytical difficulties were experienced in the determination of barium in rocks and minerals. The range of reported values in G-1 is from 900 to 3000 ppm and in W-1 from 120 to 390 ppm. Barium determinations obtained by mass spectrometric stable isotope dilution, employing ^{138}Ba , are reported. Experimental details are outlined and results tabulated. The sensitivity of barium in the thermal ionization mass spectrometer is stated to be so high that less than 1 μg of barium is needed for an analysis, although larger samples were employed for the analysis. The barium was separated chromatographically, and determined using a 12-in. 60° sector surface ionization mass spectrometer. The 134 to 138 mass range was scanned magnetically and the barium concentration in the sample calculated from the resulting mass spectrum. Results indicate a barium concentration of 1040 ± 20 ppm in G-1 and 158 ± 2 ppm in W-1 (UK).

1676 (ORNL-NSIC-30) COMPILATION OF UNITED STATES NUCLEAR STANDARDS. 3rd Edition, 1966. (Oak Ridge National Lab., Tenn.). Dec 1966. Contract W-7405-eng-26. 111p. Dep. mn. CFSTI \$3.00 cy, \$0.65 mn.

A compilation of all known standards and regulations applicable to the nuclear industry in the United States are presented in tabular form. Standards activities of all organizations including technical societies as well as relevant regulations established by government agencies are shown in alphabetical order. Brief descriptions of most organizations which developed the standards are also included (F S.)

1677 INMM STANDARDS COMMITTEE REPORT. McDowell, S. C. T. (Atomic Energy Commission, Washington, D. C.). pp 143-56 of *Institute of Nuclear Materials Manage-*

ment Sixth Annual Meeting. Columbus, Ohio, Institute of Nuclear Materials Management, 1965.

The activities of the following Institute of Nuclear Materials Management Committees were reviewed: Standards, SS Color Code, Glossary of Terms, Scrap Classification Guide, Fuels Standards, and Standards for Shipping Containers (F S)

1678 DETERMINATION OF TRACE ELEMENTS IN STANDARD REFERENCE MATERIALS BY NEUTRON ACTIVATION ANALYSIS. Smith, Gilbert W., Becker, Donald A., Lutz, George J., Currie, Lloyd A., Devoe, James R. (National Bureau of Standards, Gaithersburg, Md.). *Anal. Chim. Acta*, 38: 333-40 (July 1967).

Neutron activation analysis with its high sensitivity and accuracy in trace analysis is being used at the NBS for analysis of Standard Reference Materials. Four problems affecting precision and accuracy are discussed. First, the positive bias introduced by induced radioactivity of similar γ ray energy was found in the determination of interstitial argon in ultra pure silicon: a decay curve resolution technique was used to compensate for the error. Secondly, errors due to differences in geometrical location between sample and standard during irradiation were observed: flux gradients were determined by copper foil flux monitoring to give necessary means of correction. Thirdly, errors are caused by differences in neutron self-shielding between sample and standard during irradiation: an empirical correction method was used and a computer program written for calculation. Finally, the problem of γ ray attenuation during counting of sample and standard was explored; a theoretical and experimental study gives the necessary corrections (auth).

1679 K-Ar AND Rb-Sr MEASUREMENTS ON P-207, THE U. S. GEOLOGICAL SURVEY INTERLABORATORY STANDARD MUSCOVITE. Lanphere, Marvin A.; Dalrymple, G. Brent (U.S. Geological Survey, Menlo Park, Calif.). *Geochim. Cosmochim. Acta*, 31: 1091-4 (June 1967).

Potassium-argon analyses of P-207, the U. S. Geological Survey standard muscovite, in twenty-four laboratories and rubidium-strontium analyses in ten laboratories indicate that for material of this type the average interlaboratory precision for K-Ar ages is 2.6% and for Rb-Sr ages is 3.4% and the average intralaboratory precision for K-Ar ages is 1.6% and for Rb-Sr ages is 2.9% (auth).

1680 DETERMINATION OF CHLORINE IN U. S. GEOLOGICAL SURVEY STANDARD ROCKS BY NEUTRON ACTIVATION ANALYSIS. Johansen, O.; Steinnes, E. (Institutt for Atomenergi, Kjeller, Norway). *Geochim. Cosmochim. Acta*, 31: 1107-9 (June 1967).

The chlorine content in eight U. S. Geological Survey standard rocks was determined by neutron activation analysis. The results are within the range 9.4 to 431 ppm, and the precision from duplicate determinations is about $\pm 3\%$ (auth).

1681 (ORNL-NSIC-38) COMPILATION OF NATIONAL AND INTERNATIONAL NUCLEAR STANDARDS (EXCLUDING U. S. ACTIVITIES). 3rd Edition, 1967. (Oak Ridge National Lab., Tenn.) Oct. 1967. Contract W-7405-eng-26. 50p. Dep. CFSTI.

Countries and international organizations which have reported nuclear standards activities are listed and the activities are described (D C C).

1682 (SCL-DR-67-81) MEASUREMENT CAPABILITIES OF THE SANDIA CORPORATION, LIVERMORE LABORATORY, STANDARDS LABORATORIES. Wilson, J. L. (Sandia Corp., Livermore, Calif.) Oct. 1967. Contract AT(29-1)-789. 26p. Dep. CFSTI.

The principal measurement services provided by the Livermore Laboratory Standards Laboratories are summarized and the nominal levels of measurement accuracy that can be obtained are listed (auth).

1683 ABUNDANCE OF ANTIMONY IN METEORITES, TEK-TITES, AND ROCKS BY NEUTRON ACTIVATION ANALYSIS. Tanner, James T.; Ehmman, William D. (Univ. of Kentucky, Lexington) Contract AT(40-1)-2670. *Geochim. Cosmochim. Acta*, 31: 2007-26 (Oct. 1967).

Antimony was determined by neutron activation in twenty-four chondrites, eight achondrites, three siderites, five separated meteoritic phases, twelve tektites, six natural glasses, eleven standard rocks, fifteen selected terrestrial rocks, and eight deep sea sediments. The data confirm the expectation that antimony has appreciable siderophilic and chalcophilic properties in the meteorites. A cosmic atomic abundance for antimony of 0.40 ($S_i = 10^6$) was obtained based on two Type I carbonaceous chondrites analyzed. This value is considerably higher than was predicted by current theories of nucleosynthesis. The ordinary chondrites are relatively uniform with respect to their antimony abundances, and average 0.11 ($S_i = 10^6$). The relatively

few analyses of terrestrial rocks and sediments reported suggest a rather complex geochemistry for antimony. Using the available data a crustal antimony abundance of approximately 0.2 ppm was indicated (auth) (UK).

1684 (NBS-TN-428) ACTIVATION ANALYSIS COCK-CROFT-WALTON GENERATOR, NUCLEAR REACTOR, LINAC, JULY 1966-JUNE 1967. DeVoe, James R. (ed.). (National Bureau of Standards, Washington, D. C.). Nov. 1967. 90p. GPO \$0.55.

The irradiation facilities of the nuclear reactor Linac and Cockcroft-Walton generator are described. The initial installation of pneumatic transfer tubes was completed. A clean room was completed for pre-irradiation chemical separation for high-sensitivity activation analysis. A dual-sample biaxial rotating 14-MeV neutron-irradiation assembly was tested. This assembly is part of a system that is controlled by a relay type of programmer to automate those irradiation steps that adversely affect precision of the analysis. This system was used to improve the precision of analysis for oxygen and fluorine. As a result of improved precision with the 14 MeV neutron irradiation, a study of systematic errors is now possible. Efforts to establish a reproducible correction factor for neutron and gamma absorption between different matrices within the sample showed considerable promise. Standard Reference Material (SRM) steel chip Nos. 3b, 3c, and 30f were analyzed for vanadium. Preliminary analyses of high purity platinum (a potential SRM) showed silver, copper, gold, palladium, and iridium at the ppm level. Future biological SRMs (tree leaves and beef liver) were tested for homogeneity and found satisfactory. A variety of service analyses were performed. In particular, very pure aluminum was found to contain fractions of a ppm of chromium and scandium. Additional efforts are being made to monitor reactor neutron fluxes. Additional nuclear instrumentation is being assembled to improve the versatility of the analysis technique. Performance of the bremsstrahlung target used with the linear electron accelerator was evaluated. Photon intensity distribution and stability was found to be within usable range. Analyses using the (γ, n) or (γ, p) reactions were developed for major elements in steels and carbon in sodium metal (auth).

1685 OCCUPANCY STANDARDS AND PROCESS HAZARDS. National Fire Codes. A Compilation of NFPA Codes, Standards, Recommended Practices, and Manuals. Volume 9, 1967-68. AIA File Number 40-B-7. Boston, National Fire Protection Association, 1967.

Seventeen fire protection standards are presented. Separate abstracts were prepared for two standards. The remaining fifteen standards are concerned with wood and forest products, explosions, static electricity, furs, ovens and furnaces, piers and wharves, garages, dehydrators and dryers, homes, indoor and outdoor storage, records and community dumps (R C K).

1686 DATA ON THE ROCK GSP-1 (GRANODIORITE) AND THE ISOTOPE-DILUTION METHOD OF ANALYSIS FOR Rb AND Sr. Peterman, Zell E.; Doe, Bruce R.; Bartel, Ardith. U. S. Geol. Surv., Prof. Pap., 575-B, B181-6 (1967).

Concentrations of selected elements in the U. S. Geological Survey standard granodiorite, GSP-1, as determined by isotope dilution are 268 ppm of U, 5.5 ppm of Sr, 68.7 ppm of Pb, 2.4 ppm of U, and 106 ppm of Th. Duplicate analyses of Rb, Sr, and Pb agreed to within 1%. Replicate analyses of U and Th showed larger variations. The range of U values was $\pm 20\%$ of the mean and for the Th value, $\pm 8\%$ of the mean. The isotopic compositions of Pb and Sr are given, and the analytical techniques for determination of Rb and Sr are discussed. The $^{87}\text{Sr}/^{86}\text{Sr}$ ratio after normalization is 0.7687 ± 0.0011 . The isotopic composition of lead is given by the following ratios: $^{208}\text{Pb}/^{204}\text{Pb}$ 18.077, $^{207}\text{Pb}/^{204}\text{Pb}$ 15.67, and $^{206}\text{Pb}/^{204}\text{Pb}$ 47.33 (auth) (Geo. Sci. Abstr.).

1687 ISOTOPE-DILUTION DETERMINATION OF FIVE ELEMENTS IN G-2 (GRANITE), WITH A DISCUSSION OF THE ANALYSIS OF LEAD. Doe, Bruce R.; Tatsumoto, Mitsunobu; Delevaux, M. H.; Peterman, Zell E. U. S. Geol. Surv., Prof. Pap., 575-B, B170-7 (1967).

Concentrations of selected elements in the reference sample G-2 (granite) were determined by isotope dilution to be: Pb, 30.8 ppm, Rb, 74 ppm, Sr, 481 ppm, Th, 24.3 ppm, and U, 1.9 ppm. A statistical study of the analytical uncertainties involved in Pb-isotope analysis showed the uncertainties to be systematic and to closely approach those expected from fractionation of Pb isotopes within the mass spectrometer. The ranges in $^{208}\text{Pb}/^{204}\text{Pb}$ and $^{207}\text{Pb}/^{204}\text{Pb}$ on samples approach 4 times those expected from tests of the mass spectrometer, because of a sample-loading effect. The precision can be increased, approximately to a level expected only from mass spectrometer effects, by loading an amount of NH_4NO_3 solution proportional to the amount of Pb loaded (auth) (Geo. Sci. Abstr.).

1688 SILICON ABUNDANCES IN SOME METEORITES AND STANDARD ROCKS BY ACTIVATION ANALYSIS. Ehmman,

William D., Durbin, Daniel R. (Univ. of Kentucky, Lexington) *Geochim. Cosmochim. Acta*, 32 461-4 (Apr. 1968)

Analytical data for silicon in 18 meteorites and 8 standard rocks were obtained by fast neutron activation analysis. The meteorite data together with the data of Vogt and Ehmann (1965) were used to compute mean silicon abundances among the chondrite classes of Van Schmus and Wood (1967) (auth) (UK)

1689 (ORNL-NSIC-43) COMPILATION OF UNITED STATES NUCLEAR STANDARDS. 4th Edition 1967. (Oak Ridge National Lab., Tenn.). May 1968. Contract W-7405-eng-26. 147p. Dep. CFSTI

A complete list of codes and standards which are applicable to the nuclear industry is given. The overall scope is international. The standards activities of all organizations including technical societies and government agencies are tabulated. 35 references are given also. (M L S)

1690 DETERMINATION OF ANTIMONY IN ROCKS BY NEUTRON-ACTIVATION ANALYSIS. Brunfelt, A. O. (Univ. of Oslo); Steinnes, E. *Analyst*, 93 286-8 (May 1968).

Antimony was determined in some geochemical standards (andesite AGV-1, diabase W-1, dunite DTS-1, granite GB, and tonalite T-1) by neutron activation analysis. A radiochemical procedure was developed in which antimony(V) is extracted into isopropyl ether and subsequently back-extracted after reduction to the trivalent state with tin(II). The antimony activity is measured by γ spectrometry. Chemical-yield determination is carried out by reactivation. The precision of the method is better than 5 percent for samples with antimony content exceeding 1 ppm. (auth) (UK)

1691 CERIUM AND EUROPIUM CONTENT OF SOME STANDARD ROCKS. Brunfelt, A. O.; Steinnes, E. (Univ. of Oslo). *Chem. Geol.*, 2: 199-207 (Sept. 1967).

A neutron activation technique and radiochemical separation procedure are described for determination of Ce and Eu in geological samples. By selecting appropriate time intervals for neutron irradiation and cooling, advantage was taken of the half-life of the 32 day ^{141}Ce nuclide and of the 2 long-lived europium nuclides 12.4 yr ^{152}Eu , ^{154}Eu formed by (n, γ) reactions. The relevant nuclear data are shown. After decomposition of the irradiated rock specimens by fusion with sodium hydroxide, the melt was dissolved and hydroxide precipitation performed. The precipitate was dissolved in a mixture of nitric acid, ethanol, and water. A chromatographic fractionation procedure by amion-exchange resin (Dowex 1 X8 100 to 200 mesh) was developed for separation of Ce and Eu from this mixture. After the adsorption of the ions, the resin was washed with 20 ml of the mixture 10% (v/v) nitric acid-70% ethanol-20% water. Europium was then eluted with 20 ml of 10% nitric acid-50% ethanol-water, and the still-retained Ce with 20 ml of water. Relative to an average chondritic distribution, both Ce and Eu appeared to be normal in all the rocks studied, except for granodiorite GSP-1, in which Eu was found to be significantly depleted. (BBB)

1692 SPLAT-COOLED MATERIALS FOR NEUTRON ACTIVATION ANALYSIS STANDARDS. Dorward, R. C. (McMaster Univ., Hamilton, Ont.). *J. Nucl. Mater.*, 27 235-6 (Aug. 1968).

A method is described by which homogeneous and radiochemically pure alloy standards for neutron activation analysis have been prepared. The method uses levitation melting and extremely rapid solidification by splat cooling. (M C G)

1693 1968 BOOK OF ASTM STANDARDS WITH RELATED MATERIALS. PART 30. GENERAL TESTING METHODS; RADIOISOTOPES AND RADIATION EFFECTS; STATISTICAL METHODS; APPEARANCE OF MATERIALS; EMISSION, MOLECULAR, AND MASS SPECTROSCOPY; SENSORY EVALUATION OF MATERIALS AND PRODUCTS; CHROMATOGRAPHY; TEMPERATURE MEASUREMENT; SPACE SIMULATION; MICROSCOPY. Philadelphia, American Society for Testing and Materials, 1968. 1271p. \$21.00.

Part 30 of The 1968 Book of ASTM Standards, which consists of 32 parts, is presented. All current formally approved ASTM standard and tentative specifications, methods of test, recommended practices, definitions, and other related materials, such as proposed methods are included. (D H M)

1694 1968 BOOK OF ASTM STANDARDS WITH RELATED MATERIAL. PART 32. CHEMICAL ANALYSIS OF METALS; SAMPLING AND ANALYSIS OF METAL BEARING ORES. Philadelphia, American Society for Testing and Materials, 1968. 930p. \$18.00.

Part 32 of The 1968 Book of ASTM Standards is presented. Major topics included are: general recommended practices, sampling methods, chemical analysis of ferrous metals, chemical analysis of nonferrous metals including Ni-Cr-Fe alloys, Ni and

Ni-Cu alloys, Cu and Cu-base alloys, Al and Al-base alloys, Mg and Mg-base alloys, Ti and Ti-base alloys, Zr and Zr-base alloys, Mo, Nb, Pb, Sn, Sb, Ag alloys, and Zn and Zn-base alloys, chemical analysis of metal powders, spectrochemical analysis methods, sampling and analysis of metal-bearing ores, and microchemical analysis. (D H M)

1695 ABSOLUTE ISOTOPIC ABUNDANCE RATIOS OF COMMON, EQUAL-ATOM, AND RADIOGENIC LEAD ISOTOPIC STANDARDS. Catanzaro, E. J., Murphy, T. J., Shields, W. R.; Garner, E. L. (National Bureau of Standards, Washington, D. C.). *J. Res. Nat. Bur. Stand.*, 72A 261-7 (May-June 1968).

Absolute values were obtained for the isotopic abundance ratios of common, equal-atom and radiogenic lead isotopic standards using solid-sample mass spectrometry. Samples of known $^{208}\text{Pb}/^{206}\text{Pb}$ ratio prepared from nearly pure separated ^{206}Pb and ^{208}Pb solutions were used to calibrate the mass spectrometers. (auth)

1696 (ORNL-NSIC-50) COMPILATION OF NATIONAL AND INTERNATIONAL NUCLEAR STANDARDS (EXCLUDING U.S. ACTIVITIES). 4th Edition, 1968. (Oak Ridge National Lab., Tenn.). Sept. 1968. Contract W-7405-eng-26. 75p. Dep. CFSTI.

All known national and international nuclear standards activities are tabulated. Standards activities of all national organizations, technical societies and government agencies are listed alphabetically by country. Standards activities are included for Australia, Austria, Belgium, Canada, Denmark, France, Germany, Hungary, India, Israel, Italy, Japan, Netherlands, Norway, Pakistan, Republic of South Africa, Sweden, United Kingdom, and Yugoslavia. International organizations activities include Bureau Veritas, European Organization for Nuclear Research, European Atomic Energy Community, International Air Transport Association, IAEA, International Commission on Radiological Protection, International Commission on Radiation Units and Measurements, International Electrotechnical Commission, Intergovernmental Maritime Consultative Organization, International Organization for Standardization, Lloyds, Organization for Economic Cooperation and Development, European Nuclear Energy Agency, and United Nations. (15 references) (M L S)

1697 (IN-1203, pp 62-6) UMPIRE QUALIFICATION PROGRAM. (Idaho Nuclear Corp., Idaho Falls).

Participation of AEC, U.S. commercial, and foreign laboratories in the umpire qualification program is discussed. Preparation and distribution of standards are described. (M C G)

1698 PREPARATION OF AN NBS BIOLOGICAL STANDARD REFERENCE MATERIAL FOR TRACE ELEMENTAL ANALYSIS. Smith, G. W.; Becker, D. A. (National Bureau of Standards, Washington, D. C.). pp 197-207 of *Nuclear Activation Techniques in the Life Sciences*. Vienna, International Atomic Energy Agency, 1967.

From Symposium on Nuclear Activation Techniques in the Life Sciences, Amsterdam, Netherlands. See STI/PUB-155, CONF-670546.

A survey of leading US biological, medical, and forensic laboratories confirms the need for well characterized botanical, soft mammalian tissue, bone tissue, and blood standards with elemental constituents at the 100 ppm level and below. Before reliable analytical data can be obtained the reference material must be considered homogeneous and tests for inhomogeneity should be performed. Examples are given of this procedure, which is carried out routinely by the NBS on Standard Reference Materials. Homogeneity of Bowen's kale for chlorine (~4000 ppm), manganese (~14 ppm), and copper (~6 ppm) as well as for manganese in beef liver (~10 ppm), citrus leaf (~28 ppm), and oak leaf (~1000 ppm) are given. Measurements were made by neutron activation analysis both with and without chemical separation, using a Ge(Li) semiconductor detector. This technique was also used for the quantitative determination of the trace constituents chlorine and manganese, nondestructively. In addition, a destructive method was used for the elements arsenic and copper. Analyses of variance, using the activation analysis data, show for all of the biological materials except the citrus leaves no evidence of inhomogeneity. Therefore, preparation under contract, of large lots of deciduous leaves and beef liver, will begin. Tests for inhomogeneity and elemental content certification will be made by NBS activation analysis and other analytical methods. (auth)

1699 DEVELOPMENT OF HIGH TEMPERATURE THERMAL CONDUCTIVITY STANDARDS. Wechsler, Alfred E. (Arthur D. Little, Inc., Cambridge, Mass.); Minges, Merrill L. pp 77-87 of *Thermal Conductivity*. Flynn, Daniel R.; Peavy, Bradley A. Jr. (eds.). Washington, D. C., National Bureau of Standards, 1968.

From 7th Conference on Thermal Conductivity, Gaithersburg, Md. See NBS-SPEC.PUBL.-302; CONF-671110.

The program described encompasses an analytical and experimental study to establish high-temperature thermal conductivity

and thermal diffusivity standards and to test these standards at several property measurement laboratories. Candidate ceramics intermetallics, metals, and graphites were selected and used in a preliminary laboratory evaluation consisting of heating tests, visual and microscopic examination, and room-temperature thermal conductivity and electrical resistivity measurements. On the basis of test results, alumina, thorium tungsten, and RVD and AXM 5Q1 graphites were chosen for the laboratory measurement program. Specifications written for these materials and the results of receiving inspection and density measurements of the samples obtained are presented. The status of measurements at participating laboratories is briefly described. (auth)

1700 PREPARATION OF ZIRCALOY STANDARD SAMPLES FOR SPECTROCHEMICAL ANALYSIS Kashu, Seichiro, Nagase, Michio, Hayashi, Chikara, Nakajima, Tokunosuke, Takashima, Kyoichiro (Japan Vacuum Engineering Co., Ltd., Yokohama, Japan) Nippon Kinzoku Gakkaishi, 32 919-25(1968) (In Japanese)

The preparation of Zircaloy standard samples for spectrochemical analysis by using a 120 kW electron beam skull furnace is described. Major elements (Sn, Fe, Ni, and Cr) and impurity elements such as Al, Cu, Ti, Si, Co, B, and Hf were observed before and after the skull casting. Three major elements (Sn, Fe, and Ni) in Zircaloy can be controlled to within $\pm 10\%$ of the respective predicted preset level, provided each content in the skull being previously controlled to within $\pm 50\%$ of a predetermined value. Chromium showed a low and scattered yield. Composition analysis of major elements in the upper, middle, and lower parts of an ingot showed less than 4% deviation in Sn, 8% in Fe, and 11.1% in Cr from the average contents in the ingot. Impurity elements of B, Ti, Si, and Al in Zircaloy can be controlled to within $\pm 15\%$ of the preset level. Yields of Cu and Co are less than 20% and widely scattered results are obtained even if the 120 kW rotated electron beam is used. Chemical analysis of impurity elements in the upper, middle, and lower parts of the ingot showed less than 5.2% deviation in Ti and less than 10% in B, Si, Co, Cu, and Al from the average contents of the respective elements. In skull melting of the alloy, there is an active zone near the surface of the skull which reacts with the molten pool. For control of the Al or Ti content in Zircaloy, the surface layer of the skull up to 5 mm in depth is estimated to be reactive. (auth)

1701 (CONF-671111-, pp 465-9) STANDARD REFERENCE MATERIALS FOR TRACE ANALYSIS IN THE LIFE SCIENCES DeVoe, J. R. (National Bureau of Standards, Washington, D. C.)

The National Bureau of Standards recognizes the demand for biological materials certified for a variety of elements at concentrations of 10 to 100 ppm. These standards will be useful as calibrators of an analytical technique. Consequently the standard will be certified to the highest accuracy and precision attainable. So that a good standard can be provided, the material must be homogeneous and have a long shelf life. Preliminary consideration is being given to standards of powdered dry beef liver and blood. (auth)

1702 DETERMINATION OF SILICON IN ROCKS BY FAST-NEUTRON ACTIVATION ANALYSIS USING INTERNAL STANDARDS Santos, G. G., Wanner, R. E. (Texas A and M Univ., College Station) J. Radioanal. Chem., 1 509 14(Nov 1968)

A technique for using internal standards in the determination of Si in rocks using fast-neutron activation is presented. Different weights of barium acetate were irradiated for 30 sec then cooled for 10 sec before counting for one min. A peak area, at 0.662 MeV due to ^{137m}Ba , versus weight of barium calibration curve (I) was made. Similarly, barium acetate, which served as the neutron flux monitor, was mixed with known weights of standard rocks BCR-1 and G-2. Then a peak area (at 1.78 MeV due to ^{28}Al) versus weight of silicon (present in the standard rocks) calibration curve (II) was constructed which was corrected for flux variations. Flux corrections were made possible using curve (I). Utilizing curve (I) and curve (II), the percentage Si in granite samples obtained from Llano, Texas, was determined. This technique avoids any external neutron monitor or sample rotation system. The applicability of this approach may be limited to samples in which the internal flux monitor can be dispersed. (auth)

1703 (EIR-142) STANDARDIZATION OF THE DEUTERIUM CONTENT OF HEAVY WATER Baertschi, P., Rosatzin, H. (Eidgenossisches Institut fuer Reaktorforschung, Wuerenlingen (Switzerland)) Oct. 1968 20p (In German) Dep

An observed uncertainty of several hundredths percent in absolute determination of the relative D content of D_2O samples makes the production of a reference standard of D_2O as exact as possible appear desirable. The production and absolute determination of a D_2O primary standard with a D content of 99.9983 ± 0.0002 at % is described. By comparison of the IR absorption at 2.5μ and comparison of the density, the D contents of three second-

dary standards were determined. These two comparison methods gave error limits of $\pm 0.002\%$ D. (tr. auth)

1704 (ORNL-NSIC-57) COMPILATION OF UNITED STATES NUCLEAR STANDARDS 5th Edition 1968 (Oak Ridge National Lab. Tenn.) Apr 1968 Contract W-7405-eng-26 161p Dep CFSTI

A complete list of codes and standards which are applicable to the nuclear industry is presented. The standards activities of all organizations, including technical societies and government agencies, are tabulated. 52 references. (D. C. C.)

1705 ESTIMATION OF POTASSIUM, RUBIDIUM, AND CAESIUM IN STANDARD AND ULTRAMAFIC ROCKS USING NEUTRON ACTIVATION Gangadharam, E. V. (Univ. of Saugar, India); Reddy, G. R. Radiochim. Acta, 11 90-3(Apr. 1969).

Neutron activation methods for the determination of potassium, rubidium and cesium are described. The radiochemical separations are based on the precipitation of cobaltinitrites of potassium, rubidium and cesium and in the case of rubidium and cesium on an ion-exchange separation using ammonium molybdophosphate. Potassium, rubidium and cesium are finally precipitated as their tetraphenylborates for radioactivity measurements. Potassium, rubidium and cesium contents of some ultramafic rocks of southern India and rubidium and cesium contents of the new U. S. Geological Survey standards obtained by neutron activation are presented. (auth)

1706 FIRST COMPILATION OF ANALYTICAL DATA ON STRONTIUM ISOTOPES FOR THE NEW GEOCHEMICAL ROCK STANDARDS JB-1 AND JG-1 Kurasawa, Hajime (Geological Survey of Japan, Kawasaki) Shitsuryo Bunseki, 17 649-52 (June 1969) (In Japanese)

Determinations of minor constituents and isotopic compositions of Sr reported by analysts throughout Japan are presented for the new series of standard samples issued from the Geological Survey of Japan. Two rock standard samples are still available. (NSA of Japan)

1707 ON THE STANDARD MATERIAL FOR RADIOACTIVATION ANALYSIS OF CHLORINE Iwata Shiro (Kyoto Univ.) Hayashi Masahiro Bunseki Kiki 7 222 5(Apr 1969) (In Japanese)

The behavior and the stability of various chlorine compounds generally used as standard samples for radioactivation analysis of chlorine were investigated. As standard materials such inorganic compounds as NH_4Cl and KCl , such organic chlorine compounds as p-chloroacetanilide and γ benzene hexachloride and such high polymer chlorine compounds as polyvinyl chloride, polyvinyl chloride-vinyl acetate copolymer and polyethylene chloride (PEC) were used. After these samples were irradiated with 5×10^{12} n/cm² sec thermal neutron flux for 20 min in KUR, the specific activity was determined. When inorganic chlorine compound crystal was used, a remarkable self-shielding effect of chlorine was observed, but in the case of solid polyethylene, that effect was not observed at all. Therefore, in using inorganic compounds as the standard sample, it is desirable to make the size of the sample as small as possible so as to minimize the self-shielding effect. If organic chlorine compounds are used, the compounds with high mp and bp are desirable. Polyethylene chloride is recommended as the most suitable standard material for it is more resistant to radiation. (NSA of Japan)

1708 (BNWL-1051(Pt 2), pp 131-4) NEUTRON ACTIVATION ANALYSIS OF A STANDARD PLANT MATERIAL Rancitelli, L. A. (Battelle Northwest, Richland, Wash. Pacific Northwest Lab.)

A standard biological reference material prepared from kale was analyzed by direct instrumental neutron activation analysis. The concentrations of 13 elements were measured in each of eight samples with excellent precision. The concentrations of potassium, sodium, iron, rubidium, zinc, bromine, chromium, cobalt, and antimony agreed very well with previously reported values. The cesium content was somewhat higher than previously published values. A few large discrepancies occurred between the silver, selenium, and mercury concentrations reported in this paper and results reported elsewhere. (auth)

1709 PRECISION IN THE NEUTRON ACTIVATION ANALYSIS FOR GOLD IN STANDARD ROCKS G-1 AND W-1 Fritze, K., Robertson, R. (McMaster Univ., Hamilton, Ont.) pp 1279-83 of Modern Trends in Activation Analysis Vol II, DeVoe, James R. (ed.) Washington, D. C., National Bureau of Standards, 1969. From International Conference on Modern Trends in Activation Analysis, Gaithersburg, Md. See NBS-Spec. Publ. -312(Vol 2), CONF-681003-(Vol 2)

A tabulation of a number of results of activation analysis for Au in NBS standards rocks G-1 and W-1 indicate generally poor agreement. The present work was undertaken to determine whether this disagreement was due to nonhomogeneous distribution of Au in the rocks. Large samples (200 mg) of each rock were irradiated

and after a 3-day cooling period 8 small aliquots were taken from each sample and weighed accurately. An Au carrier was added and the Au in each sample was precipitated as the metal. After filtration, the γ spectrum of each sample was recorded. Results of the experiment are tabulated and it is evident that the Au is not distributed homogeneously. Various ideas are advanced to explain this situation (B L M)

1710 NBS STANDARD REFERENCE MATERIALS AVAILABLE FOR ACTIVATION ANALYSIS. Meinke, W. Wayne, Calh, J. Paul (National Bureau of Standards, Washington, D C) pp 1291-3 of Modern Trends in Activation Analysis. Vol II DeVoe, James R (ed) Washington, D C, National Bureau of Standards, 1969

From International Conference on Modern Trends in Activation Analysis, Gaithersburg, Md. See NBS-Spec. Publ -312(Vol 2), CONF-681003-(Vol 2)

National Bureau of Standards standard reference materials available or soon to be available for activation analysis are discussed and the assays given. Steels and brassy, neutron flux wires, and high-purity metal standards are discussed (B L M)

1711 THE ROLE OF ACTIVATION ANALYSIS IN THE NBS STANDARD REFERENCE MATERIAL PROGRAM. Calh, J. Paul (National Bureau of Standards, Washington, D C) pp 1294-7 of Modern Trends in Activation Analysis. Vol II DeVoe, James R (ed) Washington, D C, National Bureau of Standards, 1969

From International Conference on Modern Trends in Activation Analysis, Gaithersburg, Md. See NBS-Spec. Publ -312(Vol 2); CONF-681003-(Vol 2)

The role of activation analysis in the NBS standard reference material (SRM) program is assessed as to uniqueness, utility, advantages, and disadvantages. In the certification of 2 recent SRM's, high-purity Zn and Pt, several elements could not have been listed without activation analysis. Oxygen content of several SRM's was determined by fast neutron activation analysis and provides an alternate analysis to vacuum fusion determinations. Activation analysis is now under consideration for use in certification of 17 SRM's (B L M)

1712 AN OXYGEN STANDARD FOR THE DETERMINATION OF OXYGEN IN STEEL BY 14 MeV NEUTRON ACTIVATION ANALYSIS. Gijbels, R., Speecke, A.; Hoste, J. (Ghent Univ) pp 1298-1305 of Modern Trends in Activation Analysis. Vol II DeVoe, James R (ed) Washington, D C, National Bureau of Standards, 1969

From International Conference on Modern Trends in Activation Analysis, Gaithersburg, Md. See NBS-Spec. Publ -312(Vol 2), CONF-681003-(Vol 2)

A relative method for routine determination of O in steel by 14-MeV neutron activation analysis by comparison with a standard of known O content is reported. The standards used were capsules of ordinary steel machined to certain dimension with a mixture of spectrographic pure graphite + Fe_2O_3 . The mixture was pressed into the capsule at 1000 psi in 7 portions. The results obtained for the O content of the standards are tabulated and indicate that the standards are identical and symmetrical. The standards and system of analysis described were used in a steel plant in Belgium since February, 1967 with sufficiently reproducible results to warrant continual use. The results of the activation analysis are computed automatically and agree satisfactorily with those obtained by various carburizing fusion methods (B L M)

1713 HIGH PURITY CELLULOSE AS A POSSIBLE BIOLOGICAL REFERENCE MATERIAL. Rancitelli, L. A.; Tanner, T. M.; Haller, W. A. (Battelle Memorial Inst., Richland, Wash) Contract AT(45-1)-1830 pp 1306-10 of Modern Trends in Activation Analysis. Vol II DeVoe, James R (ed) Washington, D. C., National Bureau of Standards, 1969

From International Conference on Modern Trends in Activation Analysis, Gaithersburg, Md. See NBS-Spec. Publ -312(Vol 2), CONF-681003-(Vol 2)

Trace element analysis by direct instrumental neutron activation of high-purity cellulose filter is presented to demonstrate the homogeneity and purity of the material. An analytical technique, which permits trace element measurement at very low concentrations with good precision, is described. Samples of cellulose filter material IPC No. 1478 obtained from Knowlton Bros., Watertown, N. Y., both untreated and treated with Kronisol (dibutoxy-ethyl phthalate) as a part of the manufacturing process were analyzed. Appropriate flux monitor standards were also irradiated. The results of the analyses of both treated and untreated materials are tabulated for comparison with each other and with results for a very pure sample of kale proposed previously for a biological standard (B L M)

1714 MICROSTANDARDS FOR ACTIVATION ANALYSIS. Freeman, David H. (National Bureau of Standards, Washington,

D C) pp 1311-16 of Modern Trends in Activation Analysis. Vol II DeVoe, James R (ed) Washington, D C, National Bureau of Standards, 1969

From International Conference on Modern Trends in Activation Analysis, Gaithersburg, Md. See NBS-Spec. Publ -312(Vol 2); CONF-681003-(Vol 2)

The theory, preparation and evaluation of ion-exchange-resin single beads loaded with an ion or ions for use as microstandard in activation analysis are discussed. Either N or S on the bead in the exchange group can serve as an internal standard. Various advantages for use of the bead standards are presented (B L M)

1715 THE ROLE OF THE NUCLEAR STANDARDS BOARD IN THE NUCLEAR INDUSTRY. Landis, J. W. (Gulf General Atomic Inc., San Diego, Calif.) pp 271-82 of Proceedings of the Tenth Annual Meeting of the Institute of Nuclear Materials Management, Las Vegas, Nevada, April 28-30, 1969. Columbus, Ohio, Institute of Nuclear Materials Management, 1969

See CONF-690411.

The work of the Nuclear Standards Board of the USASI is described and includes committees which are concerned with specification for and testing of nuclear materials used in nuclear applications, nuclear terminology, radiation terminology, radiation protection, radioactive materials transport and packaging, nuclear materials management, criticality safety, nuclear instruments, the design of nuclear equipment and facilities, and the location, construction, and operation of nuclear facilities (L C L)

1716 EFFECT OF NUCLEAR STANDARDS ON THE NUCLEAR INDUSTRY. Graham, H. B. (Oak Ridge National Lab., Tenn.) pp 283-94 of Proceedings of the Tenth Annual Meeting of the Institute of Nuclear Materials Management, Las Vegas, Nevada, April 28-30, 1969. Columbus, Ohio, Institute of Nuclear Materials Management, 1969.

See CONF-690411.

The status of the USASI Nuclear Standards Committee work on developing standards for the nuclear industry is described. The responsibilities of each section of the committee are itemized, and the work complete and contemplated for each of these sections is discussed (L C L)

1717 (ORNL-NSIC-63) COMPILATION OF NATIONAL AND INTERNATIONAL NUCLEAR STANDARDS (EXCLUDING U. S. ACTIVITIES), 5th EDITION, 1969. Cottrell, Wm B. (United States of America Standards Inst., New York. Oak Ridge National Lab., Tenn.). Sept 1969. Contract W-7405-eng-26 97p. Dep CFSTI.

All known national and international nuclear standards activities are tabulated. Standards activities of all national organizations, technical societies and government agencies are listed alphabetically by country. Standards activities are included for Australia, Austria, Belgium, Canada, Denmark, France, Germany, Hungary, India, Israel, Italy, Japan, Netherlands, Norway, Pakistan, Republic of South Africa, Sweden, United Kingdom, and Yugoslavia. International organizations activities include Bureau Veritas, European Organization for Nuclear Research, European Atomic Energy Community, International Air Transport Association, IAEA, International Commission on Radiological Protection, International Commission on Radiation Units and Measurements, International Electrotechnical Commission, Intergovernmental Maritime Consultative Organization, International Organization for Standardization, Floyds, Organization for Economic Cooperation and Development, European Nuclear Energy Agency, and United Nations. 17 references (D C C)

1718 ATOMIC-ABSORPTION DETERMINATION OF STRONTIUM IN A STANDARD PLANT MATERIAL. COMMENT ON RESULTS OF INTER-LABORATORY COMPARISON. David, D. J. (Commonwealth Scientific and Industrial Research Organization, Canberra, Australia). Analyst 94 884-5 (Oct 1969).

The concentration of strontium in Bowen's standard kale was found to be 101.13 ± 2.38 ppm, on evidence that x-ray fluorescence values obtained subsequently to Bowen's inter-laboratory comparison were in good agreement at 101 ppm with atomic absorption values by using anion exchange and the addition method. Methods used in obtaining neutron-activation results and the other atomic-absorption results implied in the inter-laboratory comparison should be examined for serious interferences (auth) (UK)

1719 HOMOGENEITY CHARACTERIZATION OF NBS SPECTROMETRIC STANDARDS. IV. PREPARATION AND MICROPROBE CHARACTERIZATION OF W-20 PERCENT Mo ALLOY FABRICATED BY POWDER METALLURGICAL METHODS. Yakowitz, H.; Michaelis, R. E.; Vieth, D. L. (National Bureau of Standards, Washington, D. C.). Advan. X-Ray Anal., 12: 418-38 (1969).

From 17th Annual Conference on Applications of X-Ray Analysis, Estes Park, Colo. See CONF-680841.

A significant problem of the National Bureau of Standards Standard Reference Materials program is the provision of standards suitable in homogeneity for use with microanalytical techniques such as the spark source mass spectrograph and the electron probe microanalyzer. An interim approach to the problem has been the extended homogeneity characterization of selected existing standards. The preparation and evaluation of the first NBS standard tested specifically from the beginning for application to electron probe microanalyzers is described. The standard designated SRM 480 is a tungsten-20 wt % molybdenum alloy prepared by a powder metallurgy process. Based on the results of about 1500 determinations for both tungsten and molybdenum by electron probe microanalysis, the material was found to be of high homogeneity at about the micrometer level of spatial resolution. The coefficient of variation for molybdenum was 2.5% and that for tungsten 1.5%. Correction of relative intensity ratios to obtain concentrations is discussed in terms of input parameter uncertainties such as mass absorption coefficients and electron backscatter factors. The result of studies for atomic number correction and effects on operating voltage on the microprobe absorption correction will be given. It is concluded that SRM 480 should be a valuable addition to any microprobe laboratory doing quantitative analyses. (auth)

1720 AVAILABILITY OF STANDARDS FOR ACTIVATION ANALYSIS. Meinke, W. Wayne (National Bureau of Standards, Washington, D. C.). Trans. Amer. Nucl. Soc., 12: 509 (Nov. 1969).

From 17th Conference on Remote Systems Technology, San Francisco, Calif. See CONF-691102.

1721 (MIT-1381-17) VARIATIONS IN ISOTOPIC ABUNDANCES OF STRONTIUM, CALCIUM, AND ARGON AND RELATED TOPICS. Seventeenth Annual Progress Report, 1969 (Massachusetts Inst of Tech, Cambridge Dept of Earth and Planetary Sciences) 1 Dec 1969 Contract AT(30-1)-1381 157p Dep CFS11

Geochronological studies based on measurements of isotopic abundances in metamorphic rocks in northeastern Newfoundland northern Appalachians Sierra Leone and eastern Liberia are presented. Continental accretion in Laurasia based on radiometric ages was investigated. The Rb/Sr ratio age estimations were made for crater rocks of possible impact origin for whole rock dating of diabase dikes and for Precambrian iron formations of the Canadian shield. $^{86}\text{Sr}/^{87}\text{Sr}$ ratios in pyroxene granulites from ten world wide locations are reported. Techniques and standards for Rb/Sr isotopic determinations are discussed. A bibliography of age data on continental basement rocks is given as well as reprints of miscellaneous papers on geochronology research. Abstracts of five papers in this field presented at international meetings are reprinted. (L. C. L.)

1722 QUANTITATIVE ASPECTS OF THE MEASUREMENT OF NATIVE SECRETION GRANULE INSULIN. Steffes, Michael W., Sorenson, Robert L., Lindall, Arnold W. (Minneapolis Medical Research Foundation) J. Lab. Clin. Med., 74: 950-60 (Dec. 1969).

Standard pork and rat crystalline insulin and fractions of rat islet of Langerhans were assayed for insulin content by the radioimmunoassay method. The results indicated that equal amounts of the crystalline insulin used in the standard preparations and the insulin present in the tissues assayed did not produce equivalent responses as measured by immunoassay, a finding that reflected unequal competition of the insulin present in the standards or tissues with the ^{125}I labeled porcine insulin used as a tracer. The use of crystalline insulin of either kind as a standard to measure insulin in tissue resulted in an underestimation of the amount of insulin present. The pork standard created the greatest discrepancy when used in the measurement of insulin in rat tissue samples. A method is described that will estimate the amount of insulin present in tissue. The results of this method agreed closely with a method of estimating insulin content by electrophoresing the samples on polyacrylamide gels, staining and scanning the gels. (auth)

1723 ACTIVATION ANALYSIS OF ROCKS FOR STRONTIUM AND BARIUM USING A SEMICONDUCTOR DETECTOR. Hamaguchi, Hiroshi (Tokyo Univ.) Bunseki Kiki, 7: 703-7 (Nov. 1969) (In Japanese)

Activation analysis using a semiconductor detector for strontium and barium, was carried out on the following rocks supplied by the U. S. Geological Survey: G-1 (granite), W-1 (Diabase), G-2 (granite), GSP-1 (granite-diorite), AGV-1 (andesite), and BCR-1 (Basalt). The rock was irradiated in a reactor (1.5×10^{12} n/cm²/sec) for one hour. The detector used was a Li-drifted detector with effective capacity of 9.6 ml. Before using the detector coupled with a pulse-height analyzer, the sample of rocks, together with the standard sample, was subjected to group (Sr and Ba) chemical precipitation for separation. For BCR-1 in par-

ticular, the gamma spectra of Sr and Ba for the sample and the standard were in fair agreement. For the six rocks, the amount of Sr and Ba detected in two analyses agreed well within the experimental error. Also the values showed good agreement with previously reported values. The sensitivity of detection by the method was 10 ppm for strontium and 5 ppm for barium, and its applicability to various significant rocks on the earth was demonstrated. (NSA of Japan)

1724 (IA-1190, pp 183-9) SPECTROSCOPY AND SPECTROCHEMICAL ANALYSIS (Israel Atomic Energy Commission, Tel Aviv).

Work was continued on the description of rare earth spectra and interpretation of the energy levels. Special attention was paid to the infrared photographic region. In the field of spectrochemical analysis the laboratory continued to provide analytical services to various customers, and in addition carried out some analyses of geological standard rocks for minor constituents. (auth)

1725 1969 BOOK OF ASTM STANDARDS, WITH RELATED MATERIAL. PART 7. NONFERROUS METALS AND ALLOYS (INCLUDING CORROSION TESTS); ELECTRODEPOSITED METAL LICK COATINGS; METAL POWDERS; NONFERROUS FILLER METAL; NONFERROUS SURGICAL IMPLANTS. Philadelphia; American Society for Testing and Materials (1969). 1115p. \$20.00.

The volume is one of 32 and contains formally approved ASTM standards, tentative specifications, methods of testing, recommended practices, definitions, proposed methods, and related materials. (J. R. D.)

1726 RADIUM AND URANIUM CONTENTS OF STANDARD ROCKS. Nishimura, Susumu (Univ. of Osaka Prefecture, Sakai City, Japan). Chem. Geol.; 5: 139-41 (Nov. 1969).

The 6 U. S. Geological standard rocks together with JG-1, issued by the Geological Survey of Japan, were analyzed with a neutron activation technique and a radon method, and the results for each rock are tabulated. For the determination of the Ra contents of the rocks, each sample, about 5 g of acid and intermediate rocks or about 10 g of basic and ultrabasic rocks, was pulverized and dissolved with HF and HNO₃. After dehydrating, HCl was added to convert to chlorides and the solutions were diluted to volume. After sufficient time for equilibrium, the solutions were boiled, and the Rn was carried into an ionization chamber by N₂. The ionization current, resulting from the radioactivity of the Rn and its decay products, was measured by a vibrating reed electrometer. For the determination of the U contents of the rocks, the samples and monitors, sealed in separate silica tubes, were placed side by side in an aluminum container, which was irradiated for 10 hr in a reactor in a thermal neutron flux of 2×10^{13} n/cm² per sec. The Cd ratio was used to correct for the effect of fast neutrons. The α spectrometric assay of ^{239}Pu was done twice, about one mo and 9 mo after irradiation. The results are compared with the Ra contents obtained by the Bureau of Standards, and the U contents with various earlier reports. (BBB)

1727 (NBS-SPEC-PUBL-310) NUCLEAR STANDARDS FOR CHEMISTRY AND TECHNOLOGY. NUCLEAR STANDARDS FOR INDUSTRY, SCIENCE, GOVERNMENT, AND CONSUMER. Proceedings of a Symposium held at the 156th National Meeting of the American Chemical Society, Atlantic City, New Jersey, September 8-9, 1968. Beeghly, H. F., Cali, J. P., Meinke, W. W. (eds.) (National Bureau of Standards, Washington, D. C.) Dec. 1968. 256p (CONF-680918) GPO \$1.25

The Symposium sponsored by the American Chemical Society Division of Nuclear Chemistry and Technology in cooperation with the Committee on Standardization Relations brought together most of the groups with interests in standards for nuclear chemistry and technology to identify the problems, to discuss present programs, and to outline future needs for standards in this field. Standards for purposes of the symposium were defined very broadly to include standard materials, standard procedures, standard specifications, standard data, and engineering standards. The mechanisms available for standardization, the "state of the art" in standardization in many areas of the nuclear field, some indications of unmet needs, and estimates of future needs were discussed in a series of papers and panel discussions that are presented here in either complete or summary form. (auth)

1728 DETERMINATION OF URANIUM CONTENT IN STANDARD ROCKS BY FISSION-TRACK REGISTRATION IN MUSCOVITE. Nishimura, Susumu (Univ. of Osaka). Radioisotopes (Tokyo); 19: 194-6 (Apr. 1970).

Uranium contents in the six U. S. Geological Survey standard rocks together with JG-1 and JB-1, issued by the Geological Survey of Japan, were analyzed by the technique of fission-track activation using a thin muscovite film placed over the sample to detect tracks

from it. With a thin section of a rock sample, it is often observed that uranium distribution is not uniform as supposed from the pattern of fission-tracks registered in polycarbonate by thermal neutron induced fission of uranium in the sample. Hence, to obtain the mean uranium content in rocks, the pulverized rock sample was used. (auth)

1729 (ORNL-tr-2309) BEHAVIOR OF CONCRETE IN THE PRESENCE OF THERMAL STRESSES AND RADIATION. Report No. 7 Crispino, E., Granata, S., Risoluti, P. (AGIP Nucleare, Milan (Italy)). Translated by R. Gregg Mansfield (Oak Ridge National Lab., Tenn.), from the 2nd Conference on Prestressed Concrete Reactor Vessels and their Thermal Insulation, Brussels, Belgium, November 18-20, 1969. 38p (CONF-691112-5) Dep CFSTI.

Investigations directed toward characterization of concrete materials by measurement of creep, thermal conductivity, and thermal expansion are described. A standard concrete was developed for structural uses in temperatures up to 300°C. Another concrete, named B H T, was developed which is suitable for use as structural material up to 500°C. (J R D)

1730 ROUND-ROBIN TESTS TO DEVELOP A STANDARD AUTOCLAVE TESTING PROCEDURE FOR ZIRCONIUM ALLOYS. Bryant, P. E. C. (Atomic Energy of Canada Ltd., Chalk River, Ont.). ASTM (Amer. Soc. Test. Mater.) Spec. Tech. Publ.; No. 458, 360-71 (1969).

From Symposium on Applications-Related Phenomena in Zirconium and Its Alloys, Philadelphia, Pa. See ASTM-STP-458; CONF-681105.

Two interlaboratory tests were conducted, the first with Zircaloy-2, the second with 2.5 Nb-Zr alloy, to formulate standard autoclave test procedures for zirconium alloys. In interlaboratory-1, each laboratory used its own test procedure. The large scatter in data was attributed primarily to differences in autoclave start-up techniques, with minor contributions from variations in pickling time, and residual oxygen remaining in the autoclaves. Standard coupon preparation techniques were invoked for the 2.5 Nb-Zr alloy for interlaboratory-2, ASTM proposed standard G-2, 1967, was used for autoclave start-up. The good reproducibility from interlaboratory-2 confirmed the acceptability of the proposed ASTM standard autoclave procedure. Decreased corrosion of annealed 2.5 Nb zirconium with time was attributed to the monotectoid transformation of Nb enriched β_{Zr} to α_{Zr} plus β_{Nb} . (auth)

1731 (ORNL-NSIC-76) COMPILATION OF UNITED STATES NUCLEAR STANDARDS. 6th Edition, 1969. (Oak Ridge National Lab., Tenn.). Jul 1970. Contract W-7405-eng-26. 177p. Dep. CFSTI.

Standards information that might be of value to an individual in the nuclear community is compiled and presented in tabular form. The technical, industrial, and environmental organizations are listed alphabetically and their standards activities are given. In addition, standards are indexed by permuted title for location by a specific topic. (H D R)

1732 (UCRL-20034) CAMAC A STANDARD FOR DIGITAL DATA HANDLING. Mack, Dick A. (California Univ., Berkeley, Lawrence Radiation Lab.). Jul 1970. Contract W-7405-eng-48. 13p. (CONF-700620-1). Dep. CFSTI.

From American Physical Society, Canadian Association of Physicists, and Sociedad Mexicana de Fisica Meeting, Winnipeg, Canada.

1733 (NBS-TN-508) ACTIVATION ANALYSIS. Summary of Activities, July 1968 to June 1969. LaFleur, Philip D. (ed.) (National Bureau of Standards, Washington, D. C.). Jul 1970. 147p. GPO \$1.25.

The design and installation of irradiation facilities for the NBS Reactor are described, and studies on the operating characteristics of the pneumatic tube facilities have begun. Procedures have been developed for determining molybdenum in the presence of large amounts of tungsten and for the determination of uranium. Methods for determining a contamination free blank for application to liquid samples, a study of the application of neutron activation to the analysis of stained glass were also begun. The application of thermal and fast neutron activation analysis and photonuclear activation analysis to the NBS Standard Reference Material program is discussed. Applications of 3-MeV neutrons from a Cockcroft-Walton neutron generator to activation analysis and of the 3-MeV neutron buildup in 14-MeV neutron activation have been studied. The determination of carbon by photonuclear activation has been extended to various metals other than sodium, thallium has been determined in glass samples by photon bombardment; and the photofission of thallium, bismuth, and lead has been studied. Hydrated antimony pentoxide has been used to separate sodium from glass samples for

subsequent instrumental activation analysis, and the antibiotic, tetracycline, has been applied to radiochemical separations. (auth)

1734 DETERMINATION OF SCANDIUM AND GOLD IN METEORITES, TEKTITES, AND STANDARD ROCKS BY NEUTRON ACTIVATION ANALYSIS WITH AN INTERNAL-REFERENCE METHOD. Nomura, K., Mikami, A., Kato, T., Oka, Y. (Tohoku Univ., Sendai). Anal. Chim. Acta, 51. 399-408 (Sep 1970).

An internal-reference method has been established for the determination of scandium and of gold by neutron activation analysis, with calcium and platinum, respectively, as the reference elements, the method has been applied to the determination of both elements in several materials of geochemical origin. The composite γ spectra of scandium and gold activities arising from scandium and gold in a sample and from the element used as reference by the (n, γ) reaction followed by the β -decay are measured. The results can be calculated on the basis of the activity ratio of the two species in terms of the photopeak areas. The success of the method depends on chemical separations and on the high resolving power of a lithium-drifted germanium detector. Sensitivity and accuracy were assessed by analyzing synthetic mixtures of known composition. The proposed method was verified to be accurate for both elements even at ppB levels. The Bruderheim and Canyon Diablo meteorites, Indochinite tektite, and standard rocks, G-I, W-I, and JG-I were tested. (auth)

1735 RARE EARTH ABUNDANCES IN SEVERAL GEO-CHEMICAL STANDARD ROCKS. Higuchi, Hideo (Rikkyo Univ., Yokosuka, Japan). Tomura, Kenji; Onuma, Naoki, Hamaguchi, Hiroshi. Geochem. J. (Nagoya); 3. 171-80 (Dec 1969).

Concentrations of rare earth elements in eight U.S. Geological Survey standard rocks G-1, W-1, G-2, GSP-1, AGV-1, BCR-1, PCC-1 and DTS-1 are reported. The rare earth elements were determined by neutron activation analysis with a lithium-drifted germanium detector after chemical group separation. Rare earth abundance data in PCC-1 and DTS-1 are the first available on these rocks. (auth) (Japan)

1736 (INSJ-120) AVERAGE RANGE-ENERGY RELATION OF MUONS OF ENERGIES ABOVE 10^4 eV AND ITS FLUCTUATION. Nagano, Motohiko (Tokyo Univ. (Japan). Inst. for Nuclear Study). 1 Jun 1970. 27p. Dep. CFSTI (U.S. Sales Only).

The average range energy relations of muons in standard rock are calculated under the several assumptions of the cross section of muon-nucleon interaction. The fluctuation of the range around the average is estimated by means of the Monte Carlo method. The energy spectra of the vertical muons at sea level derived from the depth-intensity relation are presented for the various assumptions considered. (auth)

1737 (ORO-2670-40) RADIOCHEMISTRY AS APPLIED TO GEOCHEMICAL PROBLEMS. NEUTRON ACTIVATION ANALYSIS. Progress Report, August 1, 1969-July 31, 1970. Ehmann, William D. (Kentucky Univ., Lexington, Dept. of Chemistry). 1 Oct 1970. Contract AT(40-1)-2670. 27p. Dep. CFSTI.

Research on nondestructive techniques in activation analysis and gamma-gamma coincidence spectrometry applied to activation analysis is reviewed. Thermal neutron activation and γ -spectrometry utilizing high resolution Ge(Li) detectors were used to determine the abundance of Na, Fe, Th, Cr, La, Hf, Cs, Sc, Co, Eu, Si, Au, and Hg in australites from documented sites. The analysis of representative tektites from the major occurrences indicated that Australasian tektites are all very similar in chemical composition. Neutron activation analysis was used to determine gold in a group of igneous rocks occurring in an igneous-sedimentary belt of south-eastern Manitoba. Bismuth was determined in 15 chondrites and 6 U.S. Geological Survey standard rocks, by α -counting of the ^{210}Po daughter activity. (J G B)

1738 (ORNL-NSIC-78) COMPILATION OF NATIONAL AND INTERNATIONAL NUCLEAR STANDARDS (EXCLUDING U.S. ACTIVITIES). 6th Edition, 1970. (Oak Ridge National Lab., Tenn.). Oct 1970. Contract W-7405-eng-26. 129p. Dep. NTIS.

All known national and international nuclear standards activities are tabulated. Standards activities of all national organizations, technical societies and government agencies are listed alphabetically by country. Standards activities are included for Australia, Austria, Belgium, Canada, Denmark, France, Germany, Hungary, India, Israel, Italy, Japan, Netherlands, Norway, Pakistan, Republic of South Africa, Spain, Sweden, United Kingdom, and Yugoslavia. International organizations activities include Bureau Veritas, European Organization for Nuclear Research, European Atomic Energy Community, Food and Agriculture Organization, Intergovernmental Maritime Consultative Organization, International Air Transport Association, International Atomic Energy Agency, International Commission on Radiation Units and Measurements,

International Commission on Radiological Protection, International Electrotechnical Commission, International Labor Organization, International Organization for Standardization, Lloyd's Register of Shipping, Organization for Economic Cooperation and Development, United Nations, World Health Organization, and World Meteorological Organization 17 references (D C C)

1739 USE OF X-RAY FLUORESCENCE FOR THE NON-DESTRUCTIVE QUANTITATIVE DETERMINATION OF TRACE AMOUNTS OF ELEMENTS OF ATOMIC NUMBER GREATER THAN 27 IN SILICATE, BAUXITE, AND CARBONATE ROCKS. Quintin, M. (Faculte des Sciences, Paris). pp 75-87 of Dosage des Elements a l'Etat de Traces dans les Roches et les Autres Substances Minerales Naturelles. Paris; Centre National de la Recherche Scientifique (1970). (In French).

From National Conference on Measurement of Elements Occurring in Traces in Rocks, Nancy, France. See CONF-681205.

In the determination of major elements of rocks, x-ray fluorescence is employed with success. This technique can also give good results in the determination of trace amounts of elements in geological materials. Special consideration was given to non-destructive analysis in an attempt to gain maximum information with a minimum of preparation. Hoover's method was theoretically justified then experimentally verified. The field of application and its validity are defined. A linear relation between intensity of the Compton WL β_1 ray diffused by the sample and the reverse of the relative absorption was confirmed. These principles are illustrated by the study of five international standards W_1 , syenite, GR, DRN, and UBN, for several elements situated in the zone 1 of Hoover. (auth)

1740 USE OF SODIUM CHLORIDE AS A SPECTRAL BUFFER IN EMISSION SPECTROGRAPHY. APPLICATION TO THE DETERMINATION OF TRACE ELEMENTS IN SILICATE ROCKS. Martin, A.; Quintin, M. (Faculte des Sciences, Paris). pp 187-95 of Dosage des Elements a l'Etat de Traces dans les Roches et les Autres Substances Minerales Naturelles. Paris; Centre National de la Recherche Scientifique (1970). (In French).

From National Conference on Measurement of Elements Occurring in Traces in Rocks, Nancy, France. See CONF-681205.

A simplified emission spectrography method for the quantitative determination of 10 trace elements in silicate rocks is described. The use of NaCl as spectral buffer and of a three-step filter has allowed the number of analyses as well as reproducibility to increase. Powder sample was mixed with two parts of NaCl, four parts of graphite, and arcing mixture was burned into a graphite electrode as anode in a dc arc. The reproducibility and accuracy of the method have been tested with Rock Standard W_1 (U S G S). Results obtained with Syenite Rock (CAAS) and Rock Standards GR, DRN, UBN, prepared by the CRPG of Nancy France are reported. (auth)

1741 DETERMINATION OF URANIUM CONTENTS IN SOME ROCKS BASED ON FISSION TRACK METHOD. Hashimoto, Tetsuo (Kyoto Univ.); Hayashi, Seiji; Iwata, Shiro. Jap. Anal.; 19: 1538-43 (Nov 1970). (In Japanese).

Uranium contents in some rocks were determined by means of a conventional fission track method. For making the standard samples, an aliquot of standard uranium solution was mixed with the known amounts of fine silica gel powder. Both the standard and pulverized rock samples were pressed on muscovite into thin tablets using a hand press. These tablet samples were irradiated in a reactor, KUR, and then subjected to the chemical etching procedure of mica surface in HF solution. The number of fission tracks on mica was counted up a microscopic photograph. The relationship between uranium content and track number was linear as expected from the calculation. Thus the uranium content of rocks could be easily determined by the use of a standard calibration curve. The effects of powder grain and of thorium, which is the only fissile element in nature except uranium, were also investigated. Uranium contents of four U S Geological standard rocks together with JG-1 and JB-1 have been conveniently determined by this fission track technique and the results were compared with those by others. (auth)

1742 DIFFUSION OF ^{24}Na IN A VISCOSITY STANDARD SILICATE GLASS. Winchell, P. (Gulf General Atomic Inc., San Diego, Calif.). Phys. Chem. Glasses; 11: 115-16 (Aug 1970).

Diffusion coefficients for the transport of ^{24}Na in NBS 710 viscosity standard silicate glass were obtained in the temperature range 1041 to 1742°K. The results are summarized by $D = 1.70 \times 10^{-2} \exp \{-(2.35 \times 10^4/\text{RT})\}$ (auth) (UK)

1743 (ORNL-NSIC-75(Rev.1)) PERSONNEL INVOLVED IN THE DEVELOPMENT OF NUCLEAR STANDARDS IN THE UNITED STATES. (Oak Ridge National Lab., Tenn.). Dec 1970. 626p. Dep. NTIS.

The personnel involved in the development of nuclear standards in the United States are listed. The listings, prepared by machine sorting, are alphabetical by personal name (white pages), company affiliation (blue pages), and standards, organizations, and committee titles (green pages). A KWIC (Keyword in Context) index of topics (yellow pages) giving the name of the committee or group working on a given topic is included. A list of the members of the Nuclear Technical Advisory Board is also given. (E R B)

1744 (NBS-TN-548) ACTIVATION ANALYSIS SECTION. SUMMARY OF ACTIVITIES, JULY 1969-JUNE 1970. LaFleur, Philip D.; Becker, Donald A. (eds.). (National Bureau of Standards, Washington, D. C.). Dec 1970. 164p. GPO \$1.25.

Activities of the Activation Analysis Section for the period July 1969 to June 1970 are surveyed and progress made on the various projects discussed. Operating characteristics of the NBS Reactor for activation analysis are given. Special attention is given to the many practical problems encountered and the solutions to these problems, especially the analysis of trace elements in glass Standard Reference Material (SRM) and of the botanical SRM. The quantitative analysis for boron using the nuclear track technique is discussed as well as extension of the analysis for uranium using this technique. The value of 3-MeV neutrons in neutron generator activation analysis and the experimental parameters for using these neutrons are discussed. The new target and pneumatic transfer systems at the NBS LINAC for photon activation analysis are described and the application of photon activation analysis for determining thallium in glass and high-purity metals and gold, manganese, and iron in high-purity cadmium is discussed. Research into determination of nitrogen by photon activation analysis is described. A computer program, ALSPIS, for peak finding and integration is described and the application of a mini-computer to the Activation Analysis Section is noted. (auth)

1745 TIN IN SOME STANDARD ROCKS. Schmidt, Diether (Max-Planck-Institut fuer Kernphysik, Heidelberg). Earth Planet. Sci. Lett.; 10: 441-3 (Mar 1971).

Neutron activation analysis was used to determine the concentration of tin in the United States Geological Survey (U S G S) diabase W-1, the six new U S G S standards G-2, GSP-1, AGV-1, PCC-1, DTS-1, and BCR-1, and in the standard tonalite T-1. Reproducibility was good for duplicate analyses, but there were differences from previously reported data. (auth)

1746 THE DETERMINATION OF FLUORINE IN ROCK MATERIALS BY γ -ACTIVATION AND RADIOCHEMICAL SEPARATION. Hislop, J. S.; Pratchett, A. G.; Williams, D. R. (Atomic Energy Research Establishment, Harwell, Eng.) Analyst, 96: 117-22 (Feb 1971).

A technique is described for the determination of fluorine in rock materials involving irradiation in a source of high energy γ -photons to induce the $^{19}\text{F}(\gamma, n)^{18}\text{F}$ reaction. Fluorine-18 is then separated from the radioactive matrix by distillation and its activity measured either in the distillate or as precipitated calcium fluoride and compared with that of irradiated calcium fluoride standards. The technique was applied to the analysis of standard rock materials G1 (638 ppm), W1 (221 ppm), T1 (476 ppm) and to Apollo 11 lunar fines (76 ppm). Precautions are taken to eliminate interferences. The results obtained for the standard rocks are in good agreement with those of conventional methods but disagree with other activation results. The limit of detection of the method is 0.002 μg . (auth) (UK)

1747 DETERMINATION OF SODIUM IN ULTRABASIC ROCKS. Das, H. A.; de Koning, J.; Oosterom, M. G. (Reactor Centrum Nederland, Petten). Radiochem. Radioanal. Lett.; 6: 203-9 (3 Apr 1971).

A method was developed for the selective determination of sodium in US Geological Survey standard rocks. A cadmium-cover technique was used with the neutron activation analysis of DTS-1 and PCC-1 standards. (J C B)

1748 DETERMINATION OF PLATINUM AND PALLADIUM IN GEOLOGICAL MATERIALS BY NEUTRON-ACTIVATION ANALYSIS AFTER FIRE-ASSAY PRECONCENTRATION. Rowe, J. J.; Simon, F. O. (Geological Survey, Washington, D. C.). Talanta; 18: 121-5 (Jan 1971).

Fire-assay preconcentration followed by neutron activation analysis permits the determination of as little as 0.5 ppm of platinum and 0.5 ppm of palladium in a 20 g sample. Platinum and palladium are separated with carriers and beta-counted. Results for the platinum and palladium content of seven U S G S standard rocks are presented. (auth) (UK)

1749 CODE OF GOOD PRACTICES FOR THE PERFORMANCE OF CRITICAL EXPERIMENTS. ANS-STD 1.1967. Hinsdale, Ill.; American Nuclear Society (1967). 2p. Available from American Nuclear Society, Hinsdale, Ill.

This Code of Good Practices is for guidance in the performance of critical experiments. It is intended for catholic applicability and is formulated in general terms in order to avoid imposing undue limitations on specific local experiment practices. (auth)

1750 CODE OF GOOD PRACTICES FOR THE DOCUMENTATION OF DIGITAL COMPUTER PROGRAMS. ANS-STD 2 1967. Hinsdale, Ill., American Nuclear Society (1967). 3p. Available from American Nuclear Society. Hinsdale, Ill.

1751 STANDARD REFERENCE MATERIALS FOR THE ANALYSIS OF ENVIRONMENTAL SAMPLES. Marlow W F (Atomic Energy Commission Washington D C), Lafleur P D pp 91-4 of Nuclear Techniques in Environmental Pollution. Vienna International Atomic Energy Agency (1971).

From Symposium on the use of nuclear techniques in the measurement and control of environmental pollution. Salzburg, Austria (26 Oct 1970). See STI/PUB-268 CONF 701023.

The US Atomic Energy Commission and the US National Bureau of Standards have instituted a program for the production of a series of special Standard Reference Materials fully characterized for at least 22 and possibly 30 elements suitable for use in the analysis of environmental samples particularly biological samples. These Standard Reference Materials will be available for purchase by all laboratories. Multilaboratory intercomparisons of these Standard Reference Materials will be encouraged. Details of the nature of these materials elements for which they will be characterized and analytical techniques used in standardizing them are discussed. (auth)

1752 CALIBRATED U-TH GLASSES FOR NEUTRON DOSIMETRY AND DETERMINATION OF URANIUM AND THORIUM CONCENTRATION BY THE FISSION TRACK METHOD. Schreurs J W H (Corning Glass Works N Y), Friedman A M, Rokop D J, Hair M W, Walker R M. Radiat Eff 7: 231-3 (Feb 1971).

A series of standard uranium glasses was prepared. A primary standard containing 41 ppm of added U had its concentration and isotope ratio verified by mass spectrometry and by fission track techniques. Secondary standards were compared to the primary standard using the fission track technique. These glasses are useful for measuring both Th and U in solids. The U concentration in an unknown is determined by comparing the fission track density induced by thermal neutron irradiation with the corresponding density in the standard. Th is measured by a cyclotron irradiation using the same U standards. The glasses are also useful for neutron dosimetry. Investigators may obtain small samples of most of these standards from R H Brill of the Corning Museum of Glass. Although most of the glasses were fabricated from depleted uranium, one standard containing natural uranium is available. A standard Th glass with concentration of 41 ppm was also made. (auth)

1753 STANDARD SPECIFICATION FOR TANTALUM INGOTS AND FLAT MILL PRODUCTS. ASTM B 364-70. Philadelphia, American Society for Testing and Materials (1970). 3p. Available from American Society for Testing and Materials. Philadelphia.

This specification covers unalloyed tantalum in several grades and forms. The grades consist of powder metallurgy, arc cast and electron beam cast and the forms include ingot, bar, plate, sheet, strip and foil. (auth)

1754 ABSOLUTE ISOTOPIC SCALE FOR DEUTERIUM ANALYSIS OF NATURAL WATERS. ABSOLUTE D/H RATIO FOR SMOW. Hagemann R, Nief G, Roth E (CEN de Saclay Gif-sur-Yvette France). Tellus 22: 712-5 (1970).

The absolute isotopic ratios of the hydrogen content of two reference water standards called SMOW (Standard Mean Ocean Water) and SLAP (Standard Light Antarctic Precipitation) were measured to define an absolute isotopic scale. This isotopic scale can be used to normalize measurements of the natural isotopic variations in waters. The principle of the method used to define the zero of the scale is given. The absolute D/H ratios of SMOW and SLAP were measured by mass spectrometric comparison with calibration mixtures prepared in the laboratory. The following values are obtained: (D/H) SMOW $155.76 \pm 0.05 \times 10^{-6}$, (D/H) SLAP $89.02 \pm 0.05 \times 10^{-6}$. $\delta_{\text{‰}}^{\text{D}} \text{SLAP/SMOW}$ 428.50 ± 0.10 . Samples of about 20 cc of the reference standards SMOW and SLAP are available from the International Atomic Energy Agency on request. (auth) (Sweden).

1755 STANDARD METHOD OF TEST FOR SURFACE FLAMMABILITY OF MATERIALS USING A RADIANT HEAT ENERGY SOURCE. ASTM E 162-67. Philadelphia, American Society for Testing and Materials (1967). 12p. Available from American Society for Testing and Materials. Philadelphia.

This method, to be used for research and development purposes, covers the measurement of surface flammability of materials. It

is not intended for use as a basis of ratings for building code purposes. (auth)

1756 USA STANDARD GLOSSARY OF TERMS IN NUCLEAR SCIENCE AND TECHNOLOGY. ANSI N 1.1 196. New York, United States of America Standards Institute (1967). 111p. Available from American National Standards Inst. New York.

Standard definitions for the terms appearing in nuclear science and technology are given. (R W R)

1757 ACTIVATION ANALYTICAL STUDIES OF STANDARDIZED IRON ALLOYS. I. QUANTITATIVE VANADIUM DETERMINATION AND QUALITATIVE CERTIFICATE TESTING. Gruber E, Sorantin H (Univ., Vienna Oesterreichische Studiengesellschaft fuer Atomenergie, Seibersdorf, Austria). Mikrochim Acta, No 2: 262-6 (1971). (In German).

Vanadium was determined without interference by means of neutron activation analysis and gamma spectrometry in two standardized alloys (NBS-1138 Cast Steel 1 and NBS-1140 Ductile Iron 1). In the preliminary trials for determining the optimization of the measurement conditions the presence of arsenic and antimony was established qualitatively in addition to the elements stated provisionally in the certificate describing NBS-1138 and likewise antimony and lanthanum were found in the NBS-1140. (auth)

1758 TH MICROANALYSIS USING FISSION TRACKS.

Hair M W, Kaufhold J, Maurette M, Walker R M (Washington Univ. St. Louis) pp VI 26-33 of Proceedings of the International Topical Conference on Nuclear Track Registration in Insulating Solids and Applications. Held at Clermont-Ferrand, France May 6-9 1969. Vol 2 / Isabelle D (ed.) Clermont-Ferrand France. Universite de Clermont-Ferrand (1969).

From International topical conference on nuclear track registration in insulating solids and applications. Clermont-Ferrand France (6 May 1969). See CONF-690522-(Vol 2).

A method for Th determination based on the fission track production rates observed in sequential irradiations of an unknown with 30 MeV α particles and thermal neutrons was previously described. Improved techniques for this method are reported. Measurements of the S G S standard powdered rock samples indicate an absolute accuracy of less than 10% for concentrations greater than 0.1 ppm. This conclusion is verified by further comparisons based on specially fabricated trace Th glasses and certain natural obsidian samples. The technique that was used also measures the U concentration of the unknowns. Working with obsidian artifacts and obsidian mine samples from the Aegean region. The Th groupings that agree with previous groupings that were based on Ba and Zr analyses were found. The advantage of the fission track methods for Th determination is the ability to make absolute determinations on very tiny samples and to do micromapping of the Th distribution in larger samples. As an example, some of the powdered rock standards were found to be inhomogeneous on a microscale giving rise to sunburst patterns of fission tracks. (France).

1759 (ORNL-NSIC-85) COMPILATION OF UNITED STATES NUCLEAR STANDARDS. 7th Edition, 1970. (Information Collected Spring and Summer 1970). (Oak Ridge National Lab., Tenn.). Jun 1971. Contract W-7405-eng-26, 197p. Dep. NTIS.

All United States Nuclear Standards activities known to the Special Committee of the Nuclear Technical Advisory Board are presented in simple tabular form. The pertinent technical, industrial and environmental organizations are listed alphabetically and the standards activities are given for each. In addition to approved standards, unapproved drafts and proposed activities are also listed when the information is available. In the United States the most concerted standards efforts are channeled through the American National Standards Institute, which is a national federation of more than 110 technical societies and trade associations that include 2300 companies and the U S government as sponsors. Thus, the nuclear standards effort of many organizations including several of those listed who also conduct some independent activities are represented in the standards program of the American National Standards Institute. 67 references. (auth)

1760 DETERMINATION OF ANTIMONY IN STANDARD ROCKS BY INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS. Lombard S M (Naval Research Lab., Washington, D C), Marlow K W, Tanner, James T. Anal Chim Acta, 55: No 1, 13-17 (Jun 1971).

The abundance of antimony in the standard rocks G-1, W-1, G-2, BCR-1, AGV-1, PCC-1, DTS-1, GSP-1, SUL-1, SYE-1, BCR-2 and GR was determined by instrumental neutron activation analysis. Comparison of the results of this work with those previously reported indicate that DTS-1 is the best choice as an antimony standard. Results for SYE-1, G-1 and AGV-1 indicate that these standards may not be sufficiently homogeneous. (auth)

1761 (COO-2137-1) FINAL REPORT [ON NUCLEAR STANDARDS]. Voigt, Keith L. (American Nuclear Society, Hinsdale, Ill.). 1971. Contract AT(11-1)-2137. 4p. Dep. NTIS.

1762 (IFA-NR-34) INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS OF SOME GERMAN AND CZECHOSLOVAKIAN ROCK STANDARDS. Cojocaru, V.; Ispas, Maria (Institutul de Fizica Atomica, Bucharest (Romania)). [1970]. 13p. Dep. NTIS (U. S. Sales Only).

Using high-resolution Ge(Li) detectors and neutron activation analysis, 24 elements were determined in six standard rocks GM (granite), KH (limestone), TB (argillite), BM (basalt) and an anhydrite, prepared in the Democratic Republic of Germany, and a magnesite prepared in Czechoslovakia. A comparison between three different graphites (GM, G-1, and G-2) is given (auth)

1763 DETERMINATION OF CADMIUM, MERCURY, THALLIUM, AND BISMUTH IN TERRESTRIAL ROCKS BY NEUTRON ACTIVATION ANALYSIS. Marowsky, Gerd (Univ., Goettingen, Ger.). Z. Anal. Chem., 253 No. 4, 267-71(1971) (In German).

In a series of U S Geological Survey standard rocks and high purity quartzes the trace elements Cd, Hg, Tl, and Bi were determined by thermal neutron activation analysis. The bulk activity of the samples was removed by ion exchange. Cd and Hg were purified as far as necessary for Ge(Li) γ spectrometry. The β -emitters ^{204}Tl and ^{210}Bi were separated in radiochemical purity. For a 3 day irradiation at a thermal neutron flux of $6 \times 10^{13} \text{ cm}^{-2} \times \text{sec}^{-1}$ the detection limits were 0.1 ppB for Hg and Tl, and 1 ppB for Cd and Bi (auth)

1764 NEUTRON ACTIVATION ANALYSIS OF A STANDARDIZED Al-Si ALLOY. II. DETERMINATION OF CHROMIUM, ZINC, IRON, COBALT, SCANDIUM, HAFNIUM, AND NICKEL. Becker, R., Sorantin, H. (Univ., Vienna, Oesterreichische Studiengesellschaft fuer Atomenergie, Seibersdorf). Z. Anal. Chem., 254 No. 4, 281-6(1971). (In German).

An Al-Si-alloy (No. 87a) standardized by the National Bureau of Standards, Washington, was activated by thermal neutrons and the radionuclides produced first analyzed with a Ge(Li) detector. Besides the expected radionuclides, ^{46}Sc , ^{60}Co and ^{181}Hf were also found. Afterwards the sample was dissolved and the radionuclides separated by extraction with trioctyl phosphin oxide or tributyl phosphate, supported on polytrifluoromonoethylenecol columns. The isolated radionuclides were also identified and determined by γ spectrometry, with a NaI(Tl) detector. The results of both methods showed good agreement and the deviations of the standard values were between ± 0.6 and 3.7% (auth)

1765 INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS OF SOME NEW STANDARD ROCKS. Cojocaru, V.; Ispas, M. (Inst. for Atomic Physics, Bucharest) pp 73-7 of Activation Analysis in Geochemistry and Cosmochemistry /Brunfelt, Arild O. (ed.) Oslo: Universitetsforlaget (1971)

From Conference on activation analysis in geochemistry and cosmochemistry; Kjeller, Norway (7 Sep 1970). See CONF-700968.

By means of high resolution Ge(Li) detectors and neutron activation analysis, 24 elements were determined in six standard rocks GM (granite), KH (limestone), TB (argillite), BM (basalt) and an anhydrite, prepared in D D R, and a magnesite prepared in Czechoslovakia (auth) (Norway)

1766 TENTATIVE GUIDE FOR SELECTION OF NEUTRON ACTIVATION DETECTOR MATERIALS. ASTM E419-70T. Philadelphia: American Society for Testing and Materials (1970) 5p. Available from American Society for Testing and Materials, Philadelphia

A guide is presented to bring about more uniformity in materials used for neutron activation detectors. The thickness, self-shielding, self-absorption, outer flux depression, fission fragment loss, diameter, shape and mass, and purity of foils are discussed. Alloys, other forms of detectors, and thermal neutron shields are considered. Commonly used detector materials are listed (M C G)

1767 (MIT-1381-18) VARIATIONS IN ISOTOPIC ABUNDANCES OF STRONTIUM, CALCIUM, AND ARGON AND RELATED TOPICS. Eighteenth Annual Progress Report for 1970. (Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences). 1 Dec 1970. Contract AT(30-1)-1381. 159p. Dep. NTIS.

Geochronological studies based on measurements of the isotopic abundances in rocks from worldwide locations such as Korea, Venezuela, Vermont, Guyana, Liberia, Sierra Leone, Maine, eastern USA, and east Africa, are presented. Three doctoral theses investigations on the roles of ilmenite and garnet pyroxenite in the constitution of the upper mantle, the ages and trace element compositions of the Canadian Precambrian iron formations, and age and paleomagnetic investi-

gation on precambrian diabase dikes are included. Techniques and standards for measuring isotopic abundances, particularly x-ray fluorescence and mass spectrometric analyses of Rb and Sr in silicate standards, are described. Abstracts of papers presented at meetings and additions to the project bibliography are included (L C L)

1768 (ORNL-NSIC-94) COMPILATION OF NATIONAL AND INTERNATIONAL NUCLEAR STANDARDS (EXCLUDING U.S. ACTIVITIES). 7th Edition, 1971. Information Gathered to Dec. 31, 1970. (Oak Ridge National Lab., Tenn.). Sep 1971. Contract W-7405-eng-26. 129p. Dep. NTIS.

All known national and international nuclear standards activities are tabulated. Standards activities of all national organizations, technical societies and government agencies are listed alphabetically by country. Standards activities are included for Australia, Austria, Belgium, Canada, Denmark, France, Germany, Hungary, India, Israel, Italy, Japan, Netherlands, Norway, Pakistan, Republic of South Africa, Sweden, United Kingdom, and Yugoslavia. International organizations activities include Bureau Veritas, European Organization for Nuclear Research, European Atomic Energy Community, International Air Transport Association, IAEA, International Commission on Radiological Protection, International Commission on Radiation Units and Measurements, International Electrotechnical Commission, Intergovernmental Maritime Consultative Organization, International Organization for Standardization, IAEA, Organization for Economic Cooperation and Development, European Nuclear Energy Agency, and United Nations. 18 references (D C C)

1769 (NBS-SPLC, PUBL-260-30) STANDARD REFERENCE MATERIALS. STANDARD SAMPLES ISSUED IN THE USSR. Gorozhanina R S, Freedman A Y, Shaevitch A B. Translated by M C Selby (National Bureau of Standards, Boulder, Colo.), from the Russian. 82p. GPO \$1.00

Information is presented on standard samples of properties and composition of substances and materials including areas of their application, nomenclature, certified characteristics, and values of the certified quantities (auth)

1770 SUBSTOICHIOMETRIC DETERMINATION OF SELENIUM BY NEUTRON ACTIVATION ANALYSIS. Nadkarni, R. A., Haldar, B. C. (Inst. of Science, Bombay). Radiochem. Radioanal. Lett., 7 No. 5-6, 305-11(10 Sep 1971).

A method was developed for substoichiometric neutron activation analysis of trace amounts of selenium based on extraction of Se(IV) with diaminobenzidine in ethyl acetate. The selenium content of the geological standard rocks T-1, W-1, Sye-1 and GR as well as the meteorite Allende de Pabito and the biological standard kale, were determined by the proposed method (auth)

1771 CAMAC DATAWAY AND BRANCH HIGHWAY SIGNAL STANDARDS. Larsen, R S. (Stanford Univ., Calif.) IEEE (Inst. Elec. Electron. Eng.), Trans. Nucl. Sci.; NS-18 No. 2, 26-32(Apr 1971)

From IEEE nuclear science symposium; New York, N Y (4 Nov 1970)

The basic dataway operation is briefly described to illustrate the use of various control lines. Voltage, current, and timing characteristics of CAMAC Dataway and Branch Highway signals are given (R W R)

1772 DETERMINATION OF TRACE ELEMENTS IN BIOLOGICAL STANDARD KALE BY NEUTRON ACTIVATION ANALYSIS. Nadkarni, R. A., Ehmann, W. D. (Univ. of Kentucky, Lexington). J. Radioanal. Chem., 3 No. 3-4, 175-85(Sep 1969).

Fifteen elements at trace levels were determined by neutron activation analysis in the biological standard kale distributed by BOWEN. La, Br, As, Se, Sc, Ag, Zn, Co, Cr, Sb, Eu, Fe, and Zr were determined by a nondestructive technique using a high-resolution Ge(Li) detector. Two more elements, Au and Hg, were determined after radiochemical separation. The nondestructive procedure is shown to yield data in generally good agreement with those obtained by destructive techniques. Potential sources of error in the nondestructive technique are discussed (auth)

1773 DETERMINATION OF 32 ELEMENTS IN ROCKS BY NEUTRON ACTIVATION ANALYSIS AND HIGH RESOLUTION GAMMA-RAY SPECTROSCOPY. Filby, R H., Haller, W A., Shah, K R. (Washington State Univ., Pullman). J. Radioanal. Chem., 5 No. 2, 277-89(Jul 1970)

Neutron activation analysis and Ge(Li) spectroscopy was used to determine 32 elements in seven U S G S standard rocks of a wide range of composition. Short half-life nuclides (10 sec to 10 min) were used to measure Sc, Hf, Dy, Mg, Al, Ca, Ti, V (and Na) in an automated robot Ge(Li) detector system. The elements K, Cu, Zn, Ga, Sr, Ba, La, Eu, Sm (and Mn) were determined by dissolution of the irradiated sample followed by removal of ^{24}Na on

hydrated antimony pentoxide (HAP) Long-lived nuclides were used to measure Sc, Cr, Fe, Co, Zr, Rb, Sb, Cs, Ba, Ce, Eu, Yb, Tb, Lu, Hf, Ta, and Th after decay of ^{24}Na . The method involves little radiochemistry and the separation is selective for ^{24}Na under the experimental conditions used. Elemental concentrations determined agree well with previously published data. (auth)

1774 DETERMINATION OF ZINC IN STANDARD REFERENCE MATERIALS BY ISOTOPE DILUTION AND ATOMIC ABSORPTION ANALYSIS. Rosman, K. J. R., Jeffery, P. M. (Univ. of Western Australia, Nedlands). Chem. Geol., 8 No. 1, 25-32 (Jul 1971).

Zinc was determined in a range of standard reference materials using stable isotope dilution and atomic absorption spectrophotometry. Provided that samples were first passed through an ion exchange column to reduce the level of contaminating species, the atomic-absorption method yielded results in general agreement with the isotope dilution values. (auth)

1775 SUBSTOICHIOMETRIC DETERMINATION OF TUNGSTEN BY NEUTRON ACTIVATION ANALYSIS. Nadkarni, R. A.; Haldar, B. C. (Inorganic and Nuclear Chemistry Lab., Bombay). J. Radioanal. Chem., 8 No. 1, 45-51 (Jun 1971).

A method for stoichiometric determination of tungsten by thermal neutron activation analysis was developed based on the selective extraction of the tungsten dithiol complex into amyl acetate. The method is simple, rapid, and accurate. It was used in the determination of tungsten in alloy steel, meteorites, and biological standard kale. (auth)

1776 DETERMINATION OF Iridium in Rocks. Das, H. A.; Janssen, R.; Zonderhuis, J. (Reactor Centrum Nederland Petten). Radiochem. Radioanal. Lett., 8 No. 4, 257-65 (5 Dec 1971).

A simple procedure for determination of iridium in rocks by neutron activation analysis is presented. The radionuclide used is ^{192}Ir ($T_{1/2}$ 74 d). The method of isolation is based on ion exchange with the chelating resin, Saffron NMRR. Data for a few standard rocks of the U.S. Geological Survey are given. (auth)

1777 SIMULTANEOUS DETERMINATION OF CHROMIUM AND ZINC BY NEUTRON ACTIVATION ANALYSIS. Nadkarni, R. A.; Haldar, B. C. (Inst. of Science, Bombay). Radiochem. Radioanal. Lett., 8 No. 4, 233-40 (5 Dec 1971).

Chromium and zinc were determined in standard rocks and standard biological materials by thermal neutron activation followed by the extraction of zinc with 5% tribenzylamine in CHCl_3 . Chromium(III) was then oxidized to Cr(VI) and also extracted with 5% tribenzylamine in CHCl_3 . Both Cr and Zn were finally precipitated as 8-hydroxyquinolates. The method was used to determine these elements in standard rocks such as GR W-1, Sye-1 and Pcc-1 and in biological standards kale and tobacco 1R1. (auth)

1778 DETERMINATION OF IRON IN BIOLOGICAL MATERIAL BY SUBSTOICHIOMETRIC ISOTOPIC-DILUTION ANALYSIS. Gundersen, E.; Steinnes, E. (Institutt fuer Atomenergi, Kjeller, Norway). Talanta, 18 No. 11, 1167-9 (Nov 1971).

Iron is determined in biological material by wet oxidation, in the presence of ^{59}Fe tracer, extraction of iron(III) chloride into isopropyl methyl ketone, stripping with nitric acid, and stoichiometric separation of the Fe-ED1A complex on a cation-exchanger. The precision is good and the method was applied to analysis of standard kale and blood. (auth)

1779 SPECIFICATION FOR COUNTING TRAYS (PLANCHETS) FOR RADIOACTIVE ASSAY. BS 3775 1964. London, British Standards Institution (1964). 6p. Available from American National Standards Institute, New York.

Counting trays (planchets) manufactured from aluminum, platinum, tantalum, and stainless steel and intended for the mounting of specimens for radioactive assay are described. (M.C.G.)

1780 (TID-21015 (Rev. 3)) INTERPOLATED VALUES FOR THE SCHEDULE OF BASE CHARGES AND THE STANDARD TABLE OF ENRICHING SERVICES. (Oak Ridge Operations Office (AEC), Tenn., Production Div.). Aug 1971. 245p. Dep. NTIS.

The United States Atomic Energy Commission (AEC) published in Federal Register Notice 36 FR 4563 dated March 9, 1971 a revised schedule of base charges for uranium as UF_6 to be effective September 6, 1971. The schedule of base charges, which is composed of normal uranium feed and separative work charges at unit (kilogram) charges of \$23.46 and \$32, respectively, is applicable to uranium as UF_6 sold or leased by the AEC. The standard table of enriching services, which lists the units of feed and separative work required per unit of product, published by the AEC in Federal Register Notice 32 FR 16289 dated November 29, 1967, remains in effect for uranium as UF_6 obtained through toll enriching con-

tracts with the AEC. The units of feed and separative work per unit of product are based on an enriching services tails assay of 0.20 weight percent ^{235}U . The base charges and the enriching services feed and separative work units listed in the referenced Federal Register Notices are for assay increments which vary from 0.02 to 10.00 weight percent ^{235}U . This report has been prepared to supplement the Federal Register Notices by publishing interpolated values to the nearest 0.01 weight percent ^{235}U assay using the Federal Register values (denoted in this report by asterisks to the left of the respective assays) as the reference values. (auth)

1781 (SC-M-710446) MEASUREMENT CAPABILITIES OF THE PRIMARY STANDARDS LABORATORY. (Sandia Labs., Albuquerque, N. Mex.). Dec 1971. 32p. Dep. NTIS.

1782 ACTIVATION ANALYSIS INVESTIGATIONS ON STANDARDIZED IRON ALLOYS II. QUANTITATIVE DETERMINATION OF COPPER, ARSENIC, ANTIMONY, AND LANTHANUM. Gruber, E.; Hecht, F.; Sorantin, H. (Univ., Vienna, Reaktorzentrum, Seibersdorf, Austria). Mikrochim. Acta, No. 5, 794-9 (1971). (In German).

The content of copper, arsenic, antimony, and lanthanum was quantitatively determined by neutron activation in the standardized alloys NBS-1138 (CaS + Steel 1) and NBS-1140 (Ductile Iron 1) without destruction and after a rapid group separation by means of an extraction chromatographic method in the system tri-n-octylamine-hydrochloric acid. Certificated values for copper were available in the case of both alloys, but such values were available for arsenic only in one alloy. Our analytical values showed good agreement with the certificated values if the uncertainties are taken into account. In addition with no certificated values, we quantitatively determined antimony and lanthanum in both samples, arsenic in one sample. (auth)

1783 ANALYTICAL STANDARDS FOR ACCOUNTABILITY OF URANIUM HEXAFLUORIDE. New York, American National Standards Institute [(1970)]. 53p.

An analytical standard for the accountability of uranium hexafluoride is presented that includes procedures for subsampling, determination of uranium, determination of metallic impurities, and isotopic analysis by gas and thermal ionization mass spectrometry. (auth)

1784 (IA-1244) SPECTROCHEMICAL DETERMINATION OF LITHIUM, RUBIDIUM, AND CESIUM IN GEOLOGICAL STANDARDS. Birz, R. (Israel Atomic Energy Commission, Tel Aviv). Sep 1971. 15p. Dep. NTIS (U.S. Sales Only).

Spectrochemical determinations of Li, Rb, and Cs were carried out in all of the available geological standards. In general the results are in agreement with the data reported in the literature. (auth)

1785 ANALYTICAL STANDARDS FOR ACCOUNTABILITY OF URANIUM TETRAFLUORIDE. New York, American National Standards Institute [(1970)]. 63p.

An analytical standard for the accountability of uranium tetrafluoride is presented that includes procedures for subsampling, determination of uranium, determination of metallic impurities, conversion of uranium tetrafluoride to uranium hexafluoride for gas mass spectrometry, and isotopic analysis by gas and thermal ionization mass spectrometry. (auth)

1786 INTERNATIONAL PRACTICAL TEMPERATURE SCALE OF 1968. Durieux, M. (Kamerlingh Onnes Laboratorium, Leiden). Progr. Low Temp. Phys., 6, 405-25 (1970).

The following topics are covered: international practical temperature scales, the International Practical Temperature Scale of 1948 (IPTS-48), the International Practical Temperature Scale of 1968 (IPTS-68), the accuracy and reproducibility of the IPTS-68, the vapor pressure-temperature relations of O_2 , N_2 , Ne, and H_2 , differences between the IPTS-68 and other temperature scales, the 1958 ^4He scale and the 1962 ^3He scale, and the range from 5.189°K to 13.81°K. (55 references). (M.H.R.)

1787 SOME EMISSION SPECTROGRAPHIC TRACE ELEMENT DATA FOR REFERENCE SILICATE MATERIALS. Hofmeyr, P. K. (Univ. of Cape Town). Chem. Geol., 9: No. 1, 23-8 (Mar 1972).

Data for six trace elements (Sc, Co, Y, Yb, V, Be) are reported for 27 standard silicate rocks. A dc arc emission spectrographic method was utilized using G-1, W-1, and a series of artificial rocks as standards. Results are tabulated and a brief discussion of the data is given. (auth)

1788 NONRADIOACTIVE REFERENCE MATERIALS. Hilaire, M.; Le Gall, Y. (CEN de Saclay, Gif-sur-Yvette, France). Bull. Inform. Sci. Tech. (Paris), No. 163, 67-72 (Oct 1971). (In French).

If precise radiometry measurements are to be made, the low activities of environmental materials must be taken into consideration. In order to check the activities of such materials, standard references that can be compared with industrial materials are required. The national reference standards of Cu, steel, and Pb are discussed, particular attention being given to α , β , and γ activities and purities. The reference contaminations are of the same order of magnitude as the detection thresholds i.e. $10^{-9} \mu\text{Ci g}^{-1}$ (France).

1789 SUBSTOICHIOMETRIC DETERMINATION OF MERCURY BY NEUTRON ACTIVATION ANALYSIS. Nadkarni, R. A., Haldar, B. C. (Inst of Science, Bombay). *J Radioanal Chem*; 10 No 2, 181-6 (Apr 1972).

A method was developed for substoichiometric determination of mercury by thermal neutron activation analysis, based on selective extraction of the Hg(II) -Bindschedler's Green complex into 1,2-dichloroethane. The method was applied for the determination of trace amounts of mercury in geological standards such as W-1, GR, Sye-1, and T-1, meteorite Allende de Publito, and biological materials such as kale, Ir1 standard tobacco, and human blood serum (auth).

1790 ACTIVATION ANALYSIS OF RARE EARTHS IN ROCK STANDARDS AND IN LUNAR SAMPLES. Kraehenbuehl, U., Rolli, H. P., von Gunten, H. R. (Univ., Bern). *Helv. Chim. Acta*, 55: No. 2, 697-701 (1972). (In German).

The content of rare earth elements was determined in USGS-standard rocks BCR-1 and G-2, and in lunar fines samples from Apollo-12 using activation analysis techniques. (auth)

1791 X-RAY FLUORESCENCE DETERMINATION OF ARSENIC, ANTIMONY, NICKEL, RUBIDIUM, SCANDIUM, VANADIUM, AND ZINC IN ROCK STANDARDS AND OTHER ROCK SAMPLES. Fabbri, Brent P., Espos, Laureano F. (Geological Survey, Menlo Park, Calif.). *U. S., Geol. Surv., Prof. Pap.*, No. 800-B, 147-50 (1972).

Arsenic, antimony, nickel, rubidium, scandium, vanadium, and zinc were determined in 18 rock standards and eight rock samples, making corrections for matrix and interelement effects where necessary. Detection limits for these elements are 3 to 70 ppm. X-ray fluorescence values obtained are in good agreement with the preferred or chemical values (auth).

1792 (ORNL-NSIC-102) COMPILATION OF NUCLEAR STANDARDS, 8th EDITION, 1971. PART II. NATIONAL (EXCLUDING U.S.) AND INTERNATIONAL ACTIVITIES. (Oak Ridge National Lab., Tenn.). Jun 1972. Contract W-7405-eng-26. 140p. Dep. NTIS.

All national and international nuclear standards activities known, except for the U. S. work covered in The Compilation of United States Nuclear Standards are presented in simple tabular form. The standards activities of all national organizations, technical societies, etc. as well as relevant regulations established by government agencies, are listed in alphabetical order by country or by international organization. It is to be noted that many of the so-called 'Standard Activities' listed for the various countries are legal regulations rather than voluntary standards. In some countries there are only the former. Such regulations are included however because of their relevance. (18 references) (auth).

1793 NEUTRON ACTIVATION ANALYSIS. APPLICATION TO TRACE ELEMENT ANALYSIS IN BIOLOGICAL AND ENVIRONMENTAL MATERIALS. Becker, Donald A.; LaFleur, Philip D. (National Bureau of Standards, Washington, D. C.) pp 447-53 of Trace Substances in Environmental Health V /Hemphill, Delbert D. (ed.). Columbia, Mo; Univ of Missouri (1972).

From fifth annual conference on trace substances in environmental health, Columbia, MO (29 Jun 1971). See CONF-710645.

Neutron activation analysis (NAA) has been found useful for trace element analysis of biological and environmental samples. The favorable characteristics of this technique include high sensitivity, wide applicability, great specificity, and reduced contamination and reagent blank problems. The utilization of this technique for the analysis of several elements (Mn, Na, Cu, Zn, U) in the recently certified NBS Biological Standard Reference Material orchard leaves, is described. Techniques used include both nondestructive analysis and destructive analysis using radiochemical separations. In addition, the analytical results obtained by NAA on the Orchard Leaves are compared to that obtained by other analytical techniques (auth).

1794 DETERMINATION OF TRACE AMOUNTS OF URANIUM IN SILICATE MINERALS BY THE FISSION TRACK TECHNIQUE. Matsuda, Hideki; Tsutsui, Yutaka; Nakano, Shigenori; Umemoto, Shunji (Kyushu Univ., Fukuoka). *Talanta*, 19 No. 7, 851-6 (Jul 1972).

The fission track technique was applied to the determination of uranium on Dowex 1 $\times$ 8 after chemical separation from silicates. Standard rock and several stone meteorite samples were treated by this method and satisfactory results were obtained. The procedure is applicable to natural waters (auth).

1795 NATIONAL BUREAU OF METROLOGY. Grinberg, B. (CEN de Saclay, Gif-sur-Yvette, France). *Bull Inform Sci Tech (Paris)*, No 163, 7-10 (Oct 1971). (In French).

The aims of the National Bureau of Metrology and its preliminary objectives are presented. Information is given on the system of primary and secondary standards used (France).

1796 BISMUTH IN STONY METEORITES AND STANDARD ROCKS. Santoliquido, P. M., Ehmann, W. D. (Univ. of Kentucky Lexington). *Geochim. Cosmochim. Acta*, 36 No 8 897-902 (Aug 1972).

Bismuth was determined by alpha counting of the ^{210}Po daughter activity of the ^{210}Bi formed by thermal neutron activation. Results are presented for thirty chondrites, six achondrites, eight separated meteoritic phases, and six U. S. Geological Survey standard rocks. There is no resolvable difference in Bi abundances among the different groups of ordinary chondrites. Bismuth concentration decreases with increasing petrologic grade among the ordinary chondrites. The enstatite chondrites are separable into two groups on the basis of Bi data (auth).

1797 (TID-7029(2nd Ed.), pp 3-65) GENERAL CONSIDERATIONS. 1972.

In Selected measurement methods for plutonium and uranium in the nuclear fuel cycle.

Standard reference materials, sampling, and bulk measurements are discussed for determination of Pu and U in nuclear materials (M. C. G.).

1798 (ORNL-TM-3842) AVAILABILITY OF NUCLEAR STANDARDS INFORMATION. Cottrell, Wm. B. (Oak Ridge National Lab., Tenn.). Jul 1972. Contract W-7405-eng-26. 18p. (CONF-720442-1). Dep. NTIS.

From Executive conference on nuclear standards, Monterey, CA. (30 Apr 1972).

The number of organizations and technical societies in the nuclear industry producing standards, and the numbers of standards themselves, are such that it is not an easy task to find out what standards are available on a particular subject. This report addresses itself to this problem. (2 figures, 4 tables) (R. W. R.).

1799 ATOMIC ABSORPTION DETERMINATION OF ALKALINE EARTH METALS AND REFRACTORY OXIDES IN GEOCHEMICAL STANDARDS WITH A NITROUS OXIDE-ACETYLENE FLAME. Luecke, Werner (Univ., Karlsruhe, Ger.). *Neues Jahrb. Mineral., Monatsh.*, No. 6, 263-88 (1971). (In German).

Beryllium, Mg, Ca, Sr, Ba, Ti, V, Cr, Mn, and Fe were determined by atomic absorption spectroscopy using a nitrous oxide-acetylene flame. Interference due to thermal ionization was suppressed by addition of large amounts of an easily ionized alkali metal e.g. Cs. Silicates were decomposed for the determination of major and minor elements with $\text{Li}_2\text{B}_4\text{O}_7$ melts in platinum-gold crucibles. To determine trace elements the samples were treated with $\text{HF}-\text{HClO}_4$ under pressure in a PTFE lined bomb followed by volatilization of Si (Anal. Abstr.).

1800 RADIOMETRIC METHOD FOR STANDARD URANIUM ORE SAMPLES. COMPARISON WITH STANDARD THORIUM ORE SAMPLES BY MEANS OF THE GAMMA RAYS SPECTROSCOPY. Krzok, Jerzy (Instytut Techniki Jadrowej Krakow). *Nukleonika*, 16 No. 11-12, 555-64 (1971). (In Polish).

A possibility of the thorium content comparison with that of uranium in the standard samples by means of gamma spectroscopy is shown. The basis of the described method is that both ThC'' (^{208}Tl) in thorium series, and RaC (^{214}Bi) in uranium series emit gamma rays of energy $\sim 0.6 \text{ MeV}$ (auth).

1801 (K-L-6301) URANIUM ISOTOPIC WORKING STANDARDS. Wertz, R. J. (Oak Ridge Gaseous Diffusion Plant, Tenn.). 22 Sep 1972. Contract W-7405-eng-26. 5p. Dep. NTIS.

UF_6 is usually blended to make standards that weigh in excess of 100 g. When smaller standards are required they are generally prepared by blending U_3O_8 . Primary generative, secondary generative, base standards, and working standards are discussed. A series of 135 working standards ranging from 0.13 to 97 wt % ^{235}U is maintained. The ^{235}U concentration is known to be $\pm 0.1\%$ relative to the NBS standards. These standards are available on request through the USAEC (M. C. G.).

1802 (ORNL-NSIC-98) COMPILATION OF NUCLEAR STANDARDS, 8th EDITION, 1971. PART I. UNITED STATES ACTIVITIES. (Oak Ridge National Lab., Tenn.). Feb 1972. Contract W-7405-eng-26. 208p. Dep. NTIS.

All United States activities in nuclear standards preparation are presented in tables. The technical, industrial, and environmental organizations are listed alphabetically and their standards activities are given. Approved standards, unapproved drafts, and proposed activities are listed. Standards activities are indexed both by organization and by permuted title (H D R).

1803 NEUTRON ACTIVATION ANALYSIS OF MERCURY IN FISH, FLOUR, AND STANDARD REFERENCE ORCHARD LEAVES BY ELECTRODEPOSITION RADIOCHEMISTRY Heitzman, M. W.; Simpson, R. E. (Food and Drug Administration, Wash-

ington, D. C.). J. Ass. Offic. Anal. Chem.; 55 No. 5, 960-5 (Sep 1972).

A method for neutron activation analysis of mercury is described in which electrodeposition is used to isolate the mercury carrier in the recovery step. Although the recovery of mercury carrier is variable, the results yielded by this technique are comparable to those obtained using sulfide precipitation in neutron activation analysis. The method was also compared to gas chromatography and atomic absorption techniques and similar results were obtained. No interferences were evident in the samples analyzed: fish, flour, and standard orchard leaves. The method can detect ppB levels of mercury. (auth)

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1312 THE GROWING NEED FOR STANDARD METHODS IN ENVIRONMENTAL HEALTH PROGRAMS Lewis, Keith H (National Center for Urban and Industrial Health, Cincinnati), Foter, Milton J Health Lab Sci, 3 133-42(July 1966)

The role of the Public Health Service (PHS) in the prevention and abatement of radiologic and other environmental hazards, and the need for valid methods and safe limits were reviewed. The Division of Radiological Health has five regional laboratories in which environmental samples were examined for radioactive levels and selected radionuclides. Consequently, uniform or comparable laboratory methods were necessary in making these determinations. The Division had an Interlaboratory Technical Advisory Committee (ITAC) to promote the uniformity of effort and coordination of activities among the laboratories. Some of the analytical problems considered by ITAC resulted in the establishment of a Quality Control Unit to design and direct collaborative studies of laboratory procedures among Federal, State and municipal laboratories. A committee had established standard criteria and guidelines for selected radionuclides in water. Limits were based on the recommendation of the Federal Radiation Council and published in the PHS Drinking Water Standards. In the discharge of radioactive wastes by industry, the criteria or guidelines were established by the Atomic Energy Commission in their licensing program. Thus where several agencies established guidelines or criteria, there was need for standard methods. Guidelines or criteria had also been established for radionuclides discharged into the air. Several methods for the measurement of selected radionuclides in air were reported but there was a need for the development of sampling procedures and standard laboratory procedures. Although numerous methods had been published in the technical literature for the determination of radioactivity in water, waste water, foods, and air, uniformity among State Health Laboratories and among PHS Divisions remained to be attained. (BBB)

1313 DIGEST OF PROTECTION STANDARDS AND STATE REGULATIONS FOR RADIOACTIVITY IN WATER. Hickey, J. L. S. (Public Health Service, Rockville, Md.). Radiol. Health Data Rep., 7 549-54(Oct 1966)

Numerical limits of seven published standards and guides for ^{226}Ra , ^{90}Sr , and unidentified radioisotopes in water for various applications and population groups are summarized. Of the 54 States and Territories 47 have legislation or regulations for control of radioisotopes in water. Of these, 31 have adopted some form of numerical limits for control of radioisotopes in water. Sixteen States and Territories have general legislation permitting control of radiation exposure but no numerical limits for radioisotopes in water, and seven have no specific legislation for control of radioisotopes in water (auth)

1314 CODE OF PRACTICE FOR USE OF X-RAY EQUIPMENT IN MEDICAL DIAGNOSIS. Sydney, Department of Public Health, 1966. 12p

A guide to safe practice in the use of medical diagnostic x-ray equipment covering such matters as responsibility and qualifications of personnel, safety rules for radiography and fluoroscopy (equipment, exposure of patients and staff) and personnel monitoring in New South Wales is presented. The code is not statutory, but defines the principal safety standards used by the Radiation Branch as a basis for assessing the radiological health aspects of applications for license under the New South Wales Radioactive Substances Act (Occup. Safety and Health Abstr.)

1315 RECOMMENDATIONS FOR THE ASSESSMENT OF SURFACE MATERIALS FOR USE IN RADIOACTIVE AREAS. PART 1. METHOD OF TEST FOR EASE OF DECONTAMINATION. British Standard 4247, Part 1, 1967. London, British Standards Institution, 1967. 8p. 5s.

A standard test is recommended which was developed for comparison purposes so that ease of decontamination of different surfaces can be compared representing a first stage in the preparation of recommendations for the selection of surface materials for use in areas liable to contamination by radioactive substances. The method involves contamination of the surface with a solution of radiocaesium and radiocobalt followed by a two-stage decontamination procedure. Decontaminating solutions comprise (1) sodium tripolyphosphate EDTA sodium di(2-ethylhexyl) sulphosuccinate sodium carboxymethyl cellulose and sodium hydroxide (2) disodium EDTA sodium di(2-ethylhexyl) sulphosuccinate and sodium hydroxide. The contaminated area is washed consecutively with these two solutions followed by distilled water (UK)

1316 INDUCING PLANT MUTATIONS BY NEUTRON IRRADIATION Gerrard, Martha. Isotop. Radiat. Technol., 5 313-14(Summer 1968).

The minutes of two meetings on standardization of procedures for irradiating seeds to produce mutations are reviewed (auth)

1317 INDUSTRIAL RADIATION CATARACT THE HAZARDS AND THE PROTECTIVE MEASURES. Edbrooke, Clare M., Edwards, Carolyn (Northampton Coll. of Advanced Tech., London). Ann. Occup. Hyg., 10 293-304(Oct. 1967).

A literature review of industrial radiation cataract is presented. The clinical appearance of infra-red cataracts of glass workers is described. The transmission and absorption of various wavelengths of light by the cornea, aqueous humor and crystalline lens is discussed. Hazards of uv radiation from molten glass, infra-red radiation from electric welding arcs, secondary heat sources from electric welding filters and other types of industrial hazards are reviewed. Protection standards of various countries are reviewed. It is pointed out that effectiveness of standards cannot be compared from the incidence of industrial cataract in the various countries, since incidence of cataract today results from exposure to radiation 15 to 30 years ago and relates to protection in use at that time (H L W)

1318 RESOLUTION RELATIVE TO THE STATE OF PROTECTION AGAINST IONIZING RADIATIONS IN BELGIUM. Bull. Acad. Roy. Med. Belg., 7 389-90(1967). (In French).

The Royal Academy of Medicine, was pleased at the aid accorded radioprotection research by the Ministry of the Interior, confirmed that the Ministries of Public Health and of Labor had put into action a detailed plan for the protection of nuclear industry workers, researchers, and the general population. It hoped that efficacious control would ensure compliance with those measures, insisted that authorities took all precautions necessary to ensure that the number of fluoroscopic and radiographic examinations of one patient be kept to a minimum, with transmission of the relevant radiographic files, if appropriate, insisted on the importance of progress in radiobiology, notably in health physics, for the peaceful development of atomic energy, called on the prime minister and the ministers of economic affairs, education, public health, and agriculture to assure that the radiobiology department at Mol received the financial and technical aid necessary for its activities and called on the competent authorities to give a definitive status to the radiobiology department at Mol, which had demonstrated its efficacy and whose work was indispensable to the security both of the general population and of the workers in the field of nuclear energy (BBB)

1319 STANDARDS OF GAMMA RADIATION INTENSITY FOR INDUSTRIAL AND MEDICAL GAMMA INSTALLATIONS. Terman A. V. Gig. Sanit. No. 3 45-8(Mar. 1968). (In Russian).

Existing standards of the U S S R regarding permissible limits of the intensity of γ radiation on the surface and at a distance of 1 m from the surface in industrial and medical installations are reviewed. The short-comings of each of the standardization principles are considered. Separate standards are suggested for the intensity of gamma-radiation from stationary and transportable gamma installations with due regard for the actual working site of the operator. It is suggested that standards intended for stationary gamma installations should limit the radiation intensity existing at a distance of 1 m from the radiation source and those intended for transportable installations should limit the radiation intensity on the surface of the protective shield of the gamma installation (C H)

1320 NP-17502) USERS' GUIDES FOR RADIOACTIVITY STANDARDS. Kahn, B.; Choppin, G. R.; Taylor, J. G. V. (National Academy of Sciences-National Research Council, Washington, D. C.). Oct. 1967. 43p. Dep. CFSTI.

Chemical and counting problems for radioactivity standards in common use or expected to be available are presented. The guides are prepared separately for every element. Guides are presented for Na, Mg, P, K, Ca, Cr, Fe, Co, Zn, Ga, As, Br, Kr, Sr, Y, Zr, Nb, Ru, Rh, Ag, Sn, Sb, Te, I, Cs, Ba, rare earths, Ir, Au, Hg, Tl, Po, Rn, Ra, Th, U, Np and Am (M C G)

1321 (CEA-R-3382) ESSAI DE DETERMINATION DES CONCENTRATIONS MAXIMALES ADMISSIBLES POUR LES POU-MONS. (Determination of Maximum Permissible Concentrations for the Lungs). Vacca, Georges (Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires). Dec. 1967. 66p. (In French). Dep.

The Task group of Committee II of the International Commission on Radiological Protection (ICRP) published in 1966 the results of its work on aerosol dynamics in the respiratory tract. A model was proposed for the deposition of dust in the lung and lymphatic nodes and for its clearance in the blood and/or in the gastrointestinal tract. The maximum permissible concentration values resulting from the application of such a model are presented for approximately 250 radioisotopes (auth)(TSS)

1322 RADIATION HAZARD CONTROLS IN URANIUM MINES. Com. Naz. Energ. Nucl., Notiz., 14 97-102(Jan. 1968). (In Italian).