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MASTER

INDEX TO NUCLEAR SAFETY A TECHNICAL PROGRESS REVIEW BY

CHRONOLOGY, PERMUTED TITLE, AND AUTHOR
VOL. 1, NO. 1 THROUGH VOL. 8, NO. 6

Nuclear Safety Staff

NUCLEAR SAFETY INFORMATION CENTER

NSIC

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by
Chronology, Permuted Title, and Author
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Foreword

This cumulative KWIC index to Nuclear Safety has been prepared with the cooperation of Ann Klein of the ORNL Technical Information Division. A KWIC (KeyWord In Context) index is one in which article titles are permuted around the various significant words contained therein. For example, the title, Tests of Air Leakage in Rock for Underground Reactor Containment, is indexed under the words Air, Containment, Leakage, Reactor, Rock, and Underground. As can be seen by reference to Section 2 (white) of this report, the index words are arranged alphabetically in a column in the center of the page, with the titles permuted around them. In some cases additional significant words in parentheses have been added to the title by the editors to allow more precise indexing. Location of the indexed article in the Journal is indicated by the seven-digit column of figures to the right of the page, as described below. Past issues of the index have been used primarily for the benefit of the Nuclear Safety editors. It has been so helpful, however, that this and subsequent issues are being prepared and distributed as NSIC reports. The index will be published annually following the close of each Nuclear Safety volume year. It is intended as a supplement to the regular annual index included in the Journal, and not as a replacement for it. The KWIC code was developed by IBM and has proven to be a useful tool for the preparation of indexes for many different purposes.

The index is presented in three sections as follows:

Section 1 (yellow) Chronological List of Articles

Section 2 (white) Permuted Title Index

Section 3 (green) Author Index

The seven-digit index number given in all three sections is divided into four parts (00-0-0-000) which stand respectively for volume-number-section-page. Since Feature Articles are not included in a section, they are indicated by a 0 in the fourth digit. Through the Volume 6 portion of the index, corporate affiliation was given only for non-ORNL authors;

starting with Volume 7, this information is given for all authors. Abstracts are also included for all articles, beginning with Volume 7. Starting with Volume 8, the Journal was issued six times a year; it had previously been issued quarterly. Volume 1 is dated 1959/1960; Volume 2, 1960/1961; Volume 3, 1961/1962; Volume 4, 1962/1963; Volume 5, 1963/1964; Volume 6, 1964/1965; Volume 7, 1965/1966; and Volume 8, 1966/1967.

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Nuclear Safety articles are indexed in this section in the chronological order of their appearance in the Journal. The seven-digit number in the left-hand column is divided into four parts (00-0-0-000) which stand respectively for volume-number-section-page. Following the index number are the appropriate article title and author. For example, in Vol. 1, No. 1, Sect. 2, p. 14 (01-1-2-014) appeared an article on Collapse of Parallel Plate Fuel Assemblies by W. R. Gambill (see index). The dates pertinent to each volume are listed in the Foreword. Abstracts are included in this section for all articles beginning with Vol. 7, No. 1, the first issue in which they appeared.

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*MACHTA, I.
*OFFICE OF METEOROLOGICAL RESEARCH , WEATHER BUREAU

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*CAVENDISH LABORATORY, UNIVERSITY OF CAMBRIDGE

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*SAXTON NUCLEAR EXPERIMENTAL CORPORATION

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*RODGER, W. A.
*NUCLEAR FUEL SERVICES, INC.

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*HANEY, W. A.
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*MOSES, H. + *STRICK, G. H. + *CARSON, J. E.
*ANL
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- 06-1-1-031 RADIATION IN PERSPECTIVE (SIGNIFICANCE OF CONTRIBUTION OF ATOMIC ENERGY TO PUBLIC HEALTH HAZARDS)
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- 06-1-2-038 INTEGRITY OF METALLIC REACTOR FUELS
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- 06-1-2-040 OXIDATION OF GRAPHITE
PETERSON, S.
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PETERSON, S.
- 06-1-3-046 DIRECTIONAL GAMMA SENSOR FOR LOCATING THE SITE OF A NUCLEAR EXCURSION
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- 06 1 3 040 EXPERIENCE WITH CONTROL ROD SYSTEMS AT LICENSED REACTOR FACILITIES
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- 06-1-3-054 EMERGENCY AND SHUTDOWN COOLING SYSTEMS IN REACTORS
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- 06-1-4-057 POSSIBILITIES AND CONSEQUENCES OF MAJOR ACCIDENTS IN RADIOCHEMICAL PLANTS
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- 06-1-4-065 FISSION PRODUCT TRANSPORT
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- 06-1-4-072 SAFETY IN HOT CELL DESIGN AND OPERATION
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*FLORA, J. W. + *SMITH, G. H.
*USAEC, DIV. OF COMPLIANCE, DENVER
- 06-1-5-087 ENVIRONMENTAL SURVEYS FOLLOWING ACCIDENTAL RELEASES
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- 06-1-5-089 DISPOSAL OF RADIOACTIVE WASTES IN FRESH WATER
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- 06-2-1-111 REVIEW OF 1964 GENEVA PAPERS RELATED TO NUCLEAR SAFETY
NUCLEAR SAFETY EDITORIAL STAFF, CRNL
- 06-2-1-132 ADMINISTRATION OF RADIATION SAFETY AT ARGONNE NATIONAL LABORATORY
*EGE, J. F., JR.
*ANL
- 06-2-1-142 RADIATION IN PERSPECTIVE (ATOMIC ENERGY FOR SOCIETY AND THE BALANCE BETWEEN HAZARD AND GAIN) (FACTORS OF ECONOMY, SAFETY, AND HYGIENE IN LOCATING DIFFERENT TYPES OF LARGE THERMAL POWER STATIONS IN SWEDEN)
*STERNER, J. H. + 2BERGSTROM, S. O. W.
3HOLMQUIST, C. E.
*EASTMAN KODAK CO.
2AB ATOMENERGI, SWEDEN
3STATENS VATTENFALLSVERK, SWEDEN
- 06-2-2-152 BURNOUT IN BOILING HEAT TRANSFER
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- 06-2-2-164 EFFECTS OF HIGH BURNUP ON BULK URANIUM DIOXIDE FUEL ELEMENTS
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- 06-2-2-169 ARGONNE TRANSIENT REACTOR TEST FACILITY
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- 06-2-2-171 HEAT TRANSFER EXPERIMENTS OF SIGNIFICANCE TO REACTOR SAFETY
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*GRIFFITHS, V.
*UNIVERSAL-MATTHEY, UNITED KINGDOM

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DENKINS, R. F. + NORTHUP, T. E.

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PIPER, H. B.

06-2-5-212 RELEASE AND MONITORING OF IODINE-131 AT ARTS, HANFORD, SAVANNAH RIVER, AND ORNL
COWSER, K. E.

06-3-1-231 SAFETY SYSTEM DESIGN TECHNOLOGY
*JACOBS, I. M.
*GENERAL ELECTRIC COMPANY, SAN JOSE CALIF.

06-3-1-246 SECOND SYMPOSIUM ON PROTECTION AGAINST RADIATION HAZARDS IN SPACE
*KELLER, J. W.
*NASA HEADQUARTERS

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06-3-2-255 STATUS REPORT ON SPERT PROGRAM, INCLUDING POWER BURST FACILITY
SILVER, E. G.

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STONE, R. S.

06-3-4-267 TESTS OF AIR LEAKAGE IN ROCK FOR UNDERGROUND REACTOR CONTAINMENT
*BERNELL, L. + *LINDBO, T.
*SWEDISH STATE POWER BOARD

06-3-4-272 REMOVAL OF RADIO IODINE FROM GASES
BROWNING, W. E., JR.

06-3-5-280 DISPOSAL OF RADIOACTIVE WASTE FROM THE OPERATION OF URANIUM MILLS AND MINES
*DEVERLY, R. G.
*UNION CARBIDE, GRAND JUNCTION, COLORADO

06-3-5-283 SECOND AEC CONFERENCE ON RADIOACTIVE FALLOUT FROM NUCLEAR WEAPONS TESTS
MILLER, C. E., JR. + *HILSMEIER, W. F.
*U. S. WEATHER BUREAU, OAK RIDGE

06-3-6-292 OPERATING EXPERIENCE AT INDIAN POINT NUCLEAR POWER STATION
*PRESTLE, J. A. + *FROSHAUER, G. F.
*CONSOLIDATED EDISON CO.

06-3-6-298 NUCLEAR ACCIDENT AT WOOD RIVER JUNCTION
AUXIER, J. A.

06-4-1-317 A LOOK AT FAST REACTOR SAFETY
*OKRENT, D.
*ANL

06-4-1-343 THE ADMINISTRATION OF RADIATION SAFETY AT HANFORD
KEENE, A. R.

06-4-1-354 ASA 1964 COMPILATION OF U.S. NUCLEAR STANDARDS
*COTTRELL, W. B.
*CHAIRMAN, ASA SUBCOMMITTEE N6.9

06-4-1-368 A REVIEW OF RECENT FRC AND NCRP PUBLICATIONS
SNYDER, W. S.

06-4-1-371 INTERNATIONAL SYMPOSIUM ON PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS
HAFF, K. W. + SHAPPERT, L. B.

06-4-1-374 NUCLEAR POWER REACTOR SITING
ERGEN, W. K.

06-4-1-380 RADIATION IN PERSPECTIVE (EXPLOSION OF SOME RADIOLOGICAL MYTHS)
EISENBUD, M.

- 06-4-2-386 THE KEWB PROGRAM
SILBERBERG, M.
- 06-4-2-395 STATUS OF SPACE - TIME ANALYSIS
KERLIN, T. W.
- 06-4-2-398 INTEGRITY OF REACTOR FUELS
PETERSON, S.
- 06-4-3-408 DESIGN PRECEPTS FOR ENGINEERED SAFEGUARDS
HANAUER, S. H.
- 06-4-3-411 SAFETY SYSTEM RELIABILITY VS PERFORMANCE
EPLER, E. P.
- 06-4-3-414 RADIATION MONITORING AND WARNING SYSTEM AT ORNL
LITNER, L. F.
- 06-4-4-422 DESIGN CONSIDERATIONS FOR OFF GAS SYSTEM MAJOR COMPONENTS
FULLER, A. B.
- 06-4-4-425 EMERGENCY COOLING SYSTEMS IN GAS-COOLED REACTORS
ROBINSON, G. C.
- 06-4-5-433 UNITED STATES AND SOVIET UNION WASTE DISPOSAL STANDARDS
PARKER, F. L.
- 06-4-5-436 CURRENT PRACTICES IN THE DISPOSAL OF WASTE RADIOACTIVE GASES FROM NUCLEAR REACTORS
STOLZENBACH, C. F.
- 06-4-6-441 HUMBOLDT BAY REACTOR OPERATING EXPERIENCE
CARROLL, J. C. + SCHUYLER, J. C.
- 06-4-6-451 INCIDENTS RELATED TO NUCLEAR SAFETY IN AEC OPERATIONS
AEC, DIV. OF OPERATIONAL SAFETY
- 07-1-1-001 ADMINISTRATION OF NUCLEAR SAFETY AT ANL
LEVENSON, M. + ADAMS, R. M.
ARGONNE NATIONAL LABORATORY, ARGONNE, ILLINOIS
THE SAFETY PROGRAM OF ARGONNE NATIONAL LABORATORY CONCERNED SPECIFICALLY WITH RADIOACTIVE AND FISSIONABLE MATERIALS, AND WITH REACTORS, MAY BE CONSIDERED TO CONSIST OF TWO BROAD AREAS INVOLVING RADIATION SAFETY AND NUCLEAR SAFETY. AN ATTEMPT HAS BEEN MADE TO ESTABLISH A SYSTEM OF CHECKS AND BALANCES WHICH WILL ENSURE THAT NO SIGNIFICANT FACTS HAVE BEEN OVERLOOKED IN ANALYZING THE SAFETY OF PROPOSED OPERATIONS BY REQUIRING REVIEW BY EXPERIENCED BUT DISINTERESTED EXPERTS. TO ASSIST IN DISCHARGING NUCLEAR SAFETY RESPONSIBILITIES, TWO ADVISORY COMMITTEES HAVE BEEN CONSTITUTED FORMALLY, ONE IS THE REACTOR SAFETY REVIEW COMMITTEE, AND THE OTHER IS THE CRITICALITY HAZARDS CONTROL COMMITTEE. BOTH ARE INTENDED TO PROVIDE COMPETENT TECHNICAL REVIEW AT ALL STAGES OF ALL OPERATIONS TO ENSURE THE SAFEST POSSIBLE OPERATION.
- 07-1-1-006 LEGAL ASPECTS OF A RADIATION SAFETY PROGRAM
SMITH, J. L.
NUCLEAR DIVISION, UNION CARBIDE CORPORATION, OAK RIDGE, TENNESSEE
THE PURPOSE OF THIS ARTICLE IS TO ACQUAINT THE HEALTH PHYSICIST IN PARTICULAR, AND WORKERS IN THE FIELD IN GENERAL, WITH SOME OF THE LEGAL BENEFITS OF MAKING AND KEEPING GOOD RADIATION-EXPOSURE RECORDS. THREE LAWSUITS ARE REFERENCED AND DISCUSSED IN WHICH SUCH RECORDS WERE INVALUABLE. THERE IS SOME DISCUSSION CONCERNING THE INFORMATION THAT SHOULD BE RECORDED, THE TYPE RECORDS THAT ARE ADMISSIBLE IN A COURT ACTION, AND HOW LONG RADIATION RECORDS SHOULD BE KEPT. SOME CONCLUSIONS ARE DRAWN AS TO WHY THE GENERAL PUBLIC IS SO FEARFUL AND CONFUSED REGARDING ALL RADIATION, AND ATTENTION IS CALLED TO THE OBVIOUS NEED FOR CONTINUING GOOD RECORDS.
- 07-1-1-011 RADIATION IN PERSPECTIVE (EFFECT OF LOW INTENSITY RADIATION ON MAN)
JANKOWSKI, F. J.
RUTGERS UNIVERSITY, NEW BRUNSWICK, NEW JERSEY
THE RATIO OF RADIATION-DOSE-RATE THRESHOLD FOR SOMATIC DAMAGE TO THE NORMAL BACKGROUND DOSE RATE IS OF THE ORDER OF A FEW HUNDRED (100 TO 500). THIS IS IN THE RANGE OF THE RATIO OF HARMFUL CONCENTRATION OF SEVERAL CHEMICALS TO THE AMOUNT NEEDED OR BELIEVED TO BE NEEDED FOR HEALTH. THIS OBSERVATION RAISES THE QUESTION AS TO WHETHER ALL RADIATION IS HARMFUL, A QUESTION WHICH HAS BEEN RAISED BEFORE AND WHICH IS UNDER INVESTIGATION. IT ALSO SUGGESTS FURTHER EXPERIMENTS AT LOW OR VERY LOW (BELOW BACKGROUND) DOSE RATES.

07-1-1-014

RADIATION IN PERSPECTIVE (ATOMIC ENERGY FOR SOCIETY AND THE BALANCE BETWEEN HAZARD AND GAIN)

STERNER, J. H., M. D.

EASTMAN KODAK COMPANY, ROCHESTER, NEW YORK

HEALTH PROBLEMS CREATED BY THE PEACEFUL USES OF ATOMIC ENERGY ARE NOT SIGNIFICANTLY DIFFERENT, QUANTITATIVELY OR QUALITATIVELY, FROM MANY OF THE OTHER ENVIRONMENTAL HEALTH PROBLEMS CONFRONTING SOCIETY. IT IS ONLY THAT INORDINATE CONCERN BY THE GENERAL PUBLIC TENDS TO OVEREMPHASIZE THE HIGHLY PUBLICIZED HAZARDS INHERENT IN THE USE OF ATOMIC ENERGY WITHOUT APPROPRIATE CONSIDERATION FOR THE GAINS WHICH MAY BE DERIVED THEREFROM. SOCIETY MAY THUS BE DEPRIVED OF THE SUBSTANTIAL PROFITS THAT CAN ACCRUE FROM ORDERLY DEVELOPMENT OF THE INDUSTRY. PRESENT CRITERIA THAT HAVE BEEN ESTABLISHED FOR THE CONTROL OF RADIATION HAZARDS APPEAR TO BE PRUDENT AND ACCEPTABLE. THESE HAZARDS, HOWEVER, SHOULD BE VIEWED IN PROPER PERSPECTIVE IN RELATION WITH THOSE OF OTHER COMPARABLE ACCIDENT AND ENVIRONMENTAL CONDITIONS.

07-1-2-020

NUCLEAR POWER EXCURSION SIMULATION IN FRANCE

PASCOUET, A.

COMMISSARIAT A L'ENERGIE ATOMIQUE, CENTRE D'ETUDES NUCLEAIRES DE SALLAY, SALLAY, FRANCE

THE POSSIBLE MECHANICAL EFFECTS OF NUCLEAR POWER EXCURSIONS IN WATER-COOLED AND -MODERATED REACTORS ARE OF CONCERN TO REACTOR DESIGNERS AND OPERATORS. AN INVESTIGATION AT THE FRENCH ATOMIC ENERGY COMMISSION OF MEANS FOR SIMULATING NUCLEAR POWER EXCURSIONS LED TO THE DEVELOPMENT OF EXPLOSIVE SIMULATION CHARGES WITH TIME-DEPENDENT POWER RELEASES. RELEASE COMPARABLE WITH THE MAXIMUM BORAX-I POWER RELEASE IS OBTAINED WITHIN A GIVEN VOLUME. THE DATA ARE IN GOOD AGREEMENT WITH THOSE DERIVED FROM EXPERIMENTS PERFORMED IN THE UNITED STATES ON VARIOUS REACTORS AND HAVE BEEN USED TO ESTABLISH LIKELY ORDERS OF MAGNITUDE FOR THE MECHANICAL STRUCTURAL RESPONSE. THE SIMULATION PROVIDES FOR THE INVESTIGATION OF BOILING PHENOMENA NEAR FUEL PLATES AND CLADDING BEHAVIOR DURING REACTOR TRANSIENTS.

07-1-2-025

METAL - WATER REACTIONS

BAKER, L., JR.

ARGONNE NATIONAL LABORATORY, ARGONNE, ILLINOIS

RECENT ADVANCES IN METAL-WATER INVESTIGATIONS ARE REPORTED FOR THE FOLLOWING REACTOR METALS, URANIUM, ZIRCONIUM, STAINLESS STEEL, AND ALUMINUM. HEATING THESE METALS IN A WATER OR STEAM ENVIRONMENT HAS INVOLVED INDUCTION AND LEVITATION COILS, DISCHARGING CONDENSERS, LASER IMPULSES, RESISTANCE FURNACES, AND REACTOR TRANSIENTS IN TREAT. MECHANISMS OF REACTION WITH WATER OR STEAM FOR THE SEVERAL METALS UNDER VARIOUS CONDITIONS HAVE BEEN POSTULATED. FOR REACTOR-EXCURSION ACCIDENTS, THERE IS GOOD AGREEMENT BETWEEN THE THEORETICAL AND OBSERVED REACTION ENERGIES FOR BOTH THE SL-1 ACCIDENT AND THE FINAL DESTRUCTIVE TEST OF THE SPERT-10 CORE. FOR LOSS-OF-COOLANT ACCIDENTS, DETAILED CALCULATIONS PREDICT THE NATURE AND TIMING OF FAILURE OF ZIRCALOY-CLAD FUEL ELEMENTS IN THE PROPOSED LOFT REACTOR FOLLOWING BLOWDOWN.

07-1-2-034

FISSION PRODUCT RELEASE FROM FUELS

CARROLL, K. M.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

THE BEHAVIOR OF FISSION GAS IN UO₂ IS USED TO ILLUSTRATE THE EFFECTS OF IRRADIATION ON FISSION-PRODUCT RELEASE FROM FUEL MATERIALS. FISSION GAS IS RELEASED FROM UO₂ BY A TEMPERATURE-DEPENDENT PROCESS, WHICH WAS FORMERLY ASSUMED TO BE DIFFUSION. RECENTLY, HOWEVER, IT WAS DISCOVERED THAT BURNUP AND FISSION RATE HAVE LARGE EFFECTS ON A MEASURED DIFFUSION COEFFICIENT. EARLIER DIFFUSION-COEFFICIENT VALUES WERE OBTAINED WITH A MODEL IN WHICH IRRADIATION WOULD NOT AFFECT THE DIFFUSION COEFFICIENT, THESE VALUES SHOULD THEREFORE NO LONGER BE USED FOR PREDICTIVE CALCULATIONS. A DEFECT-TRAP MODEL FOR FISSION-GAS RELEASE DEVELOPED FROM THESE OBSERVATIONS. ACCORDING TO THE DEFECT-TRAP THEORY, THE RATE OF ESCAPE OF FISSION GAS FROM UO₂ IS INVERSELY PROPORTIONAL TO THE NUMBER OF DEFECTS IN THE UO₂ STRUCTURE. SOME DEFECTS ARE CREATED BY FISSION, WHEREAS OTHERS MAY BE INHERENT FLAWS SUCH AS GRAIN BOUNDARIES AND PORES.

- 07-1-3-045 SECONDARY SHUTDOWN SYSTEMS OF NUCLEAR POWER REACTORS
WALKER, C. S.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
THIS REVIEW SUMMARIZES CURRENT PRACTICES REGARDING SECONDARY SHUTDOWN SYSTEMS IN A LARGE SAMPLE OF REACTORS IN THE UNITED STATES, THE UNITED KINGDOM, FRANCE, AND CANADA. MOST OF THE REACTOR FACILITIES EXAMINED ARE EQUIPPED WITH ALTERNATE SHUTDOWN DEVICES, DESIGNATED AS SECONDARY SHUTDOWN SYSTEMS, HOWEVER, THERE IS A RATHER LARGE VARIATION IN THE INDEPENDENCE AND PERFORMANCE OF THE ACTUAL SYSTEMS EMPLOYED. ALSO, BASICALLY SIMILAR SYSTEMS, SUCH AS THOSE FOR INJECTING BORON SOLUTIONS INTO WATER-MODERATED REACTORS, VARY GREATLY WITH RESPECT TO PROCEDURES AND TIME INTERVALS REQUIRED TO COMPLETE OPERATION. NOT ALL THE REACTORS EXAMINED HAVE SECONDARY SHUTDOWN SYSTEMS, AND THERE IS NO SIMPLE MANNER OF DETERMINING WHETHER A PARTICULAR REACTOR NEEDS A SECONDARY SHUTDOWN SYSTEM.
- 07-1-3-052 LIQUID AND GASEOUS WASTE EFFLUENT SAMPLING AND MONITORING
KNOWLES, D. J.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
A LARGE AMOUNT OF LITERATURE IN THE FIELD OF WASTE TREATMENT AND DISPOSAL HAS BEEN PUBLISHED SINCE 1960. A PORTION OF THIS MATERIAL COVERING RECENT DEVELOPMENTS IN INSTRUMENTATION AND TECHNIQUES OF SAMPLING AND MONITORING GASEOUS AND LIQUID WASTE IS REVIEWED. THE REFERENCES INCLUDE FOREIGN PAPERS AS WELL AS THOSE OF U. S. ORIGIN. GENERAL COMMENTS ON WASTE-EFFLUENT-MONITORING APPARATUS ARE MADE.
- 07-1-3-057 TESTING OF CONTROL ROD DRIVES
BATES, A. E. G.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
CONTROL-ROD-DRIVE DEVELOPMENT AND TESTING PROGRAMS FOR A NUMBER OF REPRESENTATIVE POWER REACTORS INDICATE THAT A SATISFACTORY ROD DRIVE MAY REQUIRE AN EXPENSIVE AND LENGTHY PROGRAM. THE PREDOMINANT DIFFICULTIES ENCOUNTERED HAVE BEEN ASSOCIATED WITH OLD ART RATHER THAN WITH THE EFFECTS OF NUCLEAR RADIATION. DEVELOPMENT PROGRAMS WILL PROBABLY BE REQUIRED FOR EACH NEW TYPE OF POWER REACTOR. A VERSATILE TEST STAND IS ESSENTIAL, BUT SATISFACTORY COMPLETION OF REQUIRED TESTS IS NOT A GUARANTEE OF TROUBLE-FREE OPERATION.
- 07-1-4-067 STORAGE OF IRRADIATED FUEL ELEMENTS AT REACTOR PLANTS
NICHOLS, J. P.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
A SURVEY WAS MADE OF THE METHODS OF STORAGE OF IRRADIATED FUEL AT TYPICAL U. S. REACTOR PLANTS. THE USE OF WATER-FILLED POOLS FOR STORAGE OF METAL-CLAD INERT FUELS APPEARS TO BE UNIVERSALLY ACCEPTED AS A SAFE PRACTICE. THERE IS A WIDE VARIATION OF OPINION CONCERNING THE APPROPRIATE TYPE OF CONFINEMENT FOR THE FUEL-STORAGE AREA AND THE CHOICE OF METHODS FOR FUEL HANDLING, INSPECTION, MONITORING, AND CRITICALITY ASSESSMENT.
- 07-1-4-072 RELEASE AND TRANSPORT OF FISSION PRODUCT IODINE AND ITS REMOVAL FROM REACTOR CONTAINMENT SYSTEMS
KEILHOLTZ, G. W.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
TRAPPING SYSTEMS FOR DIFFERENT FORMS OF AIRBORNE IODINE ARE DISCUSSED, AND METHODS OF EVALUATING THEIR EFFICIENCY ARE DESCRIBED. THE ADSORPTION OF IODINE ON PARTICULATE MATTER, THE RATE OF DEPOSITION OF IODINE UNDER VARIOUS POSSIBLE REACTOR-ACCIDENT CONDITIONS, AND THE FORMATION OF ORGANIC IODINE COMPOUNDS ARE ASPECTS OF IODINE BEHAVIOR NOW CONSIDERED IMPORTANT IN EVALUATING THE HAZARDS OF NUCLEAR REACTOR ACCIDENTS AND IN ESTABLISHING REACTOR-SITE CRITERIA. METHODS OF CHARACTERIZING THE FORMS OF IODINE AND OF REDUCING THEIR REMOVAL FROM AEROSOLS ARE COMPARED AND EVALUATED. FEW EXPERIMENTS HAVE BEEN PERFORMED WHICH INCLUDED ALL THE ELEMENTS OF REALISM NECESSARY FOR SIMULATION OF CONDITIONS LIKELY TO EXIST IN LOSS-OF-COOLANT ACCIDENTS IN WATER-COOLED AND/OR -MODERATED REACTORS.
- 07-1-4-081 REVIEW OF CONTAINMENT PHILOSOPHY AND DESIGN PRACTICE
GALL, W. R.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
ENGINEERED SAFEGUARDS SUCH AS CONTAINMENT, PRESSURE-AND TEMPERATURE-REDUCING SYSTEMS, AIR-CLEANING SYSTEMS, AND CORE-SPRAY AND INJECTION SYSTEMS PROVIDE PROTECTION FOR THE PUBLIC SO THAT REACTORS MAY BE LOCATED AT SITES NEARER TO POPULATED AREAS THAN IS CONSIDERED SAFE WITHOUT THESE SAFEGUARDS UNDER CURRENT GROUND RULES. A REVIEW OF RECENT DESIGN PRACTICE INDICATES THAT THE EFFECT OF ENGINEERED SAFEGUARDS IS TO REDUCE THE RADII OF THE REQUIRED EXCLUSION AND LOW-POPULATION ZONES.

07-1-5-089

THRESHOLD LIMIT VALUES IN INDUSTRIAL HYGIENE

CLAYTON, G. D.

GEORGE D. CLAYTON AND ASSOCIATES, INCORPORATED, DETROIT, MICHIGAN
THRESHOLD-LIMIT VALUES FOR ATMOSPHERIC CONTAMINANTS HAVE BEEN USED BY INDUSTRIAL HYGIENISTS FOR APPROXIMATELY 50 YEARS. THE EXPERIENCE GAINED DURING THIS PERIOD SHOWS THAT THESE VALUES HAVE BEEN BENEFICIAL TO THE PROFESSION, HOWEVER, THERE HAVE BEEN OCCURRENCES OF MISUSE OF THESE VALUES, PRIMARILY BY LAY PEOPLE. BECAUSE OF THE URGENCY OF PROTECTING THE HEALTH AND LIVES OF PEOPLE, VALUES ARE OFTEN ESTABLISHED WITH LITTLE SUPPORTING DATA AND AT TIMES ARE NO MORE THAN THE EDUCATED GUESSES OF A GROUP OF EXPERTS. PRECISE TERMINOLOGY AND PROPER USAGE ARE IMPORTANT BECAUSE THE LIMITING VALUES ARE FREQUENTLY ENFORCED BY REGULATORY AGENCIES.

07-1-5-092

SYMPOSIUM ON RADIATION AND TERRESTRIAL ECOSYSTEMS

HUNGATE, F. P.

PACIFIC NORTHWEST LABORATORIES, RICHLAND, WASHINGTON

THE SYMPOSIUM CONSISTED BASICALLY OF THREE PARTS. ONE BROUGHT TOGETHER SOME OF THE MATERIAL OF THE MANY FIELDS THAT ARE THE SOURCE OF RADIATION ECOLOGY. THE MATERIAL COMPRISED KNOWLEDGE ABOUT SOURCES OF RADIONUCLIDES AND HOW THESE RADIONUCLIDES ENTER A FOOD CHAIN THROUGH PLANTS. IN THE SECOND PART, STUDIES WERE DISCUSSED IN WHICH ECOLOGICAL PATHS AND RATES OF NUCLIDE TRANSFER WERE IDENTIFIED. TRACERS OF ALL KINDS WERE UTILIZED IN THE STUDIES - THOSE OF NATURAL ORIGIN, THOSE WIDELY DISPERSED AS FALLOUT, THOSE INTENTIONALLY INTRODUCED INTO THE SYSTEM, AND EVEN NONRADIOACTIVE SIMPLE MINERAL CONSTITUENTS. NO RADIATION EFFECTS WERE INVOLVED IN THESE PROBLEMS. THE THIRD PART BROUGHT RADIATION INTO FOCUS AS AN ENVIRONMENTAL FACTOR. IT WAS POINTED OUT THAT RADIATION PRODUCES BOTH STIMULATORY AND INHIBITORY EFFECTS, DEPENDING ON LEVELS USED AND FEATURES OF THE SYSTEM OBSERVED.

07-1-5-099

SELECTIVE SORPTION REACTIONS OF STRONTIUM WITH SOIL MINERALS

TAMURA, T.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

THE REACTIONS OF RADIOSTRONTIUM WITH SOILS AND CLAY MINERALS AND WITH CHEMICAL SOLUTIONS OF SOILS AND CLAY MINERALS CONTAINING MICROCONCENTRATIONS OF THE RADIONUCLIDE AND MACROCONCENTRATIONS OF DISSOLVED STABLE IONS ARE REVIEWED. IN THE REACTIONS OF STRONTIUM IN SOIL-RELATED SYSTEMS, IT IS IMPORTANT NOT ONLY TO CONSIDER THE CLAY MINERALS WITH THEIR ION-EXCHANGE PROPERTIES BUT ALSO TO REMEMBER THAT THESE SYSTEMS MAY CONTAIN LIMESTONE AND THE HYDROUS IRON AND ALUMINUM OXIDES COMMONLY REFERRED TO AS SESQUIOXIDES. THE PRESENCE OF THE LATTER COMPONENTS APPEARS TO HAVE LITTLE DIRECT INFLUENCE ON CESIUM SORPTION, BUT THESE COMPONENTS CAN PLAY AN IMPORTANT ROLE IN STRONTIUM SORPTION.

07-1-6-104

NPD REACTOR OPERATING EXPERIENCE

HAKE, G.

ATOMIC ENERGY OF CANADA LIMITED, CHALK RIVER, ONTARIO

THE PERFORMANCE OF THE NPD REACTOR UP TO THE END OF 1964 IS REVIEWED. THE REACTOR WAS BUILT TO DEMONSTRATE THE CONCEPT OF A PRESSURE-TUBE REACTOR COOLED AND MODERATED WITH HEAVY WATER AND FUELED WITH NATURAL URANIUM. THE OPERATION HAS DEMONSTRATED A HIGH STATION-CAPACITY FACTOR AND THE SATISFACTORY CONSERVATION OF HEAVY WATER. THE DESIGN HAS BEEN SHOWN TO BE SOUND AND THE REACTOR SAFE. SAFETY FEATURES CHARACTERISTIC OF CANADIAN REACTORS ARE IDENTIFIED, AND COMPONENT PERFORMANCE AND FAILURES ARE DISCUSSED. IMPROVEMENTS MADE TO THE STATION ARE DESCRIBED. THE ADOPTION OF THE DRY ROOM PRINCIPLE WAS THE MOST IMPORTANT IN THAT BOTH HEAVY-WATER LOSSES AND THE TRITIUM HAZARD WERE REDUCED.

07-1-6-113

BONUS SUPERHEATER FAILURE

KING, E. M. + LONG, E. L.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

ON NOV. 11, 1964, WHILE OPERATING AT ABOUT 5 MW, BONUS RECORDED A POWER TRANSIENT WHEN THE STEAM FLOW WAS REDUCED FOR ABOUT 2 1/2 MIN AS A RESULT OF OPERATOR ERROR. THERE WAS NO SIGNIFICANT EXPOSURE TO BONUS PLANT PERSONNEL NOR TO OFF-SITE PERSONNEL, THERE WAS NO SIGNIFICANT RELEASE OF RADIOISOTOPES TO THE SURROUNDING AREA. A FAILED SUPERHEATER ASSEMBLY WAS LOCATED BY A SERIES OF RADIATION SURVEYS WITHIN THE REACTOR VESSEL. HOT-CELL EXAMINATION REVEALED THAT TWO FUEL RODS IN THE ASSEMBLY HAD SWOLLEN ON THE DIAMETER THE ENTIRE LENGTH OF THE CLADDING AND THAT ONE OF THESE HAD AN 11.5-IN. RUPTURE NEAR THE BOTTOM END. THE MOST SIGNIFICANT OBSERVATIONS THAT COULD BE RELATED TO FAILURE OF THE RODS INVOLVED THE WELMENTS. METALLOGRAPHIC EXAMINATION REVEALED HOT CRACKS (I.E., CRACKS THAT FORMED DURING WELDING) IN THE VENT-PLUG WELDS.

- 07-2-1-137 ADMINISTRATION OF RADIATION SAFETY AT THE CVTR
LEWIS, L.
CAROLINAS-VIRGINIA NUCLEAR POWER ASSOCIATES, INCORPORATED, PARR,
SOUTH CAROLINA
THIS ARTICLE DESCRIBES THE BASIC ASPECTS OF THE
RADIATION- SAFETY PROGRAM AT THE CVTR, A PRIVATELY OWNED AND
OPERATED, HEAVY-WATER-MODERATED AND -COOLED POWER DEMONSTRATION
REACTOR, LOCATED IN PARR, S. C. THE OPERATING PHILOSOPHY, THE
ORGANIZATION FOR SAFETY, AND SOME IMPORTANT CONSIDERATIONS OF
THE RADIOLOGICAL PROTECTION PROGRAM ARE OUTLINED. NOTE IS ALSO
MADE OF THE USE OF AEC LICENSING AND REGULATORY REQUIREMENTS AS
A BASIS FOR THE SAFETY PROGRAM AND EFFORTS. THE ARTICLE ALSO
DESCRIBES HOW SAFETY COGNIZANCE IS INCORPORATED IN OPERATING
AND TEST PROCEDURES AND DOCUMENTS. PLANT OPERATING EXPERIENCE,
EMERGENCY PROCEDURES, AND ECONOMICS OF THE HEALTH AND SAFETY
PROGRAM ARE ALSO DESCRIBED.
- 07-2-1-148 REPORT ON THE 1965 CONFERENCE ON REACTOR OPERATING EXPERIENCE
CRAMER, E. N.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
SIXTY-FIVE PAPERS WERE PRESENTED, AND ONE PANEL DISCUSSION WAS
HELD DURING THE CONFERENCE ON REACTOR OPERATING EXPERIENCE HELD
JULY 28-29, 1965. ABSTRACTS OF THE PAPERS WERE PUBLISHED IN A
SUPPLEMENT TO VOLUME 8 OF THE ANS TRANSACTIONS. THE SUBJECTS OF
THE EIGHT SESSIONS WERE I. REACTOR AND SYSTEMS COMPONENTS II.
ADMINISTRATIVE AND OPERATIONAL PHILOSOPHY III. PANEL
DISCUSSION ON REACTOR OPERATING PROCEDURES IV. OPERATING
PARAMETER MEASUREMENTS AND TECHNIQUES V. REACTOR OPERATING
EXPERIENCE VI. FISSION-PRODUCT CONTROL VII. SPECIAL TESTS AND
OPERATIONS VIII. CONTROL AND SAFETY SYSTEMS. THIS REVIEW
REPORTS PERTINENT THOUGHTS AND TRENDS NOTED, WITH DETAILED
REVIEW OF ONLY A FEW SIGNIFICANT PAPERS.
- 07-2-1-159 NOTES ON REACTOR SAFETY IN THE USSR
U. S. ATOMIC ENERGY COMMISSION, WASHINGTON, D. C.
A GROUP OF AMERICAN SCIENTISTS JUST RETURNED FROM THE SOVIET
UNION AFTER A TWO-WEEK VISIT. THIS DELEGATION'S VISIT TO THE
SOVIET UNION ON DEC. 11, 1964, WAS PART OF A RECIPROCAL
EXCHANGE ARRANGED BY THE AEC AND THE STATE COMMITTEE FOR THE
UTILIZATION OF ATOMIC ENERGY. THE VISIT WAS REWARDING BOTH IN
TERMS OF EXCHANGE OF NUCLEAR TECHNOLOGY AND IN TERMS OF
PERSONAL CONTACTS MADE OR RENEWED. THE U. S. DELEGATION
EXPRESSED ITS INCREASED HOPE AND BELIEF THAT OUT OF CONTINUING
SCIENTIFIC DISCUSSIONS AND EXCHANGES SUCH AS THIS CAN COME
IMPROVED UNDERSTANDING BETWEEN PEOPLE OF SCIENCE THAT WILL
EXTEND BEYOND THE DIRECT TECHNOLOGICAL BENEFITS INVOLVED, AND
CONTRIBUTE TOWARD A LASTING WORLD PEACE.
- 07-2-2-162 SPACE DEPENDENT REACTOR KINETICS
KASTEN, P. R.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
RESULTS OF RECENT SPACE-TIME REACTOR KINETICS CALCULATIONS
INDICATE THAT, IN GENERAL, SPATIAL EFFECTS ARE SIGNIFICANT AND
CANNOT BE NEGLECTED IN STUDYING REACTOR BEHAVIOR OR IN
DETERMINING REACTOR PARAMETERS. UNDER CERTAIN CIRCUMSTANCES THE
SPACE-INDEPENDENT KINETICS MAY GIVE USEFUL INFORMATION, BUT
THESE CONDITIONS ARE AT PRESENT POORLY DEFINED. IT IS NOT CLEAR
WHAT INFLUENCE SPATIAL EFFECTS HAVE ON THE GENERAL SAFETY AND
STABILITY CRITERIA DEVELOPED USING THE SPACE-INDEPENDENT MODEL,
MUCH WORK STILL REMAINS TO BE DONE IN THIS AREA.
- 07-2-2-165 SAFETY ASPECTS OF THREE IN-PILE GAS LOOPS
ZASLER, J.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
THE DESIGN AND HAZARDS REPORTS OF THREE IN-PILE GAS LOOPS,
NAMELY, THE BROOKHAVEN CHEMC-NUCLEAR IN-PILE RESEARCH LOOP, THE
ORNL GCR-ORR LOOP 2, AND THE GENERAL ATOMIC IN-PILE LOOP
(GAIL), ARE REVIEWED WITH REGARD TO THE DESIGN FEATURES
PROVIDED TO ENSURE SAFETY OF PERSONNEL AND EQUIPMENT.
- 07-2-2-169 IGNITION AND COMBUSTION OF REACTOR MATERIALS UNDER ACCIDENT CONDITIONS
PETERSON, S.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
SUBJECTS TREATED INCLUDE THE IGNITION BEHAVIOR OF URANIUM
ALLOYS (INCLUDING THOSE WITH PLUTONIUM), THE PARTICLE SIZE OF
URANIUM COMBUSTION PRODUCTS, THE OXIDATION OF URANIUM
MONONITRIDE IN VARIOUS FORMS, GRAPHITE OXIDATION BY VARIOUS
GASES, THE IGNITION BEHAVIOR OF MAGNESIUM AND ITS ALLOYS IN
CARBON DIOXIDE AND MIXTURES CONTAINING CARBON DIOXIDE,
IMPROVEMENT BY ALUMINUM OF THE OXIDATION RESISTANCE OF

ZIRCONIUM AND NIOBIUM BERYLLIDES, THE IGNITION OF METAL POWDERS IN VARIOUS GASES, AND THE NATURE AND COMBATING OF FIRES. NOTEWORTHY ITEMS ARE THE EFFECT OF THERMAL HISTORY ON THE ALUMINUM - TRI URANIUM OXIDE THERMITE REACTION, THE INHIBITION OF GRAPHITE OXIDATION BY PHOSPHORUS CYCHLORIDE, THE INCREASING KNOWLEDGE OF IRRADIATION-RELATED EFFECTS ON GRAPHITE OXIDATION, AND A CURRENT EXTENSIVE STUDY OF THE NATURE OF SODIUM FIRES.

07-2-3-175 GADOLINIUM NITRATE INJECTION AS AN AUXILIARY SHUTDOWN SYSTEM FOR SAVANNAH RIVER REACTORS

FEINRICH, L. A.

E. I. DUPONT DE NEMOURS, AIKEN, SOUTH CAROLINA

EACH PRODUCTION REACTOR AT THE SAVANNAH RIVER PLANT IS EQUIPPED WITH AN AUXILIARY SHUTDOWN DEVICE CALLED THE SUPPLEMENTARY SAFETY SYSTEM. THIS SYSTEM FUNCTIONS BY INJECTING A GADOLINIUM NITRATE DEUTERIUM OXIDE SOLUTION DIRECTLY INTO THE REACTOR MODERATOR. CALCULATIONS OF THE DYNAMICS OF THE SYSTEM SHOW THAT IT WILL SHUT DOWN A SAVANNAH RIVER REACTOR AND KEEP IT SUBCRITICAL IN THE EVENT OF AN INCIDENT IN WHICH CONTROL AND SAFETY RODS BECOME INEFFECTIVE. IN A SPECIAL TEST A REACTOR, OPERATING AT POWER, WAS SHUT DOWN USING THE SYSTEM. THE OBSERVED RESPONSE TIME WAS 3.5 SEC. POISON WAS SUBSEQUENTLY REMOVED FROM THE REACTOR MODERATOR BY ION EXCHANGE.

07-2-3-179 NUCLEAR TRANSDUCERS

ROUX, D. P.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

TWO TECHNIQUES DEVELOPED TO AVOID THE EFFECTS OF GAMMA RADIATION IN IONIZATION CHAMBERS INTENDED FOR NEUTRON-FLUX MEASUREMENTS ARE DISCUSSED. ONE COMPENSATION METHOD MAKES USE OF THE FLUCTUATIONS OF THE IONIZATION-CHAMBER OUTPUT CURRENT, AND THE OTHER PROVIDES A NEW METHOD OF ELECTRICAL ADJUSTMENT OF THE COMPENSATION IN A DIFFERENTIAL CHAMBER. SOME MAJOR LIMITATIONS OF FISSION COUNTERS IN REACTOR APPLICATIONS ARE THE COUNTING-RATE RANGE, THE GAMMA PILEUP, AND THE ELECTRICAL NOISE PICKUP. SEVERAL REPORTS DISCUSSING THESE PROBLEMS AND PROPOSING SOME REMEDIES ARE REVIEWED. FINALLY, SUBMINIATURE IN-CORE IONIZATION CHAMBERS, SELF-POWERED NEUTRON DETECTORS, AND SELF-REGENERATING NEUTRON-SENSITIVE DETECTORS ARE DESCRIBED AND EVALUATED AS IN-CORE NEUTRON MONITORS.

07-2-4-185 REACTOR PRIMARY PIPING SYSTEM RUPTURE STUDIES

KILSBY, E. R., JR.

GENERAL ELECTRIC COMPANY, SAN JOSE, CALIFORNIA

THE PIPE-RUPTURE STUDIES ARE CONCERNED WITH IMPROVING CURRENT UNDERSTANDING OF FAILURE-CAUSING MECHANISMS AND WITH PROVIDING IMPROVED CAPABILITY FOR EVALUATING AND MONITORING PIPING SYSTEMS TO MINIMIZE THE PROBABILITY OF FAILURES. PHASE I STUDIES WERE COMPLETED. THESE INVESTIGATIONS INCLUDED A SURVEY OF REACTOR-PLANT DESIGNERS, BUILDERS, AND OPERATORS TO DEFINE THE BOUNDARY CONDITIONS AND PROBLEM AREAS OF CONCERN, THE COLLECTION OF PIPING FAILURE CASE HISTORIES, A METALLURGICAL REVIEW OF FRACTURE MODES, AND A REVIEW OF MECHANICAL-DESIGN CONSIDERATIONS. THE PHASE I RESULTS, WHILE GENERALLY CONFIRMING THAT PIPING SYSTEMS ARE QUITE RELIABLE, CLEARLY DEFINED SPECIFIC PROBLEM AREAS REQUIRING FURTHER WORK. THE FOUR KEY AREAS OF UNCERTAINTY ARE - FRACTURE MECHANICS, FATIGUE, LOCALIZED CORROSION, CREEP AND STRESS RUPTURE.

07-2-4-194 LEAK TESTING OF REACTOR CONTAINMENT SYSTEMS

ROBINSON, G. C. + HORTON, T. R.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE - NORTH

CAROLINA STATE UNIVERSITY, RALEIGH, NORTH CAROLINA

THIS ARTICLE COMPILES AND DISCUSSES DATA ON DESIGN, LEAK TESTING, AND LEAK-RATE TESTING OF PRESSURE-TIGHT CONTAINMENT SYSTEMS. EMPHASIS IS PLACED ON COMPARISON OF THE VARIOUS CONTAINMENTS DESIGN AND HISTORY OF LEAK-RATE TESTING. METHODS OF ANALYSIS OF LEAK-RATE TESTING BY THE VARIOUS CONTAINMENT OPERATORS ARE PRESENTED. CURRENT RETESTING SCHEDULES ARE ALSO PRESENTED AND DISCUSSED.

07-2-4-203 SYMPOSIUM ON FISSION PRODUCT RELEASE AND TRANSPORT UNDER ACCIDENT CONDITIONS

BARTON, C. J. + COTTRELL, W. B.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

THIS REPORT BY THE AEC DIVISION OF REACTOR DEVELOPMENT AND TECHNOLOGY DISCUSSES THE FUEL AND PRESSURE-TUBE FAILURES IN A PRTR TEST LOOP ON SEPT. 29, 1965, ALTHOUGH THE EXAMINATION AND ANALYSIS OF THE FAILED COMPONENTS IS NOT YET COMPLETE.

07-2-4-204

THE STRENGTH OF STEEL CONTAINMENT SHELLS I. MERKLE, J. G.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
TWO IMPORTANT REPORTS CONCERNING REACTOR CONTAINMENT TECHNOLOGY WERE RECENTLY ISSUED. A PORTION OF EACH REPORT CONCERNS THE BURSTING STRENGTH OF THIN-WALLED-STEEL CONTAINMENT SHELLS. THESE SHELLS MAY BE CAPABLE OF UNDERGOING A LARGE AMOUNT OF PLASTIC DEFORMATION PRIOR TO BURSTING. EXPERIMENTAL AND ANALYTICAL RESEARCH ON THE BURSTING STRENGTH OF THIN-WALLED CYLINDERS WITH FLAT ENDS IS SUMMARIZED. DEFINITIONS OF FAILURE AND STRENGTH ARE PRESENTED, AND THE BASIC EQUATIONS OF PLASTICITY ARE DERIVED. INCLUDED ARE A TABULATED SUMMARY OF ANALYTICAL SOLUTIONS FOR THIN-WALLED CYLINDERS WITH RIGID ENDS AND AN EXTENSIVE BIBLIOGRAPHY.

07-2-4-212

POLICIES AND PROCEDURES USED IN THE UNITED STATES FOR DECONTAMINATING HOT CELLS CARR, W. H.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
A SURVEY WAS MADE OF CURRENT DECONTAMINATION POLICIES AND PROCEDURES. FOR HOT-LABORATORY OPERATIONS THE PRACTICES RANGE FROM SPRAYING AND MOPPING OF SOLUTIONS TO GROSS SURFACE REMOVAL BY GRINDING OR SANDBLASTING. CURRENT GENERAL POLICY IS TO DESIGN HOT CELLS SO AS TO REDUCE THE NEED FOR CLEANUP AND TO DECONTAMINATE ONLY TO THE EXTENT NECESSARY. REDUCING THE NEED FOR CLEANUP IS ACCOMPLISHED BY SUCH MEANS AS PROVIDING FOR REMOTE MAINTENANCE, INSTALLATION OF CONTAINMENT BARRIERS, AND USE OF SURFACE COATINGS. BOTH CONTAMINATION AND DECONTAMINATION INCLUDE CHEMICAL AND PHYSICAL MECHANISMS. CHEMICAL METHODS FOR DECONTAMINATION INCLUDE THE USE OF SOLUTIONS, SUCH AS FORMULATIONS BASED ON OXALIC ACID, THAT ARE SUPERIOR TO NITRIC ACID AND SODIUM HYDROXIDE. PHYSICAL METHODS INCLUDE VACUUM CLEANING, STEAM CLEANING, SANDBLASTING, SCRAPING, ULTRASONIC CLEANING, ETC.

07-2-5-218

THE WHY AND HOW OF NUCLEAR ACCIDENT DOSIMETRY

VALLARIO, E. J. + WASSON, H. R.
DIVISION OF OPERATIONAL SAFETY, U.S. ATOMIC ENERGY COMMISSION, WASHINGTON, D. C. - DIVISION OF BIOLOGY AND MEDICINE, U.S. ATOMIC ENERGY COMMISSION, WASHINGTON, D. C.

CERTAIN BASIC PARAMETERS SHOULD BE CONSIDERED IN THE DEVELOPMENT OF AN EFFECTIVE NUCLEAR ACCIDENT DOSIMETRY PROGRAM (1) A METHOD FOR SCREENING PERSONNEL INVOLVED IN NUCLEAR ACCIDENTS, (2) A FIXED SYSTEM (PRIMARY UNIT) CAPABLE OF DETECTING FIRST-COLLISION DOSE WITHIN SOME ESTABLISHED DEGREE OF ACCURACY AT ITS POINT OF LOCATION, (3) THE POSSIBLE NEED FOR SECONDARY UNITS, AND (4) DEVICES WORN BY PERSONNEL WHICH WOULD AFFORD SPECTRUM AND FLUX INFORMATION TO ASSIST IN DOSIMETRY EXTRAPOLATION. THE NEUTRON COMPONENT OF THE SYSTEM SHOULD YIELD FLUX AND SPECTRUM INFORMATION TO ARRIVE AT APPROPRIATE QUALITY FACTORS IN THE DOSE ESTIMATION. THE GAMMA-RAY COMPONENT OF THE SYSTEM SHOULD PERMIT MEASURING GAMMA RADIATION WITHIN THE BIOLOGICAL AREAS OF INTEREST, 10 TO 10³ R.

07-2-5-225

SUMMARY OF MEASUREMENTS OF DISPERSION FROM QUASI INSTANTANEOUS SOURCES SLADE, D. H.

U. S. WEATHER BUREAU, WASHINGTON, D. C.
CONSIDERABLE THEORETICAL AND PRACTICAL PROGRESS HAS BEEN MADE IN THE PROBLEM OF ESTIMATING DISPERSION FROM CONTINUOUS SOURCES OVER PERIODS OF APPROXIMATELY 1 HR. PRACTICAL EXPERIENCE IN ESTIMATING THE RESULTS OF VERY SHORT RELEASES OF POLLUTANTS HAS NOT PROGRESSED AS RAPIDLY. IN THE LAST TWO YEARS, A FEW DETAILED, AND A FEW LESS DETAILED, QUASI-INSTANTANEOUS SOURCE EXPERIMENTS WERE PERFORMED. NONE OF THESE EXPERIMENTS CAN BE CONSIDERED TO BE DEFINITIVE IN THE SENSE THAT MEASUREMENTS WERE MADE AND THEORIES EVALUATED OVER A WIDE VARIETY OF RELEASE HEIGHTS AND METEOROLOGICAL AND TERRAIN CONDITIONS. HOWEVER, BY PIECING TOGETHER SOME OF THE EXPERIMENTAL DATA, A TENTATIVE ESTIMATE OF THE MAGNITUDE OF DISPERSION FROM A QUASI-INSTANTANEOUS SOURCE MAY BE OBTAINED.

07-2-5-229

WHOLE BODY COUNTING - AN ENVIRONMENTAL MONITORING TOOL ABEE, H. H.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
THE USE OF WHOLE-BODY COUNTERS IN THE EVALUATION OF POPULATION EXPOSURE TO ENVIRONMENTAL RADIOACTIVE MATERIALS IS REVIEWED. THE RESULTS OF A NUMBER OF POPULATION-EXPOSURE STUDIES ARE DISCUSSED, AND SOME OF THE ADVANTAGES AND SHORTCOMINGS OF THE USE OF WHOLE-BODY COUNTERS FOR THIS PURPOSE ARE ENUMERATED. THE RESULTS OF THE STUDIES CITED CONFIRM THE PLACE OF THE WHOLE-BODY COUNTER AS AN ENVIRONMENTAL-MONITORING TOOL. WHERE AVAILABLE, THE WHOLE-BODY COUNTER CAN PROVIDE A VALUABLE ADDITION TO CONVENTIONAL ENVIRONMENTAL-MONITORING TECHNIQUES FOR THE DETERMINATION OF DOSE TO MAN FROM RADIOACTIVE MATERIALS IN THE ENVIRONMENT.

- 07-2-5-231 CURRENT PRACTICES IN HANDLING AND STORING SOLID RADIOACTIVE WASTE FROM REACTORS
STEVENSON, C. E.
ARGONNE NATIONAL LABORATORY, IDAHO FALLS, IDAHO
SOLID RADIOACTIVE WASTES INCLUDE FILTERS AND ION-EXCHANGE RESINS, CORE HARDWARE, FAILED SYSTEM COMPONENTS, PROTECTIVE CLOTHING, AND OTHER MATERIALS CONTAMINATED IN MAINTENANCE OPERATIONS. COMBUSTIBLE WASTES, EXCLUDING RESINS, MAY AMOUNT TO 100 TO 1000 CU FT/YEAR PER REACTOR, WHEREAS ESTIMATED VOLUMES OF NONCOMBUSTIBLES ARE 50 TO 300 CU FT/YEAR. MOST MATERIALS, EXCEPT CORE HARDWARE, ARE OF MODERATE TO LOW ACTIVITY. AT TWO SITES, COMBUSTIBLES ARE INCINERATED AND THE ASHES ARE DRUMMED, AT OTHER SITES, BOTH COMBUSTIBLES OF A BULKY NATURE ARE GENERALLY BALED OR DRUMMED DIRECTLY FOR OFF-SITE DISPOSAL AT AEC-APPROVED SITES. AT SEVERAL SITES, SOLIDS, INCLUDING RESINS, MAY BE FIXED IN DRUMS OF CONCRETE. AT OTHER SITES, RESINS ARE STORED IN UNDERGROUND TANKS. A FEW SITES ARE PROVIDED WITH VAULTS FOR TEMPORARY STORAGE OF SOLIDS.
- 07-2-6-236 HALLAM NUCLEAR POWER FACILITY OPERATING EXPERIENCE
KELLER, L. E. + DAVIDSON, R. H.
CONSUMERS PUBLIC POWER DISTRICT, HALLAM, NEBRASKA
THIS ARTICLE RELATES THE SIGNIFICANT EVENTS IN THE OPERATING EXPERIENCE OF THE HALLAM NUCLEAR POWER FACILITY (HNPF). THE HNPF EXPERIENCE HAS DEMONSTRATED THE SAFE, SIMPLE OPERATION OF A SODIUM-GRAPHITE REACTOR SYSTEM. FULL-POWER OPERATION OF THIS SYSTEM WAS FIRST ACHIEVED IN JULY 1963, WITH STEAM SUPPLIED TO A 100-MW TURBINE GENERATOR. FAILURES OF EQUIPMENT, INCLUDING INTERMEDIATE HEAT EXCHANGERS AND SODIUM PUMPS, RESULTED IN INTERRUPTIONS IN POWER GENERATION FOR LIMITED DURATIONS, EVENTUAL FAILURES OF MODERATOR-ELEMENT CLADDING RESULTED IN THE CURRENT FACILITY SHUTDOWN. NOT WITHSTANDING THESE OPERATING DIFFICULTIES, THE HNPF HAS DEMONSTRATED THE INHERENT SAFETY FEATURES OF THIS LOW-PRESSURE LIQUID-METAL REACTOR CONCEPT WITH EASE OF CONTROL AND SYSTEM MAINTENANCE.
- 07-2-6-242 RUPTURE LOOP FAILURE IN PLUTONIUM RECYCLE TEST REACTOR
DIVISION OF REACTOR DEVELOPMENT AND TECHNOLOGY, U. S. ATOMIC ENERGY COMMISSION, WASHINGTON, D. C.
THE INFORMATION GIVEN HERE IS EXCERPTED FROM THE FOREWORD AND OPENING REMARKS THAT APPEAR IN THE FOLLOWING REPORT OF SYMPOSIUM PROCEEDINGS - USAEC REPORT CONF-650407, VOLS. I AND II, INTERNATIONAL SYMPOSIUM ON FISSION-PRODUCT RELEASE AND TRANSPORT UNDER ACCIDENT CONDITIONS, APRIL 5-7, 1965, OAK RIDGE, TENNESSEE.
- 07-3-0-271 NOISE ANALYSIS IN REACTOR SAFETY
PIE, J. A.
CONSULTANT, 2893 KNOX AVENUE, SOUTH, ROOM 511, MINNEAPOLIS, MINNESOTA
THE APPLICATIONS OF TECHNIQUES IN THE FIELD OF REACTOR NOISE (OR RANDOM POWER FLUCTUATIONS) TO REACTOR SAFETY ARE REVIEWED. TABULATIONS ARE GIVEN OF ESSENTIALLY ALL THE APPLICATIONS TO DATE, BOTH IN ZERO-POWER REACTORS AND IN POWER REACTORS. THESE CONTRIBUTE TO SAFETY BY - DETERMINING THE REACTIVITY SHUTDOWN MARGIN, MONITORING FOR POSSIBLE INSTABILITIES, AND ASSISTING IN UNDERSTANDING THE DYNAMIC PROCESSES IN THE REACTOR. EXAMPLES OF RECENT WORK ARE GIVEN ALONG WITH AN EXTENSIVE BIBLIOGRAPHY. THE SIGNIFICANCE OF VARIOUS EXPERIMENTAL APPLICATIONS IS POINTED OUT, WITH COMMENTS REGARDING THEIR FUTURE PROMISE.
- 07-3-1-279 CONTRIBUTION OF SYSTEMATIC INCIDENT EVALUATION TO THE ACHIEVEMENT OF REACTOR SAFETY
ABLITT, J. F.
HEALTH AND SAFETY BRANCH, UNITED KINGDOM ATOMIC ENERGY AGENCY, RISLEY, ENGLAND
THE UKAEA PROCEDURE FOR COLLECTING FAULT DATA FROM OPERATING SITES AND THEN RECORDING, ANALYZING, AND DISSEMINATING THE DATA IS DESCRIBED. THIS PROCEDURE IS A MEANS FOR EXTRACTING THE MAXIMUM PRACTICAL VALUE FROM THE SAFETY ASPECTS OF EXPERIENCE IN REACTOR DESIGN AND OPERATION. FAULTS ARE CLASSIFIED INTO FOUR CATEGORIES - PLANT TYPE, COMPONENT TYPE, FAULT IMPORTANCE, AND FAULT TYPE. THESE CATEGORIES AND THE DEGREE OF DETAIL INVOLVED IN EACH ARE ILLUSTRATED BY EXTRACTS FROM THE UKAEA FAULT CODE. THIS FAR, SOME 600 DATA ITEMS HAVE BEEN COLLECTED FROM 25 REACTORS IN A SIX-MONTH PERIOD. SIX PERCENT OF EVENTS REPORTED ADVERSELY AFFECTED THE SAFETY STATUS OF A REACTOR. THE FAULT DATA ARE APPLIED TO A NUMERICAL EVALUATION OF RELIABILITY.

07-3-1-292

RADIATION SAFETY AT THE UNIVERSITY OF VIRGINIA

MEEM, J. L.

UNIVERSITY OF VIRGINIA, CHARLOTTESVILLE, VIRGINIA

THE ORGANIZATION FOR RADIATION SAFETY AT THE UNIVERSITY OF VIRGINIA IS DESCRIBED. THE RADIATION-SAFETY PROGRAM IS APPLIED TO THE NUCLEAR REACTOR, THE PARTICLE ACCELERATORS, AND THE TWO LARGE COBALT SOURCES AT THE UNIVERSITY OF VIRGINIA HOSPITAL AND AT BLANDY EXPERIMENTAL FARM. RADIATION SAFETY IS ADMINISTERED BY A RADIATION SAFETY COMMITTEE AND A REACTOR SAFETY COMMITTEE UNDER LICENSE WITH THE ATOMIC ENERGY COMMISSION. SELF-REGULATION UNDER RATHER BROAD LIMITS HAS BEEN ESTABLISHED.

07-3-1-297

PRODUCTION AND UTILIZATION FACILITY OPERATOR LICENSING

CRAMER, E. N.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

THIS REVIEW DISCUSSES CURRENT PRACTICES IN THE LICENSING OF REACTOR OPERATORS AND SENIOR REACTOR OPERATORS. IT ALSO PRESENTS IN TABULAR FORM BY REACTOR TYPE THE NUMBERS OF OPERATOR LICENSES GRANTED TO DATE, THUS INDICATING THE GENERAL TRENDS OF OPERATOR REPLACEMENT FOR EXISTING LOW-POWER REACTORS AND OF NEW OPERATORS FOR NEW POWER-REACTOR STARTUPS. A LICENSING GUIDE HAS BEEN PUBLISHED BY THE AEC FOR USE BY PROSPECTIVE REACTOR OPERATORS. THE FIRST EXAMINATIONS AT LICENSED FUEL-REPROCESSING PLANTS HAVE BEEN GIVEN.

07-3-2-302

FUEL ELEMENT PERFORMANCE LIMITATIONS

SCOTT, J. L.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

A NEW UNDERSTANDING HAS BEEN DEVELOPED OF THE SWELLING MECHANISMS OF METAL FUELS IN THE TEMPERATURE RANGE 400 TO 600°C. RECENT WORK ON FUEL ELEMENTS CONTAINING PULVERULED URANIUM DIOXIDE HAS SHOWN THAT URANIUM DIOXIDE CAN BE IRRADIATED AT HIGHER TEMPERATURES AND TO HIGHER BURNUPS THAN THOSE SET AS DESIGN LIMITS IN CONVENTIONAL WATER-COOLED REACTORS IF AN END PLENUM IS PROVIDED FOR FISSION GASES OR THE FUEL ELEMENT IS VENTED. MIXED OXIDES, PLUTONIUM DIOXIDE - URANIUM DIOXIDE AND THORIUM DIOXIDE - URANIUM DIOXIDE, BEHAVE MUCH LIKE URANIUM DIOXIDE IN REACTORS. WITH ALL OXIDE FUEL ELEMENTS, IT APPEARS THAT IRRADIATION EMBRITTLEMENT OF THE CLADDING AND FUEL-CLADDING MECHANICAL INTERACTIONS ARE THE MAJOR PROBLEMS. URANIUM CARBIDE AND URANIUM NITRIDE HAVE SOME ATTRACTIVE PROPERTIES. PYROLYTIC CARBON COATINGS ON URANIUM DICARBIDE AND URANIUM DIOXIDE MICROSPHERES HAVE SHOWN EXCELLENT IRRADIATION STABILITY AT TEMPERATURES AS HIGH AS 1100°C AND BURNUPS IN THE RANGE 10 TO 15 AT. PERCENT.

07-3-2-313

DOPPLER EFFECT IN FAST REACTORS

PRESKITT, C. A.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

THE PHYSICS OF DOPPLER EFFECTS IN FAST REACTORS IS REVIEWED. THE RECENT INCREASED IMPORTANCE OF THE DOPPLER EFFECT IS RELATED TO CHARACTERISTICS OF CERAMIC-FUELED REACTORS NOT PRESENT IN THE EARLIER METAL-FUELED SYSTEMS. COMPARISONS ARE MADE WITH THERMAL REACTORS IN DISCUSSING THE INFLUENCE OF THE REACTOR SPECTRUM AND THE NECESSITY FOR A BASICALLY STATISTICAL APPROACH TO THE PROBLEM.

07-3-2-318

RADIATION EFFECTS IN GRAPHITE

WITTELS, M. C.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

A BRIEF REVIEW IS GIVEN OF A NUMBER OF THEORETICAL AND EXPERIMENTAL STUDIES ON GRAPHITE THAT HAVE BEEN RECENTLY PUBLISHED. THE INVESTIGATIONS DESCRIBED INCLUDE THEORETICAL MODELS OF DEFECT KINETICS, STORED-ENERGY RELEASE SPECTRA, MOLECULAR RECOMBINATION HYPOTHESES, AND FLUX-LEVEL AND FLUX-SPECTRUM EFFECTS. THE EXPERIMENTAL STUDIES DESCRIBED COMPRISE THE DIRECT OBSERVATION OF DEFECTS IN GRAPHITE SINGLE CRYSTALS, FAST-NEUTRON AND CHARGED-PARTICLE IRRADIATIONS, AND ASSOCIATED RADIATION-INDUCED CHANGES. REACTOR GRAPHITE INVESTIGATIONS ARE GIVEN FOR HARDNESS MEASUREMENTS IN THE MARCOULE (G1) REACTOR, CYCLIC ANNEALING BEHAVIOR OF DIMENSIONAL CHANGES IN THE BROOKHAVEN GRAPHITE RESEARCH REACTOR, AND GENERAL EFFECTS OF RADIATION IN HANFORD REACTORS. THE REVIEW CONSIDERS EFFORTS OF A PURELY RESEARCH NATURE AS WELL AS ACTUAL REACTOR SAFETY APPLICATIONS.

- 07-3-3-324 VITAL POWER SUPPLIES FOR NUCLEAR FACILITIES
RUBEL, P.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
MEANS FOR EVALUATING POWER SUPPLIES FOR VITAL FUNCTIONS IN NUCLEAR FACILITIES ARE DISCUSSED. THE OVERALL SYSTEM FOR SUPPLYING POWER FOR VITAL FUNCTIONS MUST BE EXAMINED SO THAT THE POWER-SUPPLY RELIABILITY CAN BE EVALUATED ACCORDING TO REQUIREMENTS CONSISTENT WITH THOSE OF THE VITAL FUNCTIONS SERVED. THE APPLICATION OF THE GENERAL SYSTEM-RELIABILITY CRITERIA OF REDUNDANCE, INDEPENDENCE, ISOLATION, AND TESTING IS SUGGESTED. OTHER DESIGN, MAINTENANCE, AND ADMINISTRATIVE ASPECTS OF POWER SYSTEMS ARE CORRELATED.
- 07-3-3-328 SEVENTH TRIPARTITE INSTRUMENTATION CONFERENCE
OAKES, L. C.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
THE SEVENTH TRIPARTITE INSTRUMENTATION CONFERENCE WAS HELD IN BOURNEMOUTH, ENGLAND, MAY 24-28, 1965. PERSONNEL OF THE CONTROL AND INSTRUMENTATION DIVISION OF THE WINFRITH ATOMIC ENERGY ESTABLISHMENT, DORCHESTER, ENGLAND, WERE HOSTS. THE TRIPARTITE SERIES OF CONFERENCES PROVIDE EXCHANGES OF INFORMATION BETWEEN PERSONNEL OF CANADA, THE UNITED KINGDOM, AND THE UNITED STATES. PREVIOUS CONFERENCES IN THIS SERIES COVERED A WIDE RANGE OF SUBJECTS RELATED TO RADIOLOGICAL INSTRUMENTATION FOR RESEARCH AND MONITORING APPLICATIONS. THIS, THE SEVENTH MEETING, WAS MORE LIMITED IN SCOPE AND EMPHASIZED INSTRUMENTATION AND CONTROL SYSTEMS FOR THE SAFETY AND CONTROL OF NUCLEAR REACTORS. APPROXIMATELY 50 TECHNICAL PAPERS WERE PRESENTED IN GENERAL CATEGORIES, AND 27 OF THESE PAPERS ARE REVIEWED IN THIS ARTICLE.
- 07-3-3-333 USE OF REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTERS AT ORNL
BAIRD, J. N., JR. + CRISTY, G. A.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
PROTECTION OF WATER SYSTEMS FROM CONTAMINATION BY BACKFLOW IS A PROBLEM AT THE OAK RIDGE NATIONAL LABORATORY (ORNL), AS IT IS IN MUNICIPALITIES AND INDUSTRIAL INSTALLATIONS. THE NUCLEAR COMPLEX AT ORNL INCLUDES MANY TYPES OF BUILDINGS THAT CONTAIN NUMEROUS LABORATORIES, EXPERIMENTAL SYSTEMS, AND DEVELOPMENTAL PROCESSES, EACH OF WHICH MUST BE INDIVIDUALLY SUPPLIED WITH WATER FOR COOLING, WASHING, OR FLUSHING. ALL THESE NEEDS FOR PROCESS WATER AT ORNL ARE SUPPLIED FROM A SINGLE POTABLE-WATER-SUPPLY SYSTEM. THIRTY-FOUR REDUCED-PRESSURE-PRINCIPLE BACKFLOW PREVENTERS HAVE BEEN INSTALLED AT ORNL. DURING THE FIRST TWO YEARS OF OPERATION OF THIS PROGRAM, ONLY SIX EQUIPMENT FAULTS WERE FOUND. NONE OF THESE FAULTS JEOPARDIZED THE SAFETY OF THE POTABLE-WATER SYSTEM BECAUSE THEY WERE DISCOVERED AND CORRECTED BEFORE MALFUNCTION COULD OCCUR.
- 07-3-4-338 EXPERIMENTAL INVESTIGATION OF CORE SPRAY
UCHIDA, H.
UNIVERSITY OF TOKYO, TOKYO, JAPAN
EXPERIMENTAL INVESTIGATIONS OF CORE SPRAY COOLING FOR ELECTRICALLY HEATED SIMULATED FUEL-ELEMENT ASSEMBLIES ARE DISCUSSED. THE PURPOSE OF A CORE SPRAY IS TO PREVENT A SUDDEN TEMPERATURE RISE OF THE FUEL ELEMENTS IN A LIGHT-WATER-MODERATED REACTOR FOLLOWING A LOSS-OF-COOLANT ACCIDENT. THE SPRAY COOLS THE HEATED RODS BY EVAPORATION OF A WATER FILM FLOWING DOWN ACROSS THE SURFACE. AS THE HEAT INCREASES BEYOND A CERTAIN POINT, THE LOWER PARTS OF THE RODS DRY OWING TO COMPLETE EVAPORATION AND TO THE FACT THAT FURTHER DOWNWARD FLOW OF WATER THROUGH THE CHANNELS IS PREVENTED BY THE UPWARD FLOW OF STEAM.
- 07-3-4-342 EFFECT OF ENGINEERED SAFEGUARDS ON REACTOR SITING
CULVER, H. N.
TENNESSEE VALLEY AUTHORITY, KNOXVILLE, TENNESSEE
AN ANALYSIS OF RECENT LICENSING TRENDS PROVIDES SOME INSIGHT AS TO THE ACCEPTABILITY AND EFFECTIVENESS OF SEVERAL ENGINEERED SAFEGUARDS TO REDUCE REACTOR SITING DISTANCES. THIS ARTICLE PRESENTS A TABULATION OF THE WATER REACTORS IN THE UNITED STATES, INDICATES THE ENGINEERED SAFEGUARDS PROVIDED FOR THESE REACTORS, AND THEN ASSOCIATES AN APPARENT ENGINEERED-SAFEGUARDS FACTOR FOR EACH REACTOR. ALTHOUGH THE EFFECTIVENESS OF ANY ENGINEERED SAFEGUARD CAN BE JUDGED ONLY ON ITS APPLICATION TO A SPECIFIC DESIGN, THE AUTHOR CONCLUDES THAT, ON THE BASIS OF EXISTING TRENDS IN THE LICENSING OF REACTORS, APPARENT ENGINEERED-SAFEGUARDS FACTORS OF UP TO 23 CAN BE ACHIEVED IN AN ADEQUATELY DESIGNED REACTOR FACILITY.

07-3-4-346

THE STRENGTH OF STEEL CONTAINMENT SHELLS II.

MERKLE, J. G.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

TWO IMPORTANT REPORTS CONCERNING REACTOR CONTAINMENT TECHNOLOGY HAVE RECENTLY BEEN ISSUED. A PORTION OF EACH REPORT CONCERNS THE BURSTING STRENGTH OF THIN-WALLED STEEL CONTAINMENT SHELLS. THESE SHELLS MAY BE CAPABLE OF UNDERGOING A LARGE AMOUNT OF PLASTIC DEFORMATION PRIOR TO BURSTING. EXPERIMENTAL AND ANALYTICAL RESEARCH ON THE BURSTING STRENGTH OF THIN-WALLED CYLINDERS WITH RIGID ENDS IS SUMMARIZED. DEFINITIONS OF FAILURE AND STRENGTH ARE PRESENTED, AND THE BASIC EQUATIONS OF PLASTICITY ARE DERIVED. A COMPARISON IS MADE BETWEEN THE STRENGTH PREDICTIONS OF PLASTIC THEORY AND THE PRESENT ASME CODE FOR BOTH SPHERICAL AND CYLINDRICAL CONTAINMENT SHELLS. ALSO INCLUDED ARE A TABULATED SUMMARY OF ANALYTICAL SOLUTIONS FOR THIN-WALLED CYLINDERS WITH RIGID ENDS AND AN EXTENSIVE BIBLIOGRAPHY.

07-3-5-354

CALCULATION OF PRECIPITATION SCAVENGING OF PARTICULATES AND GASES FROM THE ATMOSPHERE

ENGELMANN, R. J.

PACIFIC NORTHWEST LABORATORIES, RICHLAND, WASHINGTON

A FIRM BASIS FOR CALCULATIONS OF PRECIPITATION SCAVENGING OF PARTICULATES AND GASES FROM THE ATMOSPHERE AND A GUIDE TO QUANTITATIVE PREDICTIONS ARE PRESENTED. COLLECTION EFFICIENCIES, WASHOUT COEFFICIENTS FOR PARTICLES AND GASES, RAIN SPECTRA, AND WASHOUT BY SNOW ARE DISCUSSED, AND VALUES ARE GIVEN, INCLUDING SOME PREVIOUSLY UNPUBLISHED. EXTENSIVE AREA WITHIN A WASHOUT ISOPLETH CHARTS ARE SHOWN FOR THREE ATMOSPHERIC STABILITIES AND SEVERAL WASHOUT COEFFICIENTS.

07-3-5-364

PREDICTION OF IODINE-131 IN MILK FOR PROTECTIVE ACTION PLANNING

STIGALL, G. E. + LEARY, A. G.

NATIONAL INSTITUTES OF HEALTH, BETHESDA, MARYLAND

MATHEMATICAL EQUATIONS HAVE BEEN DEVELOPED FOR USE IN PREDICTIONS OF THE ATMOSPHERIC DISPERSION, GROUND DEPOSITION, AND CONCENTRATION IN MILK OF IODINE-131 THAT MIGHT BE RELEASED TO THE ENVIRONMENT. CALCULATIONS OF ATMOSPHERIC DISPERSION AND GROUND DEPOSITION OF IODINE-131 BASED ON THE WORK OF SUTTON AND CHAMBERLAIN ARE PRESENTED, AND SUBSEQUENT DISCUSSIONS DEAL WITH GROUND DEPOSITION, THE CONCENTRATION OF IODINE-131 IN MILK, AND THE RESULTING THYROID DOSE TO A ONE-YEAR-OLD RECEPTOR. THE USE OF THE MATHEMATICAL EQUATIONS PRESENTED TO EVALUATE ACTUAL EMERGENCY SURVEILLANCE TECHNIQUES WOULD POINT OUT SOME OF THE PRESENT INADEQUACIES IN PREDETERMINATION OF A PROPER RESPONSE TO AN ACCIDENT AT A NUCLEAR FACILITY AND THE PITFALLS OF THE USE OF RATIOS IN PREDICTIONS OF ESTIMATED THYROID DOSES TO PEOPLE.

07-3-5-370

REVIEW OF HEALTH PHYSICS SOCIETY PAPERS ON ENVIRONMENTAL MONITORING, HAZARDS ANALYSIS, AND WASTE DISPOSAL

MAWSON, C. A. + COWSER, K. E.

ATOMIC ENERGY OF CANADA LIMITED, CHALK RIVER, ONTARIO - OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

A REVIEW IS PRESENTED OF PAPERS ON THREE TOPICS DISCUSSED AT THE TENTH ANNUAL MEETING OF THE HEALTH PHYSICS SOCIETY - ENVIRONMENTAL MONITORING, HAZARDS ANALYSIS, AND WASTE DISPOSAL. PAPERS ON RADIATION EXPOSURES IN THE VICINITIES OF NUCLEAR OPERATIONS AT OAK RIDGE, HANFORD, AND SAVANNAH RIVER, ARE DISCUSSED. ALSO, PROBLEMS DEALING WITH ECONOMY, PRACTICE AND THEORY, CLOUD DISPERSION, DIETARY SURVEYS, UNDERGROUND EXPLOSIONS, TRITIUM IN JAPAN, AND THE CONVERSION OF LIQUID WASTE TO SOLIDS ARE COVERED. SEVERAL PAPERS ON INTERNAL AND EXTERNAL DOSE ESTIMATES AND EXPOSURES FOLLOWING THE RELEASE OF RADIONUCLIDES ARE SUMMARIZED. SOME RECENT TESTS CONCERNING THE ULTIMATE DISPOSAL OF LIQUID WASTE BY THE HYDRAULIC-FRACTURING TECHNIQUE, AND STUDIES OF LIQUID-WASTE DISPOSAL AT OAK RIDGE AND HANFORD ARE REVIEWED.

07-3-6-375

CAROLINAS-VIRGINIA TUBE REACTOR OPERATING EXPERIENCE

WAGONER, C. C. + NABOW, S. A.

CAROLINAS-VIRGINIA NUCLEAR POWER ASSOCIATES, INCORPORATED, PARR, SOUTH CAROLINA

THE OPERATING EXPERIENCE OF THE CAROLINAS-VIRGINIA TUBE REACTOR, INCLUDING PERTINENT BACKGROUND INFORMATION AND RELATED PROBLEMS ENCOUNTERED IN THE CHECKOUT AND OPERATION OF THE PLANT, IS DESCRIBED. THE REACTOR IS A PROTOTYPE FOR A 200-MW UNIT AND IS LICENSED FOR AN OUTPUT OF 65 MW (GROSS FISSION POWER) FOR A FIVE-YEAR PERIOD ENDING IN NOVEMBER 1967. THE OBJECTIVES OF THIS HEAVY-WATER PLANT ARE TO PROVIDE DATA AND

OPERATING EXPERIENCE WITH THE PRESSURE-TUBE CONCEPT AND LOW-ENRICHMENT FUEL AND TO PROVIDE A BASIS FOR FUTURE DESIGN OF A RELATED CONCEPT ON A LARGER SCALE. CAROLINAS-VIRGINIA NUCLEAR POWER ASSOCIATES, INC., A NONPROFIT ORGANIZATION, IS JOINTLY OWNED BY DUKE POWER COMPANY, VIRGINIA ELECTRIC AND POWER COMPANY, CAROLINA POWER AND LIGHT COMPANY, AND SOUTH CAROLINA ELECTRIC AND GAS COMPANY.

- 07-4-1-409 REGULATIONS AND STANDARDS FOR THE TRANSPORTATION OF RADIOACTIVE MATERIALS
PAFF, K. W. + HERTON, T. R.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE - NORTH CAROLINA STATE UNIVERSITY, RALEIGH, NORTH CAROLINA
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.
- 07-4-1-413 FRC REPORT NUMBER 7 ON PROTECTIVE ACTION GUIDES FOR ENVIRONMENTAL STRONTIUM-89, STRONTIUM-90, AND CESIUM-137 CONTAMINATION
SNYDER, W. S.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
FEDERAL RADIOATION COUNCIL (FRC) REPORT NO. 7 PROVIDES GUIDANCE FOR ACTIONS WHEN THE ENVIRONMENT IS CONTAMINATED WITH STRONTIUM-89, STRONTIUM-90, OR CESIUM-137. THE ACTIONS ENVISAGED INVOLVE CHANGES IN PROCESSING OR DISTRIBUTION OF FOOD, DIVERSION OF PRODUCTS TO USES OTHER THAN HUMAN CONSUMPTION, AND THE CONDEMNATION OF PRODUCTS. BOTH THE SITUATION DURING THE FIRST 100 DAYS FOLLOWING AN ACCIDENTAL RELEASE TO THE ENVIRONMENT AND THE LONGER TERM SITUATION ARE DISCUSSED. THE FRC GIVES RECOMMENDED PROTECTIVE ACTION GUIDES (PAG) ONLY FOR THE SITUATION DURING THE FIRST YEAR.
- 07-4-1-415 NATIONAL AND INTERNATIONAL NUCLEAR CODES, STANDARDS, AND REGULATIONS
COTTRELL, W. B.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
WITH THE COMING OF AGE OF NUCLEAR POWER, THE NUCLEAR COMMUNITY IS TURNING INCREASING ATTENTION TO THE DEVELOPMENT OF CODES, STANDARDS, AND REGULATIONS. MANY TECHNICAL SOCIETIES, INDUSTRIAL ORGANIZATIONS, AND GOVERNMENT AGENCIES ARE ENGAGED IN THE DEVELOPMENT OF STANDARDS OR, IN THE CASE OF GOVERNMENT AGENCIES, THE DEVELOPMENT OF REGULATIONS APPLICABLE TO SOME ASPECT OF THE NUCLEAR TECHNOLOGY. IN 1963 ASA SECTIONAL COMMITTEE N6, REACTOR SAFETY STANDARDS, ESTABLISHED SUBCOMMITTEE N6.9 TO MAINTAIN AN INDEXED CATALOG OF STANDARDS OF INTEREST TO THE UNITED STATES AND FOREIGN COUNTRIES, WITH PRINCIPAL INTEREST IN THE FORMER TO MAINTAIN A COMPILATION OF NATIONAL (EXCLUDING THE UNITED STATES) AND INTERNATIONAL NUCLEAR STANDARDS ACTIVITIES.
- 07-4-1-418 CRITICALITY STUDIES OF HYDROGEN MODERATED URANIUM SYSTEMS
NEWLON, C. E.
OAK RIDGE GASEOUS DIFFUSION PLANT, OAK RIDGE, TENNESSEE
RECENT STUDIES MADE WITH 1-GROUP THEORY, 16-GROUP TRANSPORT THEORY, AND A FIRST-ORDER SOLID-ANGLE METHOD FOR INTERACTING ARRAYS INCLUDE (1) THE INFINITE-MEDIUM MULTIPLICATION FACTOR K-INFINITY, OF HOMOGENEOUS HYDROGEN-MODERATED URANIUM OF ALL URANIUM-235 ENRICHMENTS, (2) CRITICAL SPACINGS OF ARRAYS OF INDIVIDUALLY SUBCRITICAL UNITS IN AIR, AND (3) THE EFFECTS OF COMPOSITE METAL-WATER REFLECTORS ON THE MINIMUM CRITICAL CYLINDER DIMENSIONS OF URANIUM SYSTEMS ENRICHED TO 4.98 WT. PERCENT URANIUM-235. SPECIFIC ITEMS DISCUSSED ARE THE SIGNIFICANCE OF K-INFINITY MINIMA FOUND FOR HIGH-ENRICHMENT SYSTEMS OF UNDER-MODERATED URANIUM, THE URANIUM 235 ENRICHMENT AND CONCENTRATION LIMITS DERIVED FROM K-INFINITY DETERMINATIONS, AND THE INVERSE URANIUM-235 ENRICHMENT PHENOMENA FOUND FOR BOTH INDIVIDUAL UNITS AND INTERACTING ARRAYS.
- 07-4-2-424 FAST REACTOR MELTDOWN PROGRAM
DICKERMAN, C. E.
ARGONNE NATIONAL LABORATORY, ARGONNE, ILLINOIS
THE STATUS OF RESEARCH ON THE CORE MELTDOWN PROBLEMS AND THEIR RELATION TO OTHER AREAS OF SAFETY RESEARCH FOR FAST REACTORS ARE REVIEWED BRIEFLY. THE EXPERIMENTAL MELTDOWN PROGRAM IS DESCRIBED, AND A SUMMARY IS PRESENTED OF THE EXPERIMENTAL FACILITIES, APPARATUS, INSTRUMENTATION, ASSOCIATED THEORETICAL TECHNIQUES, AND MELTDOWN DATA OBTAINED THUS FAR. USE OF THE DATA IN ACCIDENT ANALYSES IS ILLUSTRATED, AND THE SCOPE OF THE PROBLEMS REMAINING TO BE STUDIED IS INDICATED.

07-4-2-435

PROPOSED STATE OF THE ART REVIEW OF STEEL PRESSURE VESSEL TECHNOLOGY
WHITMAN, G. D.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
THE EXCELLENT RECORD FOR THE LARGE PRESSURE VESSELS CONSTRUCTED TO DATE IS TESTIMONIAL TO THE INTEGRITY OF THESE VESSELS. NEVERTHELESS, IT IS NECESSARY TO ESTABLISH A BETTER UNDERSTANDING OF TODAY'S TECHNOLOGY AND THE PROBLEMS INTRODUCED BY LARGER AND THICKER MATERIALS AND TO DEFINE AREAS IN WHICH QUALITY CAN BE ENHANCED FOR A PRODUCT WHOSE INTEGRITY IS VITAL TO REACTOR SAFETY. THE COMMISSION-SPONSORED STATE-OF-THE-ART REVIEW APPEARS TO BE AN ATTEMPT TO DO THIS. THIS IS PARTICULARLY NECESSARY IN VIEW OF THE FACT THAT THE LONG-TERM EFFECTS OF THE OPERATING ENVIRONMENT ARE NOT WELL UNDERSTOOD AND IN-SERVICE INSPECTION IS NOT READILY ATTAINABLE.

07-4-2-436

BURNOUT IN BOILING HEAT TRANSFER

CAMDILL, W. R.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
SELECTED RECENT DEVELOPMENTS REGARDING BOILING BURNOUT (OR BOILING CRISIS OR DEPARTURE FROM NUCLEATE BOILING) ARE REVIEWED. FOR POOL SYSTEMS, RESULTS ARE SUMMARIZED FOR MIXTURES AND BORIC ACID SOLUTIONS, LIQUID METALS (SODIUM, POTASSIUM, RUBIDIUM, AND MAGNESIUM), CRYOGENS (MOLECULAR NITROGEN, OXYGEN, AND HYDROGEN), BOILING ON FINS, BOILING UNDER VACUUM CONDITIONS, AND BOILING IN BLOCKED VERTICAL CHANNELS AND REFERENCE IS MADE TO EXPERIMENTAL BOILING DETECTION STUDIES. FOR SUBCOOLED FORCED-CONVECTION SYSTEMS, GENERAL BURNOUT STUDIES WITH WATER AND ETHANOL ARE TREATED, AS ARE INVESTIGATIONS RELEVANT TO SPECIFIC REACTORS (SAVANNAH RIVER, SM-2, ATR, AND CVTR).

07-4-2-443

STATUS REPORT ON THE SPERT PROGRAM, INCLUDING THE POWER BURST FACILITY
KERLIN, T. W.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
THE ACCOMPLISHMENTS OF THE SPERT PROGRAM SINCE THE LAST QUARTER OF 1963 ARE REVIEWED. ALL FOUR SPERT REACTORS WERE USED FOR TRANSIENT TESTS DESIGNED TO PROVIDE INFORMATION ABOUT THE DYNAMIC BEHAVIOR OF REACTORS COOLED AND MODERATED BY LIGHT WATER AND HEAVY WATER. THIS WORK INCLUDED IMPORTANT TESTS OF THEORETICAL PREDICTIONS OF REACTOR TRANSIENTS. DURING THIS PERIOD, OPERATION OF TWO OF THE SPERT REACTORS (SPERT-I AND SPERT-II) WAS TERMINATED UPON COMPLETION OF PROGRAMS. NEW WORK ON TWO REACTORS FOR DESTRUCTIVE TESTING OF SUBASSEMBLIES WAS ACCOMPLISHED. ONE OF THESE REACTORS IS THE CAPSULE-DRIVER CORE IN THE SPERT-IV FACILITY. THE OTHER NEW TEST REACTOR, THE POWER BURST FACILITY, WILL EXTEND THE CAPABILITIES FOR DESTRUCTIVE TESTING OF SUBASSEMBLIES BEYOND THE CAPABILITY OF THE CAPSULE-DRIVER CORE.

07-4-3-449

REVIEW OF BOMBAY CONFERENCE ON NUCLEAR ELECTRONICS
ROUX, D. P.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
FORTY-EIGHT PAPERS WERE PRESENTED AT THE INTERNATIONAL CONFERENCE ON NUCLEAR ELECTRONICS HELD IN BOMBAY, INDIA, NOVEMBER 22-26, 1965. THE AUTHORS AND TITLES OF ALL PAPERS ARE LISTED. IN ADDITION, SOME OF THE PAPERS RELATED TO NUCLEAR SAFETY ARE DISCUSSED BRIEFLY. THE PAPERS DISCUSSED ARE DIVIDED INTO THE GENERAL CATEGORIES OF NUCLEAR DETECTORS, REACTOR NEUTRON-FLUX MEASUREMENTS, NUCLEAR ELECTRONICS, BURST-SLUG DETECTION, REACTOR KINETICS AND SIMULATION, AND REACTOR CONTROL AND SAFETY-SYSTEM DESIGN PHILOSOPHY.

07-4-3-452

DETECTION OF BOILING IN WATER MODERATED NUCLEAR REACTORS
SAXE, R. F.

NORTH CAROLINA STATE UNIVERSITY, RALEIGH, NORTH CAROLINA
THE ABILITY TO DETECT THE ONSET OF BOILING IN SOME WATER-MODERATED REACTORS WOULD BE OF VALUE IN THAT IT WOULD MAKE IT POSSIBLE FOR THESE REACTORS TO BE OPERATED AT A HIGHER POWER THAN WOULD OTHERWISE BE CONSIDERED BECAUSE OF THE DANGER OF BOILING BURNOUT. THE CONDITIONS THAT MAKE SUCH DETECTION DIFFICULT ARE DISCUSSED, AND THE ATTEMPTS AT THE DETECTION OF THE ONSET OF BOILING RECORDED IN THE LITERATURE ARE ANALYZED. AN ATTEMPT IS MADE TO ASSESS THE RELATIVE PROMISE OF THE DETECTION METHODS SO FAR SUGGESTED.

- 07-4-3-456 FURTHER USE OF ON-LINE DIGITAL COMPUTERS IN THE OPERATION OF POWER REACTORS
LAWRENCE, B. R. + EPLER, E. P.
AUSTRALIAN ATOMIC ENERGY COMMISSION, LUCAS HEIGHTS, AUSTRALIA -
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
THERE IS INCREASING INCENTIVE TO UTILIZE THE UNIQUE FEATURES OF THE DIGITAL COMPUTER FOR CONTROL PURPOSES IN THE OPERATION OF A POWER REACTOR. A FEW AREAS OTHER THAN DATA ACQUISITION, DATA LOGGING, AND CHECKING ARE DISCUSSED IN WHICH IT IS GENERALLY BELIEVED THAT ON-LINE DIGITAL COMPUTERS MIGHT BE USED TO OVERCOME SOME OF THE DIFFICULTIES AND LIMITATIONS EXPERIENCED WITH EXISTING INSTRUMENTATION AND CONTROL SYSTEMS. AREAS DISCUSSED INCLUDE OPTIMUM CONTROL, DETECTION OF REACTIVITY ANOMALIES, AND CONTROL OF SPATIAL POWER DISTRIBUTION.
- 07-4-4-459 EXPLOSION CONTAINMENT FOR NUCLEAR REACTOR VESSELS
PROCTOR, J. F.
NAVAL ORDNANCE LABORATORY, SILVER SPRING, MARYLAND
THE FORMULATION OF BASIC EXPLOSION-CONTAINMENT EQUATIONS FOR IDEALIZED WATER-FILLED RIGHT-CIRCULAR CYLINDERS IS SUMMARIZED. THE EQUATIONS EXPRESS EXPLOSIVE CHARGE WEIGHT AS A FUNCTION OF VESSEL GEOMETRY AND CONVENTIONAL MATERIAL PROPERTIES. EXTENSIVE EXPERIMENTS WITH MODELS VERIFIED THE RELATIONS FOR A WIDE RANGE OF VESSEL MATERIALS AND SIZES. THE BASIC CONTAINMENT RELATIONS WERE AMPLIFIED TO CHARACTERIZE THE RESPONSE OF REAL REACTOR VESSELS, I.E., VESSELS WITH WELDS, NOZZLES, AND END CONSTRAINTS, TO A LARGE SPECTRUM OF POSTULATED NUCLEAR ACCIDENTS. ADDITIONAL RESEARCH ON REACTOR VESSEL CONTAINMENT AND SAFETY NEEDED FOR ACCURATE ACCIDENT ANALYSIS IS DISCUSSED.
- 07-4-4-468 THE HAZARD OF DISPERSED PLUTONIUM PARTICLES
BARTON, C. J.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
PLUTONIUM IS BEING USED MORE AND MORE FREQUENTLY AS A REACTOR FUEL COMPONENT. SINCE INHALATION OF PARTICULATE PLUTONIUM OR PLUTONIUM COMPOUNDS CONSTITUTES A WELL-ESTABLISHED HAZARD TO MAN, ADDITIONAL INFORMATION REGARDING THE PRODUCTION OF SUCH PARTICULATES AND THE SPECIFIC NATURE OF THE RESULTANT HAZARDS IS BECOMING INCREASINGLY IMPORTANT. SOME RECENT PUBLICATIONS HAVE DISCUSSED THE PRODUCTION OF PARTICULATE MATERIAL BY OXIDATION OF PLUTONIUM AND THE EFFECTS OF PARTICLE SIZE AND COMPOSITION ON RETENTION IN THE HUMAN RESPIRATORY SYSTEM. FURTHER STUDIES ARE NEEDED TO DEVELOP SIMILAR INFORMATION FOR PLUTONIUM DIOXIDE AND MIXTURES OF PLUTONIUM DIOXIDE WITH OTHER OXIDES.
- 07-4-5-474 ICRP RECOMMENDATIONS ON HANDLING AND DISPOSAL OF RADIOACTIVE MATERIALS IN HOSPITAL AND MEDICAL RESEARCH
STRUXNESS, E. G.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
THE RADIATION- SAFETY MEASURES NEEDED FOR MEDICAL WORK WITH SEALED AND UNSEALED SOURCES OF RADIOACTIVE MATERIALS IN SMALL LABORATORIES, CLINICS, AND HOSPITALS ARE REVIEWED. DETAILED GUIDANCE IS GIVEN BY THE INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION (ICRP) ON PROBLEMS SUCH AS PERSONNEL MONITORING, ENVIRONMENTAL MONITORING, CONTAMINATION CONTROL, DECONTAMINATION OF PERSONNEL AND EQUIPMENT, HANDLING AND STORAGE OF SOURCES, AND RADIOACTIVE WASTE DISPOSAL. CONDITIONS UNDER WHICH INPATIENTS AND OUTPATIENTS UNDERGOING TREATMENT ARE ALLOWED TO LEAVE THE HOSPITAL AND THE PRECAUTIONS TO BE TAKEN WITH RADIOACTIVE CORPSES ARE ALSO DISCUSSED. RECOMMENDATIONS IN THE ICRP REPORT ARE BASED ON EXPERIENCE IN THE NUCLEAR INDUSTRY AND ON THE INTERNATIONAL ATOMIC ENERGY AGENCY'S CLASSIFICATION OF ISOTOPES ACCORDING TO RELATIVE RADIOTOXICITY.
- 07-4-5-476 MEDICAL AND BIOLOGICAL EFFECTS OF IONIZING RADIATION
RANDOLPH, M. L.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
SOME ASPECTS OF CURRENT STUDIES ON BIOLOGICAL EFFECTS OF IONIZING RADIATIONS ARE REVIEWED TO GIVE A SENSE OF THE EXPERIMENTAL BASES FOR APPRAISALS OF THE HAZARDS OF EXPOSURE TO RADIATIONS. SUBJECTS TREATED BRIEFLY THROUGH REFERENCES TO RECENT LITERATURE INCLUDE DELAYED SOMATIC EFFECTS, BIOLOGICAL DOSIMETER, REDUCTION OF FERTILITY, RELATIVE EFFECTS OF DIFFERENT TYPES OF RADIATION, DOSE RATE AND FRACTIONATION, AND EFFECTS OF SMALL DOSES. AUTHORITATIVE REVIEWS AND REFERENCES TO BIOLOGICALLY USEFUL APPLICATIONS OF IONIZING RADIATIONS ARE CITED. PHYSICAL ASPECTS, HISTORICAL BACKGROUND, AND ADDITIONAL ACTIVE FIELDS OF RADIOBIOLOGY ARE INDICATED.

07-4-6-482

ELK RIVER REACTOR OPERATING EXPERIENCE

CAMPBELL, R. J. + HALL, D. + KETTNER, D.
 RURAL COOPERATIVE POWER ASSOCIATION, ELK RIVER, MINNESOTA
 THE ELK RIVER REACTOR (ERR) IS A 59-MW(T) INDIRECT-CYCLE NATURAL-CIRCULATION BOILING-WATER REACTOR. SINCE THE ERR FACILITY WENT INTO COMMERCIAL OPERATION ON JULY 13, 1964, IT HAS GENERATED OVER 230,000,000 KW-HR OF ELECTRICITY WITH AN OVERALL AVAILABILITY OF 71 PERCENT. THE MORE SIGNIFICANT DESIGN AND OPERATING PROBLEMS CONCERN TWO INSTANCES OF PRIMARY-TO-SECONDARY SYSTEM LEAKAGE, PRIMARY SYSTEM HYDRAULIC OSCILLATIONS, SPURIOUS SCRAMS CAUSED BY INSTRUMENTATION FAILURES, CHANGES IN SOME OF THE MATERIALS USED IN THE CONTROL RODS AND CONTROL-ROD DRIVES, AND THE NEED TO REPLACE THREE CONTROL RODS WHEN INSPECTIONS REVEALED CRACKS. THE PLANT WAS SHUT DOWN FOR INSPECTION OF CERTAIN CORE INTERNALS AND A PARTIAL REFUELING IN APRIL 1966. IT WAS RETURNED TO OPERATION IN JULY 1966 AND SHOULD CONTINUE TO DEMONSTRATE THE HIGH RELIABILITY SHOWN BY RECENT OPERATING EXPERIENCE.

07-4-6-495

INCIDENTS RELATED TO NUCLEAR SAFETY IN AEC OPERATIONS
 DIVISION OF OPERATIONAL SAFETY, U. S. ATOMIC ENERGY COMMISSION,
 WASHINGTON, D. C.

INFORMATION ON RADIATION EXPOSURES AND INCIDENTS THAT OCCUR IN NUCLEAR-ENERGY OPERATIONS IS PRESENTED IN NUCLEAR SAFETY AS IT BECOMES AVAILABLE BECAUSE OF ITS PARTICULAR INTEREST TO NUCLEAR SAFETY. THIS ARTICLE SUMMARIZES THE INCIDENTS THAT OCCURRED IN AEC OPERATIONS DURING CALENDAR YEAR 1965.

08-1-0-001

SPACE NUCLEAR SAFETY, 1966

HANSEN, H. E.
 SANDIA LABORATORY, ALBUQUERQUE, NEW MEXICO
 A GENERAL SURVEY IS PRESENTED OF THE PRESENT STATE OF SPACE NUCLEAR SAFETY STUDIES. THE RECENTLY FORMED AEC DIVISION OF SPACE NUCLEAR SYSTEMS, WHICH HAS RESPONSIBILITY FOR ALL SPACE NUCLEAR POWER AND PROPULSION SYSTEM DEVELOPMENT, IS DESCRIBED. A SYSTEMATIC APPROACH TO SPACE NUCLEAR SAFETY ANALYSIS IS PRESENTED, AND A BASIS FOR ACCEPTABLE SAFETY GUIDELINES IS SUGGESTED. THE SEVERE ENVIRONMENTS ASSOCIATED WITH LAUNCH-PAD ACCIDENTS AND REENTRY ARE DISCUSSED, AND THE SAFETY-ANALYSIS STEPS ARE BRIEFLY DESCRIBED.

08-1-1-012

CURRENT TRENDS AND PERSPECTIVES IN REACTOR LOCATION AND SAFETY REQUIREMENTS

BECK, C. K.
 DEPUTY DIRECTOR OF REGULATION, U.S. ATOMIC ENERGY COMMISSION,
 WASHINGTON, D. C.

REACTORS ARE SAFE, SAFEGUARD SYSTEMS ARE FULLY ADEQUATE TO PREVENT THE INHERENT POTENTIAL HAZARDS FROM BECOMING REAL DANGERS, AND MAJOR ACCIDENTS WHICH WOULD RESULT IN PUBLIC HAZARD ARE SO UNLIKELY AS TO BE INCREDIBLE. NEVERTHELESS, BEFORE LARGE POWER REACTORS ARE MOVED INTO AREAS WHERE SUBSTANTIAL INCREASES IN MAGNITUDE OF POTENTIAL HAZARD WOULD RESULT, AND AS A MEANS OF ASSURING THAT THE PRESENT LOW LEVELS OF RISKS TO INDIVIDUALS AND TO THE OVERALL POPULATION AT LEAST DO NOT INCREASE, THESE FACTORS MUST BE ESTABLISHED AT THE HIGHEST POSSIBLE LEVEL OF CONFIDENCE.

08-1-1-016

NUCLEAR SAFETY OF FISSILE MATERIAL OUTSIDE REACTORS

JOHNSON, W. A.
 U.S. ATOMIC ENERGY COMMISSION, OAK RIDGE, TENNESSEE
 EXPERIENCE, IDEAS, AND TRENDS IN NUCLEAR SAFETY CONTROL OUTSIDE REACTORS ARE EXAMINED. PARTICULAR EMPHASIS IS GIVEN TO EARLY CONCEPTS OF SAFETY IN RELATION TO ACCIDENT EXPERIENCE. THE IMPORTANCE AND STATUS OF CRITICALITY DATA, TOGETHER WITH CONTINGENCY FACTORS, ARE STRESSED, AS WELL AS THE HUMAN ELEMENT, WHICH IS PARAMOUNT IN EFFECTIVE NUCLEAR SAFETY CONTROL. THE ROLE OF THE AEC IN SAFETY CONTROL IS PRESENTED AS A PART OF THE EVOLUTION OF THE EXPANDING NUCLEAR INDUSTRY.

08-1-2-020

METAL - WATER REACTIONS

BAKER, L., JR.
 ARGONNE NATIONAL LABORATORY, ARGONNE, ILLINOIS
 RECENT ADVANCEMENTS IN METAL-WATER REACTION INVESTIGATIONS ARE REPORTED FOR THE REACTOR METALS ZIRCONIUM, STAINLESS STEEL, AND ALUMINUM. IN ADDITION, SOME RECENT STUDIES OF THE REACTION OF URANIUM DIOXIDE WITH WATER AND STEAM ARE REVIEWED. EXPERIMENTS WERE DESIGNED EITHER TO STUDY THE ISOTHERMAL REACTION WITH STEAM OR TO SIMULATE LOSS-OF-COOLANT OR NUCLEAR-EXCURSION ACCIDENTS. RECENT EXPERIMENTS HAVE SHOWN THE IMPORTANCE OF INTERACTIONS BETWEEN THE CLADDING METAL OR OXIDES AND THE FUEL URANIUM DIOXIDE.

- 08-1-2-025 IGNITION AND COMBUSTION OF REACTOR FUELS, COOLANTS, AND STRUCTURAL MATERIALS
PETERSON, S.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
OXIDATION REACTIONS THAT COULD OCCUR IN ACCIDENTS IN THE NUCLEAR INDUSTRY ARE REVIEWED BRIEFLY. CONDITIONS FOR AND CONSEQUENCES OF IGNITION ARE EMPHASIZED. MATERIALS TREATED INCLUDE REACTOR FUELS AND STRUCTURAL METALS USED IN NUCLEAR REACTORS, AS WELL AS ALKALI METALS, GRAPHITE, AND OTHER USEFUL COMBUSTIBLE MATERIALS. SIGNIFICANT DOCUMENTS ISSUED DURING THE REVIEW PERIOD INCLUDE A THOROUGH ANALYSIS OF THE FIRE HAZARD OF BERYLLIUM AND AN EXTENSIVE STUDY OF THE EXPLOSIVE TENDENCIES OF POWDERED METALS.
- 08-1-2-030 TRANSIENTS IN LARGE REACTORS
ERGEN, W. K.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
FOR SUPERPROMPT-CRITICAL EXCURSIONS IN LARGE REACTORS CONSIDERATION OF THE SPACE DEPENDENCE OF TRANSIENTS YIELDS APPRECIABLY DIFFERENT VALUES OF ENERGY DENSITY THAN THE POINT REACTOR MODEL. TECHNIQUES FOR CONSERVING COMPUTING-MACHINE TIME IN SPACE-DEPENDENT CALCULATIONS ARE DISCUSSED IN THIS PAPER. ANALYTICAL SOLUTIONS, IN TERMS OF ELLIPTIC FUNCTIONS, ARE PRESENTED FOR CERTAIN TYPICAL CASES.
- 08-1-3-035 FAILURES OF SYSTEMS DESIGNED FOR HIGH RELIABILITY
DITTO, S. J.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
THREE FAILURES OF SYSTEMS DESIGNED FOR HIGH RELIABILITY ARE USED TO ILLUSTRATE SOME OF THE PROBLEMS ASSOCIATED WITH SUCH SYSTEMS. ONE FAILURE WAS RELATED TO A SINGLE DEVICE THAT COULD NOT BE TESTED AND YET WAS REQUIRED FOR OPERATION OF THE SYSTEM. ANOTHER INVOLVED THE INTERCONNECTION OF REDUNDANT DEVICES IN A WAY THAT ALLOWED A SINGLE SHORT CIRCUIT TO PREVENT OPERATION OF THE SYSTEM. THE THIRD FAILURE RESULTED WHEN ONE OF A PAIR OF REDUNDANT COMPONENTS FAILED IN SUCH A WAY THAT ITS COUNTERPART FAILED ALSO.
- 08-1-3-037 SYMPOSIUM ON NEUTRON NOISE, WAVES, AND PULSE PROPAGATION
FRY, D. N.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
AN INTERNATIONAL SYMPOSIUM ON NEUTRON NOISE, WAVES, AND PULSE PROPAGATION WAS HELD IN GAINESVILLE, FLA., FEB. 14-16, 1966. THE PURPOSE OF THIS CONFERENCE WAS TO DEFINE THE PRESENT STATE OF THE ART AND TO REVIEW ANY SIGNIFICANT ADVANCES MADE IN NOISE THEORY AND ANALYSIS TECHNIQUES. THE PAPERS PRESENTED AND THE AUTHORS ARE LISTED. IN ADDITION, THOSE PAPERS RELATED TO NUCLEAR SAFETY ARE DISCUSSED. TOPICS COVERED INCLUDE SHUTDOWN REACTIVITY MEASUREMENTS, BOILING AND ANOMALY DETECTORS, AND REACTOR TRANSFER-FUNCTION DETERMINATIONS.
- 08-1-4-041 EVALUATION OF THE IGNITION TEMPERATURE OF ACTIVATED CHARCOALS IN DRY AIR
KOVACH, J. L. + GREEN, J. E.
BARNEBEY-CHENEY COMPANY, COLUMBUS, OHIO
ACTIVATED-CHARCOAL PROPERTIES THAT INFLUENCE THE IGNITION TEMPERATURE IN DRY AIR ARE EVALUATED IN DETAIL, AND A METHOD AND EQUIPMENT FOR CHARCOAL IGNITION-TEMPERATURE MEASUREMENT ARE DESCRIBED. A THEORETICAL EXPLANATION BASED ON THE EXPERIMENTAL DATA IS GIVEN FOR THE CONTRIBUTING EFFECTS OF CHARCOAL SURFACE AREA, ASH CONTENT, PARTICLE SIZE, AND BED DEPTH AT VARIOUS AIR VELOCITIES. METHODS FOR INCREASING THE IGNITION TEMPERATURE OF ACTIVATED CHARCOALS ARE DISCUSSED. CAREFUL SELECTION OF THE CHARCOAL FOR A REACTOR CONTAINMENT APPLICATION IS NEEDED TO MINIMIZE THE FIRE HAZARD.
- 08-1-5-047 SYMPOSIUM ON PRACTICES IN THE TREATMENT OF LOW AND INTERMEDIATE LEVEL RADIOACTIVE WASTES
MATHEWS, E. R.
DIVISION OF HEALTH, SAFETY, AND WASTE MANAGEMENT, INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA, AUSTRIA
A SYMPOSIUM ON PRACTICES IN THE TREATMENT OF LOW- AND INTERMEDIATE-LEVEL RADIOACTIVE WASTES WAS HELD DEC. 6-10, 1965, AT INTERNATIONAL ATOMIC ENERGY AGENCY HEADQUARTERS, VIENNA, AUSTRIA. LIQUID-WASTE TREATMENT WAS REPORTED TO STILL CONSIST OF THE THREE BASIC PROCESSES - CHEMICAL TREATMENT, ION EXCHANGE, AND EVAPORATION. RECENT WORK HAS BEEN DIRECTED TOWARD MODIFYING AND IMPROVING THESE BASIC PROCESSES. INSOLUBILIZATION OF CONCENTRATES AND SOLID WASTES WITH BITUMEN HAS BEEN ACCEPTED AS A DESIRABLE PROCESS BY A NUMBER OF COUNTRIES, AND SEVERAL NEW PLANTS FOR THE UTILIZATION OF THIS PROCESS HAVE BEEN BUILT. HOWEVER, SOLIDIFICATION WITH CEMENT AND CEMENT-VERMICULITE STILL GIVES ADEQUATE CONTAINMENT FOR MANY LOCATIONS. INCINERATION UNITS HAVE BEEN INSTALLED AT A NUMBER OF ESTABLISHMENTS AND ARE NOW GIVING SATISFACTORY SERVICE.

- 08-1-5-050 ICRP PUBLICATION 7 ON THE PRINCIPLES OF ENVIRONMENTAL MONITORING RELATED TO THE HANDLING OF RADIOACTIVE MATERIALS
STRUNNESS, E. G.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
THIS REVIEW IDENTIFIES THREE TYPES OF PROGRAM FOR ENVIRONMENTAL MONITORING AROUND NUCLEAR INSTALLATIONS - PREOPERATIONAL SURVEYS, ROUTINE OPERATIONAL SURVEYS, AND EMERGENCY SURVEYS. THE GENERAL PRINCIPLES BY WHICH SUCH PROGRAMS ARE DESIGNED AND OPERATED ARE INDICATED. A NEW CONCEPT OF RELEVANT MONITORING IS INTRODUCED WHICH IS BASED ON THE SPECIFIC IDENTIFICATION OF CRITICAL RADIONUCLIDES, CRITICAL EXPOSURE PATHWAYS, AND CRITICAL POPULATION GROUPS FOR EACH INSTALLATION AND ITS ENVIRONMENT. THE KEY TO THE SUCCESS OF THIS CONCEPT RESTS WITH THE ABILITY TO IDENTIFY THE CRITICAL POPULATION GROUP AND TO PREDICT THE POTENTIAL INTERNAL AND EXTERNAL EXPOSURES REALISTICALLY.
- 08-1-5-053 PROGRESS IN RADIATION ECOLOGY - RADIONUCLIDE MOVEMENT IN MAJOR ENVIRONMENTS
OLSON, J. S.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
SEVERAL RECENT MEETINGS AND PAPERS EXTENDED THE INFORMATION ON CYCLING AND LEVELS OF RADIONUCLIDES IN TERRESTRIAL, FRESHWATER, AND MARINE ENVIRONMENTS. ONE TREND IN ECOLOGICAL ANALYSIS IS TOWARD FURTHER TESTING OF MATHEMATICAL MODELS FOR TRANSFERS BETWEEN PARTS OF A COMPLEX ECOLOGICAL SYSTEM BY USING EQUATIONS AND COMPUTER SIMULATIONS LIKE THOSE WHICH HAVE PROVED USEFUL IN THE HEALTH PHYSICS AND PHYSIOLOGY OF INTERNAL DOSE. DIETARY SOURCES OF CONTAMINATION FOR MAN ARE FREQUENTLY AT LEAST AS IMPORTANT AS SOURCES OF CONTAMINATION FROM DRINKING WATER AND AIR. IN ASSESSING HAZARDS, CONCENTRATION FACTORS BASED ON STABLE ELEMENTS COULD BE USED MORE WIDELY THAN IS DONE AT PRESENT. SUCH FACTORS MAY GIVE RISE TO CONSERVATIVE ESTIMATES OF PERMISSIBLE RELEASE FOR ELEMENTS WHOSE HALF-LIFE IS SHORT OR WHOSE TRANSFER THROUGH ENVIRONMENTAL NETWORKS IS SLOW.
- 08-1-5-058 BIOLOGICAL CONCENTRATIONS OF CESIUM-137 AND STRONTIUM-90 IN ARCTIC FOOD CHAINS
WITKAMP, M.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
EFFICIENT FOLIAR SORPTION OF FALLOUT MINERALS AND THEIR TRANSFER WITHOUT MUCH DISSIPATION ALONG THE ARCTIC FOOD CHAIN FROM LICHEN VIA CARIBOU AND REINDEER TO HUMAN INHABITANTS OF INLAND COMMUNITIES LEAD TO BODY BURDENS OF CESIUM-137 AND PRESUMABLY OF STRONTIUM-90 THAT ARE SEVERAL TIMES HIGHER THAN THOSE OF THE REST OF THE WORLD POPULATION. REASONS FOR THESE HIGHER THAN AVERAGE BODY BURDENS ARE NOT HIGH FALLOUT LEVELS BUT RATHER THE UNIQUE ECOLOGICAL CONDITIONS OF THE CLOSED AND MARGINAL ECONOMIES OF VEGETATION, FAUNA, AND MAN IN THE ARCTIC ENVIRONMENT.
- 08-1-6-063 OPERATING EXPERIENCE OF THE N.S. SAVANNAH IN COMMERCIAL SERVICE
STAFF OF FIRST ATOMIC SHIP TRANSPORT, INC.
OPERATING EXPERIENCE OF THE N.S. SAVANNAH DURING THE FIRST 6 MONTHS (AUGUST 1965 TO MARCH 1966) OF COMMERCIAL SERVICE UNDER CHARTER TO FIRST ATOMIC SHIP TRANSPORT, INC., IS DESCRIBED. DURING THIS PERIOD THE SHIP MADE FOUR TRANSATLANTIC VOYAGES TO EUROPEAN PORTS, TRAVELED 39,383 NAUTICAL MILES, AND MADE 42 DIFFERENT PORT ENTRIES. THE REACTOR WAS CRITICAL MORE THAN 83 PERCENT OF THE TIME, AND REACTOR POWER WAS AVAILABLE AT ALL TIMES WHILE THE SHIP WAS UNDER WAY. THE REACTOR PERFORMED FAULTLESSLY IN ALL THE SHIPS OPERATIONS, INCLUDING HEAVY ROLLING AND PITCHING IN THE ROUGHEST SEAS YET ENCOUNTERED. EXPERIENCE IN HEAVY WEATHER OPERATION, PORT OPERATION, MAINTENANCE, PERIODIC TESTING OF ENGINEERED SAFEGUARDS, TRAINING, RADIATION CONTROL, AND RADIOACTIVE WASTE DISPOSAL IS SUMMARIZED.
- 08-1-6-072 THE NEW TECHNICAL SPECIFICATION - A REASONED APPROACH
CRAMER, E. N.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
AN AEC TASK FORCE HAS DEVELOPED A NEW APPROACH TO THE TECHNICAL SPECIFICATIONS PORTION OF A PRODUCTION AND UTILIZATION FACILITY'S LICENSE APPLICATION. NEW GUIDELINES WOULD SIMPLIFY THE SPECIFICATIONS, FOCUS RESPONSIBILITY ON THE LICENSEE, AND IMPROVE THE SAFETY OF REACTORS. THE SAN ONOFRE TECHNICAL SPECIFICATIONS WERE THE FIRST PREPARED UNDER THE NEW STANDARDS, AND SELECTED SECTIONS ARE INCLUDED HERE. THE DIFFERENCE IN CONTENT BETWEEN OLD AND NEW IS QUITE STRIKING.

08-2-1-095

ANALYSIS AND AUTOMATED HANDLING OF TECHNICAL INFORMATION AT THE NSIC
 BUCHANAN, J. R. + HUTTON, F. C.
 OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE - OAK RIDGE
 GASEOUS DIFFUSION PLANT, OAK RIDGE, TENNESSEE

THE NUCLEAR SAFETY INFORMATION CENTER SERVES THE NUCLEAR
 COMMUNITY BY COLLECTING, STORING, EVALUATING, AND DISSEMINATING
 SAFETY INFORMATION RELEVANT TO THE DESIGN AND OPERATION OF
 NUCLEAR FACILITIES. IN 1964, AFTER ABOUT A YEAR OF OPERATION,
 THE INFORMATION-HANDLING SYSTEM WAS COMPUTERIZED IN ORDER TO
 INCREASE BROADLY THE SCOPE OF THE CENTER'S SERVICES AND ENABLE
 EFFICIENT FUNCTIONING IN THE FUTURE. COMPUTER PROGRAMS WERE
 DEVELOPED (1) FOR A BIBLIOGRAPHY (ISSUED QUARTERLY), COMPLETE
 WITH KEY-WORD AND PERSONAL-AUTHOR INDEXES, AND (2) FOR THE
 SELECTIVE DISSEMINATION OF INFORMATION (SDI). THE SDI PROGRAM
 IS PRODUCED ON 5- BY 8-IN. CARDS. THESE PROGRAMS AND OTHER
 SERVICES OF THE CENTER ARE DISCUSSED.

08-2-1-102

THE ROLE OF THE U.S. COAST GUARD IN NUCLEAR MERCHANT SHIP SAFETY
 BOSNAK, R. J.

UNITED STATES COAST GUARD, WASHINGTON, D. C.

A COMPREHENSIVE DESCRIPTION OF THE ROLE OF THE U. S. COAST
 GUARD IN NUCLEAR MERCHANT SHIP SAFETY IS PRESENTED. NUCLEAR
 SHIPS ARE SUBJECT TO THE SAME LAWS AND REGULATIONS FOR
 CONSTRUCTION OF THE HULL AND THE MACHINERY AND FOR OPERATIONS
 AND MANNING AS CONVENTIONALLY POWERED SHIPS. THIS REVIEW CITES
 THE PROVISIONS OF SOLAS 67 AND THE COAST GUARD REGULATIONS AND
 TENTATIVE REQUIREMENTS COVERING DESIGN, CERTIFICATION, AND
 PERIODIC TESTING. INCLUDED ARE DESIGN REQUIREMENTS FOR NUCLEAR
 PRESSURE VESSELS, CONTAINMENT VESSELS, PRIMARY- AND
 SECONDARY-SYSTEM SAFETY VALVES, PIPING SYSTEMS, SHIPBOARD
 ACCELERATIONS, HULL STRENGTH AND COLLISION PROTECTION, FIRE
 PROTECTION, EMERGENCY PROPULSION, AND ELECTRICAL ENGINEERING.

08-2-2-116

A REVIEW OF THE GENERALIZED REACTIVITY ACCIDENT FOR WATER COOLED AND MODERATED
 URANIUM DIOXIDE FUELED POWER REACTORS

BRIGHT, G. O.

PHILLIPS PETROLEUM COMPANY, IDAHO FALLS, IDAHO

A REVIEW WAS MADE OF WHAT IS KNOWN AND, CONVERSELY, WHAT IS
 UNKNOWN ABOUT THE FACTORS THAT ENTER INTO THE DETERMINATION OF
 THE COURSE AND CONSEQUENCES OF A REACTIVITY ACCIDENT, AND AN
 ATTEMPT TO COLLATE THE AVAILABLE INFORMATION ON THE VARIOUS
 PHASES OF REACTIVITY-ACCIDENT ANALYSIS IN ORDER TO IDENTIFY THE
 MAJOR PROBLEM AREAS IS REPORTED. THE REVIEW OF EXISTING
 KNOWLEDGE OF BOTH NEUTRONIC AND NONNEUTRONIC PHENOMENA, AS WELL
 AS THE CONSIDERATION OF THE LIMITS OF CONFIDENCE IN ANALYTICAL
 METHODS AND THE ACCURACY OF VALUES FOR FUNDAMENTAL PARAMETERS
 USED IN THE ANALYSES, MADE IT INCREASINGLY EVIDENT THAT A
 REALLY QUANTITATIVE ANALYSIS OF A LARGE REACTIVITY ACCIDENT IN
 A POWER-REACTOR SYSTEM IS NOT POSSIBLE AT THIS TIME.

08-2-2-127

STATUS REPORT ON LOFT
 WILSON, T. R.

PHILLIPS PETROLEUM COMPANY, IDAHO FALLS, IDAHO

THE LOFT PROJECT WAS ESTABLISHED IN 1962 TO DEVELOP INFORMATION
 ON THE COMPLEX PHENOMENA ASSOCIATED WITH A LOSS-OF-COOLANT
 ACCIDENT IN A WATER-COOLED POWER REACTOR. THE PRINCIPAL
 ACTIVITIES SINCE THE INCEPTION OF THE PROJECT HAVE BEEN THE
 FORMULATION OF AN ENGINEERING TEST PROGRAM, THE DESIGN OF A
 FIELD-SCALE FACILITY IN WHICH TO INVESTIGATE THE ACCIDENT, AND
 THEORETICAL AND EXPERIMENTAL STUDIES PERTINENT TO THE PROGRAM.
 DESIGN OF THE REACTOR, A 50-MW(T) PRESSURIZED-WATER SYSTEM, IS
 95 PERCENT COMPLETE, AND COMPLETION OF CONSTRUCTION OF THE
 FACILITY IS EXPECTED IN EARLY 1968. THE EXPERIMENTAL PROGRAM
 WILL CONSIST OF CONTAINMENT LEAKAGE TESTS, BLOWDOWN TESTS,
 REACTOR TESTS AND OPERATION, LOSS-OF-COOLANT TESTS, AND
 POSTACCIDENT EXAMINATION.

08-2-2-134

STORED ENERGY IN GRAPHITE AND OTHER REACTOR MATERIALS
 WITTELS, M. C.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

THEORETICAL AND EXPERIMENTAL STUDIES OF STORED-ENERGY PHENOMENA
 IN GRAPHITE, MOLYBDENUM, AND BERYLLIUM OXIDE ARE REVIEWED. THE
 INVESTIGATIONS RELATED TO ACTUAL REACTORS HAVE INCLUDED THE
 SOVIET IR REACTOR AND THE U. K. STAGE I CALDER REACTORS. THE
 LATTER STUDIES WERE DIRECTED TOWARD 20-YEAR SAFETY PROJECTIONS.
 RESULTS OF EXPERIMENTAL STUDIES OF ELECTRON-IRRADIATED GRAPHITE
 AND REACTOR-IRRADIATED MOLYBDENUM AND BERYLLIUM OXIDE HAVE BEEN
 RELATED TO FUNDAMENTAL PHENOMENA.

- 08-2-3-138 COMPUTER CONTROL FOR REACTORS
 BULLOCK, J. B.
 OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
 TWO PAPERS PRESENTED AT THE SYMPOSIUM ON THE USE OF COMPUTERS IN ANALYSIS OF EXPERIMENTAL DATA AND THE CONTROL OF NUCLEAR FACILITIES INDICATE THAT DIGITAL COMPUTERS ARE BEING USED FOR REACTOR CONTROL. THE APPLICATION OF DIGITAL COMPUTERS TO REACTOR SAFETY SYSTEMS IS STILL A SUBJECT OF DEBATE. THE USE OF A SINGLE COMPUTER TO PERFORM BOTH PRIMARY SAFETY- AND CONTROL-SYSTEM FUNCTIONS IS NOT RECOMMENDED IN THE LIGHT OF CURRENT SAFEGUARD-DESIGN PHILOSOPHY.
- 08-2-3-139 EMERGENCY HEAT REMOVAL AND RELIABILITY OF AUXILIARY POWER SYSTEMS IN BOILING WATER REACTORS
 RUBEL, P.
 OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
 PRACTICAL RELIABILITY ASPECTS OF EMERGENCY HEAT-REMOVAL SYSTEMS IN FIVE BOILING-WATER REACTOR POWER PLANTS ARE REVIEWED. RELIABILITY CRITERIA FOR THE SUPPORTING EMERGENCY POWER SUPPLIES ARE DEVELOPED INFORMALLY THROUGH CONSIDERATION OF VITAL-FUNCTION PERFORMANCE REQUIREMENTS UNDER ACCIDENT CONDITIONS POSTULATED IN SAFEGUARDS REPORTS. COUNTERPART FEATURES ARE COMPARED AMONG THE PLANTS. THE DEMANDS IMPOSED ON THE POWER SUPPLIES WERE FOUND NOT TO HAVE CHANGED FUNDAMENTALLY DURING RECENT YEARS, ALTHOUGH NEW EMERGENCY HEAT-REMOVAL SYSTEMS HAVE BEEN ADDED. THERE HAS BEEN INCREASED EMPHASIS ON PROMPT OPERATION OF SOME EMERGENCY SYSTEMS ACCOMPANYING THE HIGHER REACTOR POWER RATINGS AND CORE POWER DENSITIES.
- 08-2-4-148 STATUS OF PIPE RUPTURE STUDY AT GENERAL ELECTRIC
 VANDENBERG, S. R.
 GENERAL ELECTRIC COMPANY, SAN JOSE, CALIFORNIA
 THE PIPE-RUPTURE STUDY IS CONCERNED WITH IMPROVING CURRENT UNDERSTANDING OF FAILURE-CAUSING MECHANISMS AND PROVIDING IMPROVED CAPABILITY FOR EVALUATING AND MONITORING REACTOR PIPING SYSTEMS TO MINIMIZE THE PROBABILITY OF FAILURES. FOLLOWING A DETAILED REVIEW TO DETERMINE THE WORK MOST NEEDED TO IMPROVE NUCLEAR SYSTEM PIPING (PHASE I), ANALYTICAL AND EXPERIMENTAL EFFORTS (PHASE II) WERE STARTED IN APRIL 1965. THIS STATUS REPORT SUMMARIZES THE ACCOMPLISHMENTS DURING THE INITIAL YEAR OF A BROAD 4-YEAR PROGRAM IN (1) RELIABILITY ENGINEERING OF ACTUAL REACTOR PIPING SYSTEMS, (2) SOLUTION OF HERETOFORE INTRACTABLE PROBLEMS IN STRESS ANALYSIS, (3) APPLICATION OF FRACTURE MECHANICS TO DUCTILE MATERIALS, AND (4) FATIGUE STUDIES THROUGH BOTH BENCH-SCALE AND LARGE-COMPONENT TESTS.
- 08-2-4-155 REMOVAL OF RADIOACTIVE NOBLE GASES FROM OFF-GAS STREAMS
 KEILHOLTZ, G. W.
 OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
 RADIOACTIVE NOBLE GASES, PARTICULARLY FISSION-PRODUCT KRYPTON AND XENON, MUST EITHER BE REMOVED FROM THE OFF-GAS STREAMS OF REACTORS AND NUCLEAR FUEL-PROCESSING PLANTS OR DILUTED TO LOW CONCENTRATIONS BEFORE THE OFF-GASES ARE RELEASED TO THE ATMOSPHERE. FOR PRACTICAL PURPOSES THEY CAN BE REMOVED ONLY FROM SMALL VOLUMES OR FROM LOW-VELOCITY GAS STREAMS AND ONLY BY PHYSICAL PROCESSES. SOME CURRENT TECHNOLOGICAL DEVELOPMENTS ARE REVIEWED.
- 08-2-5-161 EFFECT OF DILUTING STACK GASES ON DOWNWIND CONCENTRATION
 BRYANT, P. M.
 UNITED KINGDOM ATOMIC ENERGY AUTHORITY, BERKSHIRE, ENGLAND
 EXAMPLES ARE GIVEN TO ILLUSTRATE THE EFFECT ON DOWNWIND CONCENTRATION OF DILUTING STACK GASES BEFORE DISCHARGE. DILUTION ALTERS THE EFFLUX VELOCITY AND, IN THE CASE OF HOT PLUMES, THE BUOYANCY, WHICH BOTH CHANGE THE EFFECTIVE HEIGHT OF DISCHARGE. ESTIMATES OF RESULTANT DOWNWIND CONCENTRATIONS IN VARIOUS WEATHER CONDITIONS SHOW THAT A DECREASE IN EFFLUENT CONCENTRATION BY A FACTOR OF 3 OFTEN PRODUCES A REDUCTION OF LESS THAN A FACTOR OF 3 IN DOWNWIND CONCENTRATIONS.
- 08-2-5-165 REPORT ON THE 1966 SYMPOSIUM ON SOLIDIFICATION AND LONG TERM STORAGE OF HIGHLY RADIOACTIVE WASTES
 BELTER, W. G.
 U.S. ATOMIC ENERGY COMMISSION, WASHINGTON, D. C.
 FORTY-SEVEN PAPERS WERE PRESENTED AND ONE PANEL DISCUSSION WAS HELD DURING THE SYMPOSIUM ON SOLIDIFICATION AND LONG-TERM STORAGE OF HIGHLY RADIOACTIVE WASTES HELD FEBRUARY 14-18, 1966, AT RICHLAND, WASH. THE SYMPOSIUM WAS NOTABLE IN THAT IT MARKED THE FIRST TIME U. S. INDUSTRY HAD ATTENDED A MEETING ON

MANAGEMENT OF HIGH-LEVEL WASTE. THIS REPORT REVIEWS THE LONG-RANGE PLANS AND REQUIREMENTS FOR MANAGEMENT OF HIGH-ACTIVITY WASTE IN THE UNITED KINGDOM, FRANCE, GERMANY, BELGIUM (EUROCHEMIC), AND THE UNITED STATES, AS WELL AS THE TECHNICAL STATUS OF RESEARCH AND DEVELOPMENT ON WASTE SOLIDIFICATION AND LONG-TERM STORAGE.

- 08-2-5-175 BEHAVIOR OF RADIOACTIVE GASES DISCHARGED INTO THE GROUND
JACOBS, D. G.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
THE FEASIBILITY OF DISCHARGING RADIOACTIVE GASES AND AEROSOLS FROM A REACTOR CONTAINMENT VESSEL INTO THE GROUND FOLLOWING A FUEL-MELTDOWN INCIDENT HAS BEEN DISCUSSED BY AN AEC WORKING GROUP. THIS REVIEW INCORPORATES MUCH OF THE INFORMATION DISCUSSED. THE BEHAVIOR OF VARIOUS RADIONUCLIDES IN THE GROUND DEPENDS ON THE PHYSICAL PROPERTIES AFFECTING THE MOVEMENT OF FLUIDS IN THE GROUND AS MODIFIED BY REACTIONS BETWEEN THE RADIONUCLIDES AND THE GEOLOGIC FORMATION. WHEN INJECTION IS COMPLETED THE SUBSEQUENT MOVEMENT OF THE RADIONUCLIDES RESULTS FROM NATURAL CONVECTIVE TRANSPORT OF THE FORMATION FLUIDS AND FROM MOLECULAR DIFFUSION. THE EXTENT OF MOVEMENT OF MOST OF THE GASEOUS RADIONUCLIDES IS LIMITED BY THEIR RADIOACTIVE DECAY.
- 08-2-6-179 OPERATIONAL PROBLEMS WITH THE HEALTH PHYSICS RESEARCH REACTOR
GILLEY, L. W. + HOLLAND, L. B. + POSTON, J. W.
WARD, D. R.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
THE HPRR IS A BARE-METAL UNMODERATED REACTOR THAT IS USED TO PRODUCE SHORT (ABOUT 50-MICRO-SEC) INTENSE PULSES OF NEUTRONS IN SELF-LIMITING NUCLEAR EXCURSIONS OR TO PRODUCE A CONSTANT FLUX OF NEUTRONS AT POWER LEVELS OF 10 KW OR LESS IN THE STEADY-STATE MODE FOR DOSIMETRY AND BIOMEDICAL RESEARCH AT ORNL. ALTHOUGH THE REACTOR HAS BASICALLY PERFORMED ACCORDING TO DESIGN SINCE OPERATIONS WERE INITIATED AT ORNL IN 1963, SEVERAL PROBLEMS THAT REQUIRED A CONSIDERABLE AMOUNT OF TIME AND EFFORT TO RECTIFY WERE ENCOUNTERED. THESE PROBLEMS ARE DISCUSSED, AND THE INFORMATION NECESSARY TO ISOLATE THE CAUSE OF ONE PROBLEM, THE SCATTER IN THE BURST SIZE, IS OUTLINED.
- 08-3-1-217 TRANSPORTATION OF RADIOACTIVE AND FISSILE MATERIALS
HAFF, K. W.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
A BRIEF REVIEW OF NEWLY ENACTED REGULATIONS, 10 CFR 71 AND ICC ORDER 7C, CONCERNING THE TRANSPORTATION OF RADIOACTIVE AND FISSILE MATERIALS IS PRESENTED. TITLE 10, CODE OF FEDERAL REGULATIONS, PART 71, WAS PUBLISHED IN THE FEDERAL REGISTER ON JULY 22, 1966, AND BECAME EFFECTIVE AUG. 21, 1966. ICC ORDER 7C WAS ISSUED ON APR. 25, 1966, AND BECAME EFFECTIVE JULY 12, 1966.
- 08-3-2-220 EXPERIMENTS AND ANALYSES IN FAST REACTOR SAFETY
DICKERMAN, C. E.
ARGONNE NATIONAL LABORATORY, ARGONNE, ILLINOIS
RECENT EXPERIMENTAL AND ANALYTICAL WORK ON THE BEHAVIOR OF FAST REACTOR CORES UNDER ACCIDENT CONDITIONS IS REVIEWED. ORIENTATION OF THE SAFETY-RELATED INVESTIGATIONS IS DISCUSSED, DEVELOPMENT OF EXPERIMENTAL EQUIPMENT AND TECHNIQUES IS SUMMARIZED, EXPERIMENTAL RESULTS ARE DESCRIBED, AND THE STATUS OF ASSOCIATED ANALYTICAL WORK IS PRESENTED. INTENSIVE INVESTIGATIONS OF THE EFFECTS OF COOLANT ON FUEL FAILURE AND FUEL MOVEMENT AND ON TRANSIENT COOLANT VAPORIZATION AND HYDRODYNAMICS ARE BEGINNING.
- 08-3-2-226 SAFETY ASPECTS OF THE MOLTEN SALT REACTOR EXPERIMENT
HAUBENREICH, P. N.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
FLUID-FUEL AND SOLID-FUEL REACTORS, ALTHOUGH SIMILAR IN ULTIMATE CONTAINMENT REQUIREMENTS, DIFFER IN THE KINDS OF ACCIDENTS THAT CAN CAUSE SYSTEM DAMAGE. SOME FLUID FUELS ARE SUSCEPTIBLE TO SEGREGATION, AND FILLING ACCIDENTS ARE MORE LIKELY, BUT AFTERHEAT IS MORE EASILY HANDLED. THE SURVIVING FLUID-FUEL CONCEPT, THE MOLTEN-SALT REACTOR, IS BEING DEVELOPED INTO A THERMAL BREEDER. THE MSRE, IN WHICH MOLTEN FLUORIDE SALTS CIRCULATE AT 1200F, IS A STEP IN THAT DEVELOPMENT. SAFETY ANALYSES AND EXPERIENCE HAVE SHOWN THE MSRE TO BE SAFE, AND NO SERIOUS PROBLEMS ARE EXPECTED IN DESIGNING SAFE MOLTEN-SALT BREEDER REACTORS.

08-3-3-236

MERITS AND LIMITATIONS OF THE CONTROL ROD WORTH MINIMIZER
BULLOCK, J. B.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

THE CONTROL-ROD-WORTH MINIMIZER CONCEPT AS PROPOSED FOR SEVERAL BOILING-WATER POWER REACTORS INVOLVES THE APPLICATION ON AN ON-LINE DIGITAL COMPUTER TO PREVENT MALADJUSTMENT OF THE REACTOR CONTROL RODS. THIS CONCEPT OF MINIMIZING THE WORTH OF A CONTROL ROD REQUIRES A DETERMINATION OF THE POSITION OF THE POISON SECTION OF A CONTROL ROD THAT MAY HAVE ACCIDENTALLY SEPARATED FROM ITS DRIVE. THE PROBLEM OF MAKING SUCH A DETERMINATION APPEARS TO ALLOW THE COMPUTER TO BE ONLY A BACKUP TO MANUAL ROD CONTROL.

08-3-4-238

NINTH AEC AIR CLEANING CONFERENCE

ADAMS, R. E. + ACKLEY, R. D.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

THE NINTH AEC AIR-CLEANING CONFERENCE WAS HELD SEPT. 13-16, 1966, AT BOSTON, MASS. RESEARCHERS FROM 8 COUNTRIES WERE IN ATTENDANCE. THE AGENDA INCLUDED 54 FORMAL PAPERS AND 6 INFORMAL PAPERS COVERING VIRTUALLY ALL PHASES OF AIR CLEANING IN WHICH THE NUCLEAR INDUSTRY IS INVOLVED. THE SCOPE OF THE CONFERENCE IS INDICATED BY THE FOLLOWING LISTING OF MAJOR TOPICS DISCUSSED, (1) AEROSOL PRODUCTION IN REACTOR ACCIDENTS, (2) FILTRATION OF MICRON AND SUBMICRON PARTICLES, (3) RADIOACTIVE IODINE AND METHYL IODIDE REMOVAL, (4) CONFINEMENT AND CONTAINMENT OF RADIOACTIVE MATERIAL, (5) IN-PLACE TESTING OF AIR-CLEANING SYSTEMS, AND (6) NOBLE-GAS STUDIES. THE PAPERS PRESENTED, TOGETHER WITH FLOOR DISCUSSIONS, WILL BE PUBLISHED AS USAEC REPORT CONF-660974.

08-3-4-245

DESIGN TRENDS IN SYSTEMS FOR CONTAINMENT

GALL, W. R.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

THE RECENT TREND TOWARD NUCLEAR POWER PLANTS WITH GREATER CAPACITIES HAS LED TO RENEWED CONCERN OVER THE POSSIBILITY OF FAILURE OF THE PRIMARY REACTOR VESSEL. THIS CONCERN IS REFLECTED IN ACRS REVIEWS OF DESIGNS FOR SOME OF THESE LARGER REACTORS. TRENDS IN THE DESIGN AND CONSTRUCTION OF CONTAINMENT INCLUDE THE USE OF REINFORCED AND PRESTRESSED CONCRETE, AND THE POSSIBLE USE OF PRESTRESSED CONCRETE FOR PRIMARY REACTOR VESSELS WITHOUT SECONDARY CONTAINMENT IS ALSO BEING CONSIDERED. RECENT PUBLICATIONS INCLUDE A COMPILATION OF CURRENT REACTOR-CONTAINMENT TECHNOLOGY, A SECTION OF THE ASME BOILER AND PRESSURE VESSEL CODE DEVOTED TO NUCLEAR VESSELS, AND AN AMERICAN STANDARD RELATIVE TO STEEL CONTAINMENT SHELLS.

08-3-5-249

SYMPOSIUM ON WASTE DISPOSAL INTO SURFACE WATERS

PARSONS, P. J.

INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA, AUSTRIA

THE IAEA SYMPOSIUM WAS HELD IN MAY 1966 IN VIENNA AND WAS CONCERNED WITH THE BEHAVIOR OF RADIOACTIVE WASTES RELEASED INTO SURFACE WATERS. THE FIRST SESSION COVERED THE PHYSICAL AND BIOLOGICAL TRANSPORT OF RADIONUCLIDES BY DILUTION, SEDIMENTATION, AND CURRENT MOVEMENTS OR UPTAKE BY BIOLOGICAL ORGANISMS, AND THE BEHAVIOR OF RADIONUCLIDES IN SURFACE AND DEEP LAYERS OF WATER. THE SECOND SESSION WAS DEVOTED TO THE WAYS IN WHICH RADIONUCLIDES, RELEASED AS WASTE, MAY CAUSE A RADIATION DOSE TO MAN - THROUGH MOVEMENT INTO THE FOOD CHAIN, BY INTRODUCTION INTO SUCH CHAINS BY IRRIGATION, OR BY EXTERNAL RADIATION. THE THIRD AND FINAL SESSION DEALT WITH THE POSSIBLE EFFECTS WASTES MAY HAVE ON THE RESOURCES OF THE SEAS THROUGH SOMATIC EFFECTS ON ORGANISMS OR GENETIC EFFECTS ON POPULATIONS OF SUCH ORGANISMS.

08-3-5-257

ESTIMATING THE EFFECT OF BUILDINGS ON PLUMES FROM SHORT STACKS
CULKOWSKI, W. M.

U.S. ATOMIC ENERGY COMMISSION, OAK RIDGE, TENNESSEE

THE BEHAVIOR OF PLUMES FROM SHORT STACKS NEAR BUILDINGS IS COMPLICATED BY THE SHAPE OF THE BUILDING, SURROUNDING TERRAIN, AND GUSTINESS OF THE WIND. CONSEQUENTLY THE EFFECTIVE PLUME-SOURCE CONFIGURATION CAN VARY FROM THAT OF AN AREA SOURCE TO A POINT SOURCE (ELEVATED OR GROUND LEVEL) IN A MATTER OF SECONDS. THE CONSERVATIVE ASSUMPTION OF A GROUND-LEVEL POINT RELEASE AS AN UPPER LIMIT IS USEFUL IN ESTIMATING CONCENTRATIONS.

- 08-4-0-299 OPERATING EXPERIENCE FEEDBACK TO DESIGNERS AND TO OTHER OPERATING AGENCIES
COX, J. A.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
IN STUDYING OPERATING SAFETY PROBLEMS, IT IS APPARENT THAT SIMILAR PROBLEMS OCCUR IN DIFFERENT REACTORS AND THAT MOST PROBLEMS ARE OF A RATHER MINOR NATURE COMPARED WITH THE MAXIMUM CREDIBLE ACCIDENT WHICH, PERFORCE, HAS OCCUPIED THE ATTENTION OF DESIGNERS. ALTHOUGH MOST OPERATING PROBLEMS ARE RELATIVELY MINOR, THEY ARE NONETHELESS TROUBLESOME AND TEND TO BE REPEATED IN NEW FACILITIES UNLESS PERSONNEL WITH OPERATING EXPERIENCE PARTICIPATE IN THE DESIGN. IN THE CASE OF THE HIGH FLUX ISOTOPE REACTOR, CONSIDERABLE ATTENTION WAS GIVEN TO SUCH PROBLEMS, AND OPERATING EXPERIENCE TO DATE INDICATES THAT THESE IMPROVEMENTS HAVE BEEN VERY WORTHWHILE. SOME OF THE PROBLEMS SOLVED DURING THE 23 YEARS OF OPERATING EXPERIENCE WITH OAK RIDGE NATIONAL LABORATORY RESEARCH REACTORS ARE DESCRIBED.
- 08-4-1-316 NUCLEAR SAFETY ECONOMICS
LANE, J. A.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
COSTS OF NUCLEAR SAFETY, ALTHOUGH IMPORTANT, DO NOT IN THEMSELVES PRESENT A SERIOUS BARRIER TO THE ACHIEVEMENT OF ECONOMIC NUCLEAR POWER. THE COSTS OF ITEMS DESIGNED TO PREVENT OR LIMIT THE ACCIDENTAL RELEASE OF RADIOACTIVITY, FOR EXAMPLE, ARE ESTIMATED AT \$8/KW(E) FOR A 600-MW(E) PLANT, AND THE COST OF A STANDARD CONTAINMENT STRUCTURE ADDS ANOTHER \$8/KW(E). A MORE SERIOUS COST PROBLEM ASSOCIATED WITH NUCLEAR SAFETY IS THAT OF REMOTE SITING OF A NUCLEAR PLANT TO MEET ISOLATION-DISTANCE REQUIREMENTS. REMOTE SITING CAN ADD AN EQUIVALENT OF FROM \$10 TO \$20/KW(E) TO NUCLEAR PLANT COSTS. THE USE OF MULTIPLE CONTAINMENT INSTEAD OF STANDARD CONTAINMENT AND THE INCLUSION OF OTHER ENGINEERED SAFEGUARDS, HOWEVER, OFFERS THE PROMISE OF REDUCING ISOLATION-DISTANCE REQUIREMENTS AND ASSOCIATED COSTS.
- 08-4-1-323 REVIEW OF THE NUCLEAR CRITICALITY SAFETY TOPICAL MEETING
SMITH, D. R.
LOS ALAMOS SCIENTIFIC LABORATORY, LOS ALAMOS, NEW MEXICO
THE AMERICAN NUCLEAR SOCIETY TOPICAL MEETING IN LAS VEGAS IN DECEMBER 1966 ON NUCLEAR CRITICALITY SAFETY IS DISCUSSED, AND SEVERAL OF THE PAPERS PRESENTED ARE REVIEWED. THE 24 PAPERS AND TWO PANEL DISCUSSIONS DEALT WITH MANY FACETS OF CRITICALITY SAFETY. AN ACADEMIC TASK FORCE CONCLUDED THAT CRITICALITY SAFETY SHOULD RECEIVE INCREASED EMPHASIS IN NUCLEAR ENGINEERING EDUCATION CURRICULA. NUMEROUS STATEMENTS BY PARTICIPANTS REFLECTED DISCONTENT WITH OVERLY CONSERVATIVE SAFETY PRACTICES AND CONCERN WITH THE PUBLIC SENSITIVITY TO NUCLEAR RISK. THERE WAS A CONSENSUS THAT THE INCIDENCE OF CRITICALITY ACCIDENTS HAS BEEN EXCEPTIONALLY LOW. HOWEVER, THERE WERE SIGNIFICANT DIFFERENCES OF OPINION AS TO THE PROPER ATTITUDE TOWARD THE CONTROL OF NUCLEAR HAZARDS.
- 08-4-2-331 FUEL ELEMENT PERFORMANCE
SCOTT, J. L.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
FUEL-ELEMENT DEVELOPMENT WORK IS NOW BEING DIRECTED PRIMARILY TOWARD ADVANCED CONVERTERS AND FAST BREEDER REACTORS. WITH THE TECHNICAL FEASIBILITY OF THE COATED-PARTICLE FUELS FOR HIGH-TEMPERATURE GAS-COOLED REACTORS ASSURED, EMPHASIS IS CURRENTLY PLACED ON INNOVATIONS THAT WILL REDUCE FUEL-CYCLE COSTS. RECENT HIGH-BURNUP DATA ON MIXED-OXIDE FUEL PINS FOR BOTH ADVANCED CONVERTER AND FAST BREEDER REACTORS HAVE DELINEATED BETTER THE FORMIDABLE SWELLING AND FISSION-GAS-RELEASE PROBLEMS AT THE HIGH BURNUPS REQUIRED FOR ECONOMICAL FUEL CYCLES. WE CAN EXPECT MANY NEW DEVELOPMENTS IN OXIDE AND CARBIDE FUELS AT HIGH BURNUPS IN THE NEAR FUTURE.
- 08-4-2-339 FREQUENCY RESPONSE TESTING
KERLIN, T. W.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
FREQUENCY-RESPONSE TESTING IS A CONVENIENT METHOD FOR DETERMINING THE DYNAMIC BEHAVIOR OF A REACTOR SYSTEM. A NUMBER OF TEST SIGNALS ARE AVAILABLE FOR TESTING WHICH OFFER SIGNIFICANT ADVANTAGES OVER THE CLASSICAL OSCILLATOR TEST. THESE SIGNALS ARE (1) MULTIFREQUENCY SINE WAVES, (2) SQUARE WAVES, (3) MULTIFREQUENCY BINARY SEQUENCES, (4) PSEUDORANDOM BINARY SEQUENCES, (5) PSEUDORANDOM TERNARY SEQUENCES, (6) PULSES, AND (7) STEPS. THESE SIGNALS ARE DESCRIBED, AND THEIR IMPORTANT CHARACTERISTICS ARE COMPARED.

08-4-2-345

FISSION GAS BEHAVIOR IN FUEL MATERIALS

CARROLL, R. M.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

RECENT PUBLICATIONS THAT RELATE TO THE BEHAVIOR OF FISSION GAS IN FUEL MATERIALS ARE REVIEWED. THE MIGRATION AND RELEASE OF FISSION GAS FROM SOLIDS PRESENTS A RATHER CONSISTENT PATTERN OF ISOLATED GAS ATOMS MOVING COMPARATIVELY SWIFTLY BY AN INTERSTITIAL PROCESS UNTIL TRAPPED ON A DEFECT IN THE STRUCTURE OF THE SOLID. THE DEFECT CAN BE INHERENT TO THE SOLID (SUCH AS A GRAIN BOUNDARY), OR IT CAN BE PRODUCED BY RADIATION. SMALL CLUSTERS OF GAS ATOMS ARE ALSO MOBILE. RECOIL AND KNOCKOUT RELEASE OCCUR AT ALL TEMPERATURES, BUT THE SURFACE CONDITIONS AND HISTORY OF THE FUEL CAN HAVE A STRONG INFLUENCE ON THE AMOUNT OF RELEASE BY THESE MECHANISMS. THE ENGINEERING APPROACH TO FISSION-GAS PRESSURE WITHIN A FUEL ELEMENT IS REVIEWED.

08-4-3-354

SAFETY SYSTEM DESIGN PROBLEMS

ANDERSON, J. L.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

SAFETY SYSTEMS FOR NUCLEAR REACTORS HAVE SHOWN LITTLE, IF ANY, IMPROVEMENT, ALTHOUGH INSTRUMENT COMPONENTS HAVE UNDERGONE SUBSTANTIAL CHANGES. SOME OF THE PROBABLE REASONS FOR THIS SITUATION INCLUDE SEPARATION OF THE SYSTEM DESIGNER AND ANALYST, SPECIFICATIONS BASED ON INSTRUMENT PACKAGES RATHER THAN ON SYSTEM REQUIREMENTS, AND AN INORDINATE CONCERN WITH SELF-TESTING CIRCUITS AND FAIL-SAFE CONCEPTS. ELECTRICAL AND PHYSICAL SEPARATION TO PROVIDE INDEPENDENCE OF INSTRUMENT CHANNELS, ALTHOUGH DIFFICULT TO ACHIEVE, CONTINUES TO BE VITAL TO SAFETY-SYSTEM DESIGN.

08-4-3-356

SOME ASPECTS OF RELIABILITY IN REACTOR INSTRUMENT SYSTEMS

MCLEAN, T. L.

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THE FIELD OF RELIABILITY ENGINEERING GREW AS A NECESSARY PART OF THE DEVELOPMENT OF THE COMPLEX ELECTRONIC SYSTEMS USED IN MILITARY AND AEROSPACE INSTALLATIONS AND WAS EXPANDED AS A USEFUL TOOL IN OPERATIONS RESEARCH AND SYSTEM ENGINEERING. AN EXAMINATION OF THE SENSITIVITY OF REACTOR PROTECTION SYSTEMS TO VARIOUS TYPES OF FAILURES IS ONE APPLICATION OF THIS TECHNOLOGY. OTHER USES OF RELIABILITY ENGINEERING INCLUDE THE COMPARISON OF SYSTEMS AND THE DEVELOPMENT OF HIGHER RELIABILITY SYSTEMS. BECAUSE COMPONENT FAILURE IS NOT THE LEADING CAUSE OF REACTOR ACCIDENTS, RELIABILITY CANNOT BECOME THE SINGULAR CHAMPION OF NUCLEAR SAFETY. THERE ARE, HOWEVER, USEFUL APPLICATIONS OF RELIABILITY TECHNOLOGY TO THE IMPROVEMENT OF THE SAFETY, OPERABILITY, AND ECONOMICS OF NUCLEAR POWER STATIONS.

08-4-4-360

AIR CLEANING SYSTEMS AS ENGINEERED SAFEGUARDS IN NUCLEAR REACTOR CONTAINMENT

KEILHOLTZ, G. W.

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

THE FUNCTIONS OF AIR-CLEANING SYSTEMS DURING NORMAL REACTOR OPERATIONS AND AS ENGINEERED SAFEGUARDS ARE REVIEWED, WITH SPECIAL REFERENCE TO THE RETENTION OF AIRBORNE RADIOACTIVITY BY HIGH-EFFICIENCY PARTICULATE AIR (HEPA) FILTERS AND CHARCOAL ADSORBERS UNDER POSSIBLE ACCIDENT CONDITIONS. THE COMBINATION OF AN HEPA FILTER FOR PARTICLES AND AN IMPREGNATED CHARCOAL BED FOR GASES SEEMS TO BE GENERALLY ACCEPTED AS THE BEST AVAILABLE TRAPPING SYSTEM FOR FISSION PRODUCTS (E.G., IODINE) RELEASED FROM IRRADIATED FUELS. THE DIOCTYL PHTHALATE TESTS ARE SATISFACTORY FOR IN-PLACE TESTING OF THE PARTICULATE RETENTION EFFICIENCY OF HEPA FILTERS. THE COMPLETE FILTER UNIT SHOULD ALSO BE TESTED FOR HEAT RESISTANCE AND MECHANICAL STRENGTH.

08-4-4-370

NEUTRON DOSIMETRY IN RADIATION DAMAGE STUDIES OF STEEL

ROBINSON, G. C.

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THE STATE OF THE ART OF NEUTRON DOSIMETRY AS APPLIED TO STUDIES OF RADIATION DAMAGE TO LIGHT-WATER-REACTOR PRESSURE-VESSEL STEELS IS REVIEWED. THE FOLLOWING ASPECTS ARE COVERED - CURRENT DOSIMETRY PRACTICE, INFLUENCE OF DAMAGE MODELS ON DATA ASSESSMENT, PROBLEMS PERTAINING TO CURRENT PRACTICE, AND THE TREND IN EFFORT TO OVERCOME THE PREVAILING PROBLEMS. A RECOMMENDED COURSE FOR FUTURE EFFORTS TO RESOLVE DOSIMETRY PROBLEMS IS PRESENTED.

- 08-4-5-376 DISPOSAL OF LOW LEVEL RADIOACTIVE WASTES INTO THE OCEANS
PARKER, F. L.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
DISPOSAL OF LOW-LEVEL RADIOACTIVE WASTES INTO THE OCEANS IS INCREASING, BUT TO DATE SUCH DISPOSALS ARE NEGLIGIBLE IN COMPARISON WITH FALLOUT IN THE OCEAN. INTERNAL DOSES TO POPULATIONS HAVE LIMITED DISCHARGE IN SOME CASES, BUT EXTERNAL DOSES HAVE ALSO LIMITED THE DISCHARGES FROM OTHER SITES. THE EFFECT OF SUCH DISCHARGES ON THE BICTA HAS NOT YET BEEN RESOLVED.
- 08-4-5-382 DOSIMETRY AND EXPOSURES IN NUCLEAR ACCIDENTS
ALXIER, J. A.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
DURING THE PAST 2 YEARS, THERE HAVE BEEN SEVERAL DEVELOPMENTS IN DOSIMETRY FOR NUCLEAR ACCIDENTS, AND THERE HAS BEEN ONE NUCLEAR REACTOR ACCIDENT. THE MOST IMPORTANT DOSIMETRIC DEVELOPMENT WAS THE SOLID-STATE TRACK DETECTOR FOR USE WITH THE FISSION-FOIL DETECTOR. LITTLE SPECIFIC INFORMATION HAS BEEN MADE AVAILABLE ON THE NUCLEAR ACCIDENT, WHICH OCCURRED AT MOL, BELGIUM, ON DEC. 30, 1965.
- 08-4-5-385 CURRENT PRACTICES IN THE DISPOSAL OF RADIOACTIVE WASTES FROM FUEL FABRICATION FACILITIES
BROOKSBANK, R. E. + MCDUFFIE, W. T.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
THE CURRENT PRACTICES EMPLOYED BY TYPICAL COMMERCIAL NUCLEAR FUEL-FABRICATION FIRMS IN THE UNITED STATES IN STORING AND HANDLING WASTES ARE REVIEWED. TYPICAL PRACTICES AND TECHNIQUES FOLLOWED IN HANDLING, STORAGE, AND DISPOSAL OF WASTES, INCLUDE BALING AND/OR DRUMMING OF COMPRESSIBLE WASTES, INCINERATION OF COMBUSTIBLE WASTES COUPLED WITH INCORPORATION OF THE ASH IN CONCRETE IN STEEL DRUMS EQUIPPED WITH HEAVY-DUTY FORGED CLOSURE RINGS, INCORPORATION OF BOTH LIQUID AND SOLID NONCOMBUSTIBLE WASTES IN CONCRETE OR CONCRETE-VERMICULITE MIXTURES IN STEEL DRUMS, AND THE TREATMENT AND DISPOSAL OF THE LARGE-VOLUME WASTES, SUCH AS VENTILATION AIR AND COOLING WATER. THE HEALTH AND SAFETY ASPECTS OF THESE ARE DISCUSSED BRIEFLY, AND APPLICABLE REGULATIONS ARE INCLUDED IN THE LIST OF REFERENCES.
- 08-5-0-429 TECHNOLOGY OF STEEL PRESSURE VESSELS FOR WATER COOLED NUCLEAR REACTORS
WHITMAN, G. D.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
CURRENT DESIGNS OF PRESSURIZED-WATER REACTOR VESSELS ARE BASED ON OPERATING CONDITIONS OF 650F AND 2500 PSIG, AND BOILING-WATER REACTOR VESSELS, ON CONDITIONS OF 575F AND 1250 PSIG. A MANGANESE-MOLYBDENUM STEEL, ASTM A-533, IS BEING USED. IT IS SATISFACTORY FOR SECTIONS UP TO 12 IN. THICK. AS REACTOR VESSELS EVOLVE AND GROW IN SIZE, HIGHER STRENGTH STEEL ALLOYS WILL BE REQUIRED. A CHROMIUM-MOLYBDENUM ALLOY AND A NICKEL-CHROMIUM-MOLYBDENUM ALLOY ARE PRESENTLY UNDER STUDY FOR THIS PURPOSE. THE MECHANICAL PROPERTIES OF METALS MAY DETERIORATE UPON EXPOSURE TO NUCLEAR RADIATION TO A DEGREE THAT IS OF CONSIDERABLE ENGINEERING SIGNIFICANCE. THE MOST PROMISING CANDIDATES FOR THE NEEDED PERIODIC TESTING AND INSPECTION OF NUCLEAR VESSELS FOR THE DETECTION OF RADIATION AND OTHER DAMAGE APPEAR TO INVOLVE SOME FORM OF ACOUSTIC PHENOMENA.
- 08-5-1-443 NUCLEAR TRANSPORTATION
THOMPSON, J. T. + MORGAN, J. M., JR.
THE JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND - VIRGINIA MILITARY INSTITUTE, LEXINGTON, VIRGINIA
A REVIEW OF NUCLEAR TRANSPORTATION RESEARCH PERFORMED UNDER THE COGNIZANCE OF THE USAEC WAS ACCOMPLISHED IN 1964 AND REPORTED IN 1965. THIS PAPER SUMMARIZES THE STRENGTHS AND WEAKNESSES OF THE RESEARCH PROGRAM UNDER SUCH ACCOMPLISHMENTS AS SYMPOSIA, CRITICALITY EXPERIMENTATION AND ANALYSIS, AND MODEL TESTING. IT ALSO POINTS OUT GAPS IN KNOWLEDGE, NEGLECTED AREAS, AND AREAS OF DUPLICATION AS WELL AS THE EFFECTS OF CLASSIFICATION, LACK OF INDUSTRIAL PARTICIPATION AND COORDINATION, ETC. ALSO DISCUSSED ARE SOME OF THE PROBLEMS THAT GIVE RISE TO THE NEED FOR RESEARCH. THESE ARE SUMMARIZED UNDER SUCH HEADINGS AS COMPARISON OF TRANSPORTATION MODES, SAFETY AND ITS COST, CRITICALITY CONTROL, INSURANCE, WEIGHT-COST RELATIONS, INTERCHANGEABILITY, SPECIALIZED SERVICES, RELATIONS WITH TRANSPORTATION GROUPS, AND REGULATIONS.

- 08-5-2-455 CABRI - A TEST REACTOR FOR SAFETY STUDIES
MILLOT, J. P.
CADARACHE NUCLEAR RESEARCH CENTER, FRANCE
THE SAFETY OF SWIMMING-POOL REACTORS HAS BEEN THOROUGHLY STUDIED IN FRANCE. THE CABRI REACTOR, DESIGNED FOR THAT PURPOSE, WAS INITIALLY USED TO INVESTIGATE REACTIVITY ACCIDENTS. LOSS-OF-COOLANT-FLOW ACCIDENTS WERE ALSO STUDIED, AND THIS WORK IS BEING EXTENDED WITH A NEW FACILITY THAT BECAME OPERATIONAL THIS YEAR, CABRI PUISSANCE. A PROGRAM OF FUEL TESTING FOR BOTH WATER AND FAST REACTORS, INVOLVING CABRI AS A CAPSULE-DRIVER CORE, IS BEING ESTABLISHED.
- 08-5-2-461 RADIATION DAMAGE TO PRESSURE VESSEL STEELS
WECHSLER, M. S.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
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- 08-5-3-470 RELIABILITY ANALYSIS OF ENGINEERED SAFEGUARDS
GARRICK, B. J. + GEKLER, W. C.
HOLMES AND NARVER, INC., LOS ANGELES, CALIFORNIA
THE REQUIREMENTS FOR ASSESSING RELIABILITY IN ENGINEERED SAFEGUARDS ARE REVIEWED, AN EXAMPLE OF RELIABILITY ANALYSIS IN A TYPICAL EMERGENCY CORE-COOLING SYSTEM IS GIVEN, AND A PLAN IS PRESENTED FOR USE OF RELIABILITY TECHNIQUES IN NUCLEAR SYSTEMS SAFETY ANALYSIS. RELIABILITY CAN NOW BE USED IN MANY WAYS IN NUCLEAR SAFETY, BUT, BEFORE IT CAN BE A TRULY EFFECTIVE TOOL, CERTAIN ADDITIONAL REQUIREMENTS MUST BE MET. RELEVANT PROBABILISTIC MODELS MUST BE DEVELOPED, AND REALISTIC STATISTICAL DATA ARE NEEDED. TECHNIQUES EXIST FOR DEVELOPING RELEVANT MODELS. STATISTICAL DATA NOW DERIVE LARGELY FROM OPERATING EXPERIENCE. THESE DATA, ALTHOUGH OF SOME USE, MUST BE IMPROVED TO PERMIT CONFIDENCE IN MATHEMATICAL EVALUATION OF RELIABILITY. THE IMPORTANCE OF RELIABILITY LIES NOT SO MUCH IN NUMBERS GENERATED AS IT DOES IN REQUIRING SYSTEMATIC GUIDANCE OF SAFETY ANALYSIS AND TESTING AND ACCIDENT-PREVENTION PROGRAMS.
- 08-5-3-479 RELIABILITY ESTIMATES AND REACTOR SAFETY SYSTEM OPERATION
SCOTT, R. L.
OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
TWO PAPERS PRESENTED AT THE WINTER 1966 MEETING OF THE AMERICAN NUCLEAR SOCIETY ARE SUMMARIZED. ONE PAPER DISCUSSES DATA OBTAINED FROM FIVE POWER-REACTOR OPERATING AGENCIES IN ORDER TO MAKE RELIABILITY ESTIMATES. SINCE THE DATA WERE OBTAINED FOR PURPOSES OTHER THAN RELIABILITY PREDICTION, IT HAS LIMITED APPLICABILITY. RELIABILITY ESTIMATES ARE PRESENTED FOR EMERGENCY CORE-COOLING SYSTEMS, EMERGENCY POWER SYSTEMS, AND SECONDARY SHUTDOWN SYSTEMS. THE OTHER PAPER DISCUSSES REACTOR-SAFETY SYSTEM OPERATION DATA OBTAINED FROM THE SAME FIVE POWER-GENERATING PLANTS. THE COMPOSITE DATA INDICATE THAT REAL AND SPURIOUS SCRAM RATES ARE EACH BETWEEN FIVE AND SIX PER YEAR. MOST OF THESE SCRAMS OCCURRED AT LOW REACTOR POWER AND PRODUCED ONLY ONE OR TWO POWER-GENERATION OUTAGES PER YEAR.
- 08-5-4-483 CONTAINMENT INTEGRITY - A STATE OF THE PROGRAM REPORT
WRSPD STAFF
PHILLIPS PETROLEUM COMPANY, IDAHO FALLS, IDAHO
SEVERAL TYPES OF HIGH-PRESSURE CONTAINMENT SYSTEMS MAY BE UTILIZED FOR WATER REACTORS - DIRECT PRESSURE, DOUBLE OR MULTIPLE WALL, PRESSURE SUPPRESSION, OR PRESSURE RELIEF. MAINTENANCE OF INTEGRITY OF THE CONTAINMENT STRUCTURE REQUIRES THAT IT BE DESIGNED AND CONSTRUCTED TO WITHSTAND THE TEMPERATURES AND PRESSURES RESULTING FROM COOLANT DISCHARGE IN THE MAXIMUM CREDIBLE ACCIDENT. PROGRAMS ARE CURRENTLY UNDER WAY OR BEING PROPOSED TO STUDY CONTAINMENT PRESSURIZATION, CONTAINMENT-SHELL RESPONSE, BRITTLE FRACTURE, CONTAINMENT-PRESSURE REDUCTION, LEAKAGE TESTING, MISSILE AND SHOCK PROTECTION, AND ANTISEISMIC DESIGN.

08-5-5-490

ATMOSPHERIC TRANSPORT AND DIFFUSION AT COASTAL SITES
 VAN DER HOVEN, I.
 ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION, SILVER SPRING,
 MARYLAND

OVERLAND ATMOSPHERIC DIFFUSION IS THREE TIMES MORE RAPID THAN OVERWATER DIFFUSION, ON THE AVERAGE, WHEN THE WATER IS COLDER THAN AIR TEMPERATURES OVER LAND. THE TRANSPORT DISTANCE REQUIRED TO COMPLETE THE TRANSITION FROM OVERWATER TO OVERLAND DIFFUSION IS A FUNCTION OF PLUME HEIGHT, WIND SPEED, AND VERTICAL TEMPERATURE PROFILE. DIFFUSION MODELS HAVE BEEN DEVELOPED TO ACCOUNT FOR THE DIFFUSION RATES WITHIN THIS TRANSITION ZONE. DAILY REVERSALS BETWEEN LAND AND SEA BREEZES RESULT IN LOCAL VARIATIONS OF COASTLINE ATMOSPHERIC TRAJECTORIES. LARGE-SCALE PRESSURE-GRADIENT EFFECTS RESULT IN STRAIGHT-LINE TRAJECTORIES.

08-6-1-539

REACTOR SAFETY AND SITING - A PROPOSED RISK CRITERION
 FARMER, F. R.
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 ENGLAND

THE BUILDING OF A REACTOR IMPLIES THE ACCEPTANCE OF SOME FINITE DEGREE OF RISK. NO ENGINEERING PLANT AND NO STRUCTURE IS ENTIRELY RISK FREE, AND THERE IS NO LOGICAL WAY OF DIFFERENTIATING BETWEEN CREDIBLE AND INCREDIBLE ACCIDENTS. THE INCREDIBLE IS OFTEN MADE UP OF A COMBINATION OF VERY ORDINARY EVENTS - FOR EXAMPLE, THE BREAKDOWN OR DETERIORATION THAT OCCURS IN NORMAL PLANTS AND THEIR MEASURING INSTRUMENTS AND THE CREDIBLE MAY BE EXCEEDINGLY IMPROBABLE. THE LOGICAL WAY OF DEALING WITH THIS SITUATION IS TO SEEK TO ASSESS THE WHOLE SPECTRUM OF RISKS IN A QUANTITY-RELATED MANNER AND THUS PROVIDE FOR THE CHOICE OF SITES FOR NUCLEAR POWER STATIONS.

08-6-2-549

DESCRIPTION OF CALCULATIONAL METHODS AND DIGITAL COMPUTER CODES FOR ANALYZING COOLANT BLOWDOWN AND CORE HEATUP PHENOMENA

WAAGE, J. M.
 PHILLIPS PETROLEUM COMPANY, IDAHO FALLS, IDAHO

AN IMPORTANT PART OF LIGHT-WATER-REACTOR ACCIDENT ANALYSIS IS THE PREDICTION OF SYSTEM AND CORE TEMPERATURES, PRESSURES, AND FORCES FOLLOWING A POSTULATED RUPTURE OF THE PRIMARY SYSTEM. EVEN WITH MANY ASSUMPTIONS AND APPROXIMATIONS, THE ANALYSIS OF COOLANT BLOWDOWN AND SUBSEQUENT CORE HEATUP IS QUITE COMPLEX, AND THIS COMPLEXITY INVARIABLY REQUIRES THE USE OF DIGITAL-COMPUTER PROGRAMS TO OBTAIN NUMERICAL RESULTS. THIS REVIEW INCLUDES A COMPARISON OF FEATURES AND APPROXIMATIONS CONTAINED IN THE PROGRAMS, A SHORT SUMMARY OF THE PURPOSE AND LIMITATIONS OF EACH PROGRAM, AND A BRIEF DESCRIPTION OF THE INPUT AND OUTPUT DATA. NO ATTEMPT IS MADE, HOWEVER, TO EVALUATE THE VALIDITY OR ACCURACY OF THE PROGRAMS.

08-6-3-559

POSTACCIDENT INSTRUMENTATION
 UBRICH, H. G.
 OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

THE NUCLEAR ACCIDENT RECOVERY PROGRAM WAS ESTABLISHED BY THE AEC TO DEVELOP TECHNIQUES AND EQUIPMENT THAT WOULD BE EFFECTIVE IN RESCUING PERSONNEL, PLACING THE FACILITY IN A SAFE CONDITION, AND SALVAGING THE FACILITY. SPECIAL BUILT-IN INSTRUMENTATION SEEMS TO OFFER THE BEST MEANS OF DETERMINING THE CONDITIONS IN THE REACTOR AND CONTAINMENT BUILDING AND THE SEQUENCE OF THE ACCIDENT. SEVERAL PORTABLE SYSTEMS ARE ALSO BEING DEVELOPED. NOISE-ANALYSIS SYSTEMS ARE BEING EVALUATED AS TOOLS FOR MEASURING THE REACTIVITY, HOWEVER, THEY DO NOT APPEAR TO BE PRACTICAL. OTHER SYSTEMS INCLUDE A TELEVISION VIEWING SYSTEM, REMOTELY CONTROLLED SERVICE VEHICLES, ALARMING DOSIMETERS, AIR MONITORS, AERIAL TRACKING SYSTEMS, AND DIRECTIONAL GAMMA SENSORS.

08-6-4-565

ADEQUACY OF EXPLOSION RESPONSE DATA IN ESTIMATING REACTOR VESSEL DAMAGE
 PROCTOR, J. F.

U.S. NAVAL ORDNANCE LABORATORY, SILVER SPRING, MARYLAND
 TYPICAL FACTOR METHODS USED BY SOME REACTOR DESIGNERS FOR ESTIMATING REACTOR DAMAGE FROM NUCLEAR EXCURSIONS ARE DEMONSTRATED IN WHICH VARIOUS FACTORS ARE APPLIED TO THE TOTAL ACCIDENT ENERGY TO ARRIVE AT THE MECHANICAL-DAMAGE ENERGY. DIFFERENCES BETWEEN THE REACTIVITY ACCIDENT IN SL-1 AND HIGH-ENERGY EXPLOSION SIMULATIONS OF THIS ACCIDENT ARE DISCUSSED. THE ENERGIES ABSORBED IN MECHANICAL DAMAGE OF THE SL-1 ARE REEVALUATED AND FOUND TO BE ALMOST 5 PERCENT OF THE TOTAL NUCLEAR RELEASE AS COMPARED WITH THE PREVIOUSLY PUBLISHED ESTIMATE OF LESS THAN 1 PERCENT. A COMPARISON OF RESULTS FROM THE ANALYTICAL EXPLOSION MODEL WITH SL-1 DAMAGE SHOWS EXCELLENT AGREEMENT. ADDITIONAL RESEARCH ON ENERGY PARTITION NEEDED FOR ACCURATE ACCIDENT ANALYSIS IS DISCUSSED.

08-6-5-573

RISKS TO THE POPULATION AND THE INDIVIDUAL FROM IODINE RELEASES
BEATTIE, J. R.
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ENGLAND

THE INHALATION OF RADIOACTIVE IODINE LEADS TO A DOSE OF RADIATION IN THE THYROID GLAND, AND THERE MAY BE A RISK OF DEVELOPING THYROID CANCER. CALCULATIONS ARE MADE IN WHICH A POPULATION DISTRIBUTION IS ASSUMED THAT REPRESENTS POTENTIAL URBAN REACTOR SITES, AND ACCOUNT IS TAKEN OF PROBABLE METEOROLOGICAL CONDITIONS AND DOSE-RISK RELATIONS OF THE INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION. FROM A POSTULATED LIMIT LINE OF ACCIDENT FREQUENCY VS. SEVERITY, A CALCULATION DERIVES AN AVERAGE CASUALTY RATE FOR THE POPULATION AND AN ANNUAL RISK RATE FOR THE INDIVIDUAL. THESE ARE SHOWN TO BE EXCEEDINGLY SMALL COMPARED WITH THE NORMAL CASUALTY RATE IN THE SAME POPULATION AND WITH THE RISKS RUN BY THE INDIVIDUAL IN THE COURSE OF NORMAL LIVING.

08-6-5-576

COMPUTATIONAL METHOD FOR THE PREDICTION OF UNDERGROUND MOVEMENT OF RADIONUCLIDES
BAETSLE, L. H.

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THE HYDRODYNAMIC DISPERSION OF RADIONUCLIDES IS DISCUSSED, WITH SPECIAL EMPHASIS ON THE RELATION BETWEEN THE HYDRODYNAMIC DISPERSION COEFFICIENT AND THE WATER FLOW VELOCITY. THE PHYSICO-CHEMICAL DISPERSION OF ADSORBED RADIONUCLIDES IS DISCUSSED THEORETICALLY IN ORDER TO SHOW THE LIMITATIONS OF THE CLASSICAL ION EXCHANGE-CHROMATOGRAPHIC THEORIES WHEN APPLIED TO UNDERGROUND MOVEMENT. THE MATHEMATICAL FRAMEWORK FOR COMPUTATION OF SYMMETRICAL AND ASYMMETRICAL PULSE SHAPES IS SHOWN AND COMPARED WITH AN EMPIRICAL METHOD BASED ON THE USE OF DISPERSION COEFFICIENTS. FINALLY THE DISPERSION OF CONTINUOUSLY INJECTED LIQUIDS IS BRIEFLY REVIEWED AND SUPPLEMENTED BY A MASTER PLOT THAT IS OF DIRECT USE IN DESIGN COMPUTATIONS.

08-6-6-590

WATER LOSS TESTS IN WATER-COOLED AND WATER-MODERATED RESEARCH REACTORS
WEBSTER, C. C.

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LOSS-OF-WATER TESTS HAVE BEEN PERFORMED WITH THREE DIFFERENT REACTORS SINCE 1951. THE REPORTED RESULTS OF THESE TESTS ARE DISCUSSED IN THIS REVIEW, AND THE NEED FOR ADDITIONAL WORK IS EMPHASIZED. THE DANGERS THAT COULD RESULT FROM EXTRAPOLATING BEYOND THE LIMITS OF THE TESTS ARE POINTED OUT. ONE SERIES OF TESTS WAS PERFORMED TO OBTAIN VALID HEAT-TRANSFER COEFFICIENTS FOR A MATHEMATICAL MODEL, BUT MORE WORK AND EXPERIMENTAL VERIFICATION MUST BE CARRIED OUT BEFORE SUCH A MODEL CAN BE USED WITH RELIABILITY. THE TESTS INDICATE THAT A WATER-COOLED AND -MODERATED REACTOR CAN BE OPERATED AT 3 MW FOR A WEEK AND THEN LOSE THE COOLANT WITHOUT DANGER OF DAMAGE TO THE CORE.

08-6-6-597

FORMAL EDUCATION IN NUCLEAR REACTOR SAFETY

JANKOWSKI, F. J.

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A SURVEY WAS MADE OF UNIVERSITY COURSES IN THE FIELD OF NUCLEAR SAFETY ENGINEERING. BRIEF DESCRIPTIONS ARE GIVEN OF THE COURSES OFFERED AT NINE UNIVERSITIES, OF THE SINGLE UNIVERSITY PROGRAM IN NUCLEAR SAFETY, AND OF SHORT COURSES GIVEN AT TWO INSTALLATIONS. SEVERAL OTHER UNIVERSITIES HAVE STATED PLANS TO OFFER NUCLEAR SAFETY COURSES. PRACTICALLY ALL EDUCATIONAL EFFORT IN NUCLEAR SAFETY IS CENTERED IN THE UNITED STATES.

Section 2

KWIC INDEX

A KWIC (KeyWord In Context) index is one in which article titles are permuted around the various significant words contained therein. For example, the title, Tests of Air Leakage in Rock for Underground Reactor Containment, is indexed under the words Air, Containment, Leakage, Reactor, Rock, and Underground. The index words are arranged alphabetically in a column in the center of the page, with the titles permuted around them. In some cases additional significant words in parentheses have been added to the title by the editors to allow more precise indexing. Location of the indexed article in the Journal is indicated by the seven-digit column of figures to the right of the page, as described in the Foreword.

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Asterisks and numerals appearing before authors names were used to indicate corporate affiliation other than ORNL in Vols. 1 through 6. This practice has now been discontinued, so these designations may be disregarded.

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ANDERSON, T. D.	02-1-6-102	BINFORD, F. T.	01-3-3-034
ANDERSON, T. D.	03-1-2-013	BINFORD, F. T.	02-1-1-010
ANDERSON, T. D.	04-4-2-039	*BINNS, J. E.	04-2-3-063
ANDERSON, T. D.	06-2-2-164	BLOMEKE, J. O.	02-3-5-050
*ANDREWS, G. A.	03-4-5-069	BOHLMANN, E. G.	03-2-2-020
*ANS STANDARDS PROJECT	01-1-1-006	BOHLMANN, E. G.	05-1-2-051
ARNOLD, E. D.	03-1-4-056	BOSNAK, R. J.	08-2-1-102
ARNOLD, E. D.	05-4-4-382	BRADSHAW, R. L.	03-1-5-068
AUERBACH, S. I.	01-3-5-062	*BRANNIGAN, F. L.	03-1-1-001
AUERBACH, S. I.	03-3-5-051	BRESEE, J. C.	02-4-6-052
AUXIER, J. A.	02-3-5-048	BRIGGS, R. B.	02-1-6-099
AUXIER, J. A.	04-4-5-111	BRIGHT, G. O.	08-2-2-116
AUXIER, J. A.	06-3-6-298	BROOKSBANK, R. E.	08-4-5-385
AUXIER, J. A.	08-4-5-382	BROWN, W. D.	06-1-3-054
		BROWNING, W. E., JR.	01-3-4-040
BAES, C. F., JR.	05-1-2-045	BROWNING, W. E., JR.	01-4-4-047
BAETSLE, L. H.	08-6-5-576	BROWNING, W. E., JR.	02-3-4-035
BAIRD, J. N., JR.	07-3-3-333	BROWNING, W. E., JR.	03-2-4-046
BAKER, L., JR.	07-1-2-025	BROWNING, W. E., JR.	04-2-4-083
BAKER, L., JR.	08-1-2-020	BROWNING, W. E., JR.	04-3-4-062
BARTON, C. J.	01-3-4-049	BROWNING, W. E., JR.	06-3-4-272
BARTON, C. J.	03-2-4-051	BRUCE, F. R.	02-3-4-040
BARTON, C. J.	04-2-5-092	BRUCE, F. R.	03-4-1-021
BARTON, C. J.	04-3-4-062	BRYANT, P. M.	08-2-5-161
BARTON, C. J.	05-1-4-084	BUCHANAN, J. R.	03-2-6-073

BUCHANAN, J. R.	03-3-6-074	COTTON, B. Y	01-2-3-032
BUCHANAN, J. R.	03-4-6-090	COTTRELL, W. B.	01-1-1-004
BUCHANAN, J. R.	04-1-6-103	COTTRELL, W. B.	01-2-1-002
BUCHANAN, J. R.	04-3-6-083	COTTRELL, W. B.	01-3-6-077
BUCHANAN, J. R.	04-3-6-086	COTTRELL, W. B.	01-3-6-078
BUCHANAN, J. R.	04-4-6-147	COTTRELL, W. B.	01-3-6-080
BUCHANAN, J. R.	05-4-6-410	COTTRELL, W. B.	01-3-6-081
BUCHANAN, J. R.	08-2-1-095	COTTRELL, W. B.	02-1-4-051
BULLOCK, J. B.	08-2-3-138	COTTRELL, W. B.	02-3-6-061
BULLOCK, J. B.	08-3-3-236	COTTRELL, W. B.	02-4-1-003
BURKE, O. W.	03-1-3-048	COTTRELL, W. B.	02-4-6-055
BURKE, O. W.	04-3-3-050	COTTRELL, W. B.	03-2-1-006A
BURNETT, T. J.	01-4-5-077	COTTRELL, W. B.	03-3-1-009
BURNETT, T. J.	02-4-1-001	COTTRELL, W. B.	03-3-6-064
*BURNETT, W. D.	04-4-6-155	COTTRELL, W. B.	04-1-1-011
*BUTLER, H. L.	04-3-5-077	COTTRELL, W. B.	04-2-1-029
BUTLER, H. M.	05-1-5-104	COTTRELL, W. B.	04-3-1-028
		COTTRELL, W. B.	05-1-1-020
CAGLE, C. D.	02-2-6-073	COTTRELL, W. B.	05-3-1-221
CAGLE, C. D?	03-1-2-031	COTTRELL, W. B.	05-3-1-223
CALLIHAN, A. D	01-1-6-037B	*COTTRELL, W. B.	06-4-1-354
CALLIHAN, D	04-4-6-136	COTTRELL, W. B.	07-2-4-203
CAMPBELL, R. J.	07-4-6-482	COTTRELL, W. B.	07-4-1-415
CANTOR, S.	04-3-4-058	COWSER, K. E.	02-2-5-059
CARR, W. H.	01-2-4-039	COWSER, K. E.	06-2-5-212
CARR, W. H.	02-2-4-048	COWSER, K. E.	07-3-5-370
CARR, W. H.	07-2-4-212	COX, J. A.	08-4-0-299
CARRIGAN, P. H.	03-2-5-060	CRAMER, E. N.	04-1-1-021
CARROLL, J. C.	06-4-6-441	CRAMER, E. N.	07-2-1-148
CARROLL, R. M.	04-1-2-035	CRAMER, E. N.	07-3-1-297
CARROLL, R. M.	05-4-2-356	CRAMER, E. N.	08-1-6-072
CARROLL, R. M.	07-1-2-034	CRISTY, G. A.	07-3-3-333
CARROLL, R. M.	08-4-2-345	CROSSLEY, D. A., JR.	05-3-5-265
*CARSON, J. E.	06-1-1-001	CULKOWSKI, W. M.	08-3-5-257
CASTO, W. R.	02-2-1-007	CULVER, H. N.	01-1-6-043
CLAIBORNE, H. C.	01-1-2-015	CULVER, H. N.	01-2-2-014
CLARK, R. L.	01-1-5-033	CULVER, H. N.	01-2-6-063A
CLAYTON, G. D.	07-1-5-089	CULVER, H. N.	01-2-6-063B
*CUBB, L. I.	06-1-3-049	CULVER, H. N.	01-3-6-077
COFIELD, R. E.	03-4-5-080	CULVER, H. N.	01-3-6-078
COLE, T. E.	01-2-1-001	CULVER, H. N.	01-3-6-081
COLOMB, A. L.	05-2-6-203	CULVER, H. N.	01-3-6-085
*CONNOR, G. B.	04-3-1-025	CULVER, H. N.	01-4-2-024
COOK, M. J.	01-2-5-054	CULVER, H. N.	01-4-6-083
COOK, M. J.	03-2-5-065	CULVER, H. N.	01-4-6-089
*COOMBE, J. R.	04-2-6-100	CULVER, H. N.	02-1-5-083
COSTNER, R. A. JR.	04-4-6-144	*CULVER, H. N.	04-4-4-090

CULVER, H. N.	07-3-4-342	FAIR, M. F.	03-1-5-075
*DAVENPORT, D. E.	02-2-4-031	*FARMER, F. R.	05-1-1-001
DAVIDSON, R. H.	07-2-6-236	FARMER, F. R.	08-6-1-539
DAVIS, D. M.	04-2-1-026	*FIRST, M. W.	04-1-4-061
DAVIS, F. J.	01-2-5-052	FISH, B. R.	04-4-5-112
DAVIS, F. J.	02-1-5-075	*FLORA, J. W.	06-1-5-081
DE LAGUNA, W.	01-4-5-064	FONTANA, M. H.	01-2-4-041
DELENE, J. G.	05-1-2-040	FONTANA, M. H.	01-3-4-046
DENKINS, R. F.	06-2-4-194	FONTANA, M. H.	01-3-4-052
DEVAN, J. H.	01-3-6-073	FONTANA, M. H.	01-4-4-053
DICKERMAN, C. F.	07-4-2-474	FONTANA, M. H.	02-1-4-055
DICKERMAN, C. E.	08-3-2-220	FONTANA, M. H.	02-3-4-031
*DICKINSON, R. W.	02-3-6-054B	FONTANA, M. H.	04-4-2-054
*DINUNNO, J. J.	02-1-4-044	FORD, M. R.	04-4-5-119
*DINUNNO, J. J.	04-2-2-034	FOSTER, J.	03-4-3-046
DITTO, S. J.	02-4-3-016	FRAAS, A. P.	02-4-2-013
DITTO, S. J.	03-1-3-046	*FRISCH, O. R.	05-3-1-228
DITTO, S. J.	06-2-3-183	*FROSHAUER, G. F.	06-3-6-292
DITTO, S. J.	08-1-3-035	FRY, D. N.	08-1-3-037
DUDLEY, I. T.	01-1-1-005	FULLER, A. B.	02-2-4-037
*DUNNING, G. M.	04-3-5-069	FULLER, A. B.	06-4-4-422
		*FUQUAY, J. J.	05-4-5-403
*EDWARDS, A. R.	04-1-4-075	*GAILLEDREAU, C.	04-1-5-086
*EGAN, W. E.	05-1-4-069	GALL, W. R.	03-1-6-087
*EGE, J. F., JR.	06-2-1-132	GALL, W. R.	03-4-4-052
EISENBUD, M.	06-4-1-380	GALL, W. R.	05-1-4-075
ELDRIDGE, J. S.	02-4-4-041	GALL, W. R.	07-1-4-081
EMERSON, L. C.	01-2-5-047	GALL, W. R.	08-3-4-245
EMERSON, L. C.	01-2-5-054	GAMBILL, W. R.	01-1-2-014
EMPSON, F. M.	03-3-5-054	GAMBILL, W. R.	04-1-2-030
ENGEL, J. R.	04-2-6-102	GAMBILL, W. R.	05-1-2-049
ENGELMANN, R. J.	07-3-5-354	GAMBILL, W. R.	05-2-2-157
EPLER, E. P.	01-2-6-057A	GAMBILL, W. R.	06-2-2-152
EPLER, E. P.	01-4-3-043	GAMBILL, W. R.	07-4-2-436
EPLER, E. P.	04-4-3-072	GARDINER, D. A.	02-2-3-027
EPLER, E. P.	05-2-3-172	GARRICK, B. J.	08-5-3-470
EPLER, E. P.	06-4-3-411	GEKLER, W. C.	08-5-3-470
EPLER, E. P.	07-4-3-456	*GIFFORD, F. A., JR.	01-3-5-056
ERGEN, W. K.	01-3-2-022	*GIFFORD, F. A., JR.	02-2-5-056
ERGEN, W. K.	02-1-2-024	*GIFFORD, F. A., JR.	02-4-5-047
ERGEN, W. K.	03-3-2-015	*GIFFORD, F. A., JR.	03-4-5-076
ERGEN, W. K.	04-4-1-003	*GIFFORD, F. A., JR.	04-2-5-091
ERGEN, W. K.	05-3-2-231	GILLESPIE, F. E.	01-4-4-058
ERGEN, W. K.	06-4-1-374	GILLEY, L. W.	08-2-6-179
ERGEN, W. K.	08-1-2-030	GISSEL, W. Y.	02-1-1-007

GLENNON, E. J.	01-2-1-007	*HOWARD, D. E.	05-3-6-269
*GLENNON, E. J.	04-2-1-014	HOWELL, L. N.	03-3-4-044
GOSHORN, W. W.	02-2-4-037	HOWELL, L. N.	05-1-4-087
GREEN, J. E.	08-1-4-041	HUNGATE, F. P.	07-1-5-092
GREENSTREET, B. L.	01-1-4-026	HURST, F. J.	04-1-4-068
GRIESS, J. C.	04-3-2-032	HUTTON, F. C.	08-2-1-095
*GRIFFITHS, V.	06-2-4-186		
GRIMES, W. R.	01-4-2-020	JACOBS, D. G.	01-3-5-065
GRIMES, W. R.	01-4-4-056	JACOBS, D. G.	02-2-5-063
GROSS, E. E.	01-1-5-031	JACOBS, D. G.	05-1-5-109
GUPTON, E. D.	03-1-5-065	JACOBS, D. G.	08-7-5-175
GUPTON, E. D.	05-7-5-192	*JACOBS, I. M.	06-3-1-231
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GUTHRIE, C. E.	06-1-4-057	JANKOWSKI, F. J.	08-6-6-597
		JOHNSON, W. A.	08-1-1-016
HAFF, K. W.	04-4-1-018		
HAFF, K. W.	06-4-1-371	*KANN, W. J.	04-3-3-039
HAFF, K. W.	07-4-1-409	KAPLAN, S. I.	05-3-4-254
HAFF, K. W.	08-3-1-217	KAPLAN, S. I.	05-4-1-321
*HAIRE, J. C., JR.	02-3-2-015	*KASLOW, J. F.	04-1-6-096
HAKE, G.	07-1-6-104	KASTEN, P. R.	01-2-2-024
HALL, D.	07-4-6-482	KASTEN, P. R.	02-1-2-019
HANAUER, S. H.	02-1-3-029	KASTEN, P. R.	03-3-2-018
HANAUER, S. H.	03-1-3-041	KASTEN, P. R.	07-2-2-162
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HANAUER, S. H.	06-4-3-408	KAUFMAN, J. L.	02-3-3-027A
*HANEY, W. A.	05-4-5-399	KAUFMAN, J. L.	03-2-3-041
HANSEN, H. E.	08-1-0-001	KAUFMAN, J. L.	04-1-3-058
HARRINGTON, F. E.	04-7-5-096	KAUFMAN, J. L.	05-1-3-063
HARTER, J. A.	01-2-5-052	KEENE, A. R.	06-4-1-343
*HARWELL, W. L.	03-3-1-004	KEILHOLTZ, G. W.	07-1-4-072
*HARWELL, W. L.	04-2-1-014	KEILHOLTZ, G. W.	08-2-4-155
HAUBENREICH, P. N.	04-3-2-035	KEILHOLTZ, G. W.	08-4-4-360
HAUBENREICH, P. N.	05-4-2-354	*KELLER, J. W.	06-3-1-246
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HENRY, H. F.	03-1-1-004	KERLIN, T. W.	07-4-2-443
*HILSMEIER, W. F.	06-3-5-283	KERLIN, T. W.	08-4-2-339
HOFFMAN, H. W.	06-7-2-171	*KERN, W. K.	04-3-1-025
HOLCOMB, R. R.	04-7-4-079	KERTESZ, F.	02-3-1-005
HOLLAND, L. B.	08-2-6-179	KERTESZ, F.	03-3-1-006
HOLMES, J. M.	02-4-4-039	KETTNER, D.	07-4-6-482
3HOLMQUIST, C. E.	06-2-1-142	KEYS, J. J., JR.	06-2-2-171
*HOLT, A. B.	04-2-2-034	KILSBY, E. R., JR.	07-2-4-185
HORTON, T. R.	07-2-4-194	KING, E. M.	07-1-6-113
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*HOSLER, C. R.	05-2-5-184	KINNEY, W. E.	05-1-1-015

KLEPPER, O. H.	03-1-6-080	MANN, L. A.	03-1-6-090A
KNOWLES, D. J.	01-4-4-058	MANN, L. A.	03-1-6-092
KNOWLES, D. J.	02-2-3-025	MANN, L. A.	03-2-6-063
KNOWLES, D. J.	05-1-3-059	*MANN, M. M.	01-1-6-040A
KNOWLES, D. J.	07-1-3-052	*MANN, M. M.	01-1-6-040B
KORSMeyer, R. B.	02-7-6-070	*MANN, M. M.	01-1-6-042
KORSMeyer, R. B.	05-4-1-303	MARABLE, J. H.	03-1-2-028
KOVACH, J. L.	08-1-4-041	MARABLE, J. H.	05-1-2-042
		MATHEWS, E. R.	08-1-5-047
LAFYATIS, P. G.	01-4-1-001	MAWSON, C. A.	07-3-5-370
LAFYATIS, P. G.	03-2-1-004	MCCLUNG, R. W.	01-4-3-041
LAMB, E.	02-3-4-038	MCCOY, H. E.	02-2-2-015
LAMB, E.	06-3-1-249	MCCOY, H. E.	02-2-2-017
LANE, J. A.	01-1-1-001	MCCOY, H. E.	06-1-1-031
LANE, J. A.	02-2-1-001	*MCCULLOUGH, C. R.	01-4-1-003
LANE, J. A.	04-2-6-105	MCCURDY, H. C.	02-1-6-102
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LANE, J. A.	08-4-1-316	MCDONALD, W. B.	01-3-6-073
LANGER, S.	01-2-2-015	MCDUFFIE, H. F.	03-2-1-008
LARIN, F.	01-1-3-018	MCDUFFIE, H. F.	04-4-1-016
LAWRENCE, B. R.	07-4-3-456	MCDUFFIE, W. T.	08-4-5-385
LEARY, A. G.	07-3-5-364	MCLAIN, H. A.	03-3-2-023
LEUZE, R. E.	05-4-4-392	MCLEAN, T. L.	02-1-3-030
LEVENSON, M.	07-1-1-001	MCLEAN, T. L.	08-4-3-356
*LEVERETT, M. C.	03-2-1-001	MEEM, J. L.	07-3-1-292
LEWIS, L.	07-2-1-137	*MEHANN, R. O.	04-4-6-176
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LINCOLN, T. A.	02-3-5-045	MERKLE, J. G.	07-3-4-346
*LINDBO, T.	06-3-4-267	MESERVEY, A. B.	04-1-4-066
*LONG, C. G.	03-1-3-039	MESERVEY, A. B.	04-4-4-098
LONG, E. L.	07-1-6-113	METZ, H. J.	01-4-3-041
		METZ, H. J.	03-2-3-042
*MACHTA, L.	04-4-5-103	MILFORD, R. P.	03-3-4-036
*MACHTA, L.	05-1-5-095	MILLER, C. E., JR.	06-3-5-283
MALLET, A. J.	01-2-1-005	MILLER, E. C.	01-3-1-009
MANN, E. R.	01-1-2-010	MILLOT, J. P.	08-5-2-455
MANN, L. A.	01-1-1-005	MOORE, R. E.	02-2-2-011
MANN, L. A.	01-2-1-005	MOORE, S. E.	03-4-4-058
MANN, L. A.	01-2-1-007	MOREHEAD, J. F.	02-2-4-042
MANN, L. A.	01-3-1-013	MORGAN, J. M., JR.	08-5-1-443
MANN, L. A.	01-4-1-004	MORGAN, K. Z.	06-1-1-020
MANN, L. A.	01-4-1-008	*MORRIS, P. A.	01-1-6-040A
MANN, L. A.	01-4-1-013	*MORRIS, P. A.	01-1-6-040B
MANN, L. A.	02-1-1-007	*MORRIS, P. A.	01-1-6-042
MANN, L. A.	02-3-1-007	*MORRIS, P. A.	02-1-1-001
MANN, L. A.	02-4-6-064	MORTON, R. J.	01-4-5-063
MANN, L. A.	03-1-1-007		

MORTON, R. J.	03-3-5-055	PARSONS, P. J.	08-3-5-249
*MOSES, H.	06-1-1-001	PASCOUET, A.	07-1-2-020
MOSSMAN, C. A.	04-4-3-081	PATTON, F. S.	01-2-6-0578
MOSSMAN, C. A.	05-4-3-372A	PERRY, A. M.	01-4-2-032
*MOWRY, A. S.	05-1-4-069	PETERSON, S.	04-2-2-055
		PETERSON, S.	04-4-2-060
NABOW, S. A.	07-3-6-375	PETERSON, S.	05-1-2-047
NEILL, F. H.	04-4-2-044	PETERSON, S.	05-4-2-338
NELSON, D. J.	02-1-5-081	PETERSON, S.	05-4-2-360
NELSON, D. J.	05-2-5-196	PETERSON, S.	06-1-2-038
NEWLON, C. E.	07-4-1-418	PETERSON, S.	06-1-2-040
NEWTON, C. E.	01-2-1-005	PETERSON, S.	06-1-2-041
NICHOLS, J. P.	01-3-6-075	PETERSON, S.	06-4-2-398
NICHOLS, J. P.	02-2-4-045	PETERSON, S.	07-2-2-169
NICHOLS, J. P.	03-1-4-056	PETERSON, S.	08-1-2-025
NICHOLS, J. P.	03-2-6-071	PIERCE, E. E.	03-3-4-044
NICHOLS, J. P.	04-4-4-087	PIERCE, R. M.	01-4-3-038
NICHOLS, J. P.	06-1-4-057	PIPER, H. B.	06-2-4-201
NICHOLS, J. P.	07-1-4-067	PITKANEN, P. H.	02-1-2-026
NICHOLSON, E. L.	03-4-4-063	PITKANEN, P. H.	04-1-1-016
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