UNITED STATES ATOMIC ENERGY COMMISSION

TID-3578

FIRE AND EXPLOSION PROTECTION OF GLOVE-BOX FACILITIES

A Literature Search

Compiled by
Sidney F. Lanier

September 1964

Division of Technical Information

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HEALTH AND SAFETY
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ABSTRACT

A total of 379 references are cited on the safety design of facilities handling radioactive materials. Included are references on glove boxes, fire hazards and control, explosion hazards and control, laboratory design, ventilation systems, and filter systems.

INTRODUCTION

The references included in this compilation were selected to satisfy a specific literature-search request. The information required was glove-box design and associated laboratory facilities with emphasis on fire and explosion hazards in a facility handling radioactive materials.

The search has been published because the information appears to be of value to others who are interested in the design of hot laboratories and equipment - especially glove-box installations.

References are arranged broadly by subject, as shown in the table of contents. Under each subject, the arrangement is by report-number followed by journal references.

A personal author and a report-number index are included. Availability of the reports is cited in the report-number index.

REFERENCES

GLOVE BOXES

1 A/CONF.15/P/533
Los Alamos Scientific Lab., N. Mex.
ANALYTICAL CHEMICAL LABORATORIES FOR THE HANDLING OF PLUTONIUM. C. F. Metz. 22p. $0.50(OTS).

Prepared for the Second U. N. International Conference on the Peaceful Uses of Atomic Energy, 1958.

The analytical laboratories at Los Alamos equipped with dry and glove boxes are described and the philosophy of handling plutonium is presented. The boxes are so designed that all required operations in chemical analysis can be safely performed without room contamination and with minimum risk to the analyst. These boxes are fabricated of stainless steel, with windows of lucite or safety glass. All metal exposed on the inside is painted with a stripable plastic base paint. Glove ports at a convenient height permit easy use of rubber gloves. Experience has shown that plutonium in solution can be safely handled in these enclosures without rubber gloves on the ports, but for handling plutonium in solid form, rubber gloves must be attached to the glove ports. These enclosures are equipped with all the usual laboratory services. Doors between boxes are of an unusual design, vertically operated by compressed air. Provisions exist for operation of equipment such as centrifuges and pH meters within the boxes yet permitting removal in an uncontaminated condition. Ventilation is provided through filters for all gloved boxes and is regulated so as not to interfere with operations by means of dampers in the exhaust ducts. In case of open front boxes, a minimum face velocity of 100 feet per minute is maintained. Polyvinyl plastic was used for exhaust duct installations and was found to be quite satisfactory.

2 A/CONF.15/P/760
Los Alamos Scientific Lab., N. Mex.
CONTROL OF HEALTH HAZARDS IN HANDLING PLUTONIUM. RESULTS OF 14 YEARS EXPERIENCE. H. F. Schulte and D. D. Meyer. 9p. $0.50(OTS).

Prepared for the Second U. N. International Conference on the Peaceful Uses of Atomic Energy, 1958.

As a result of 14 years of experience in handling plutonium in large batch sizes practical techniques for the control of health hazards have been developed. The health hazards involved, including both external and internal radiation, will be outlined and a brief historical review will be made of the Los Alamos experience in developing methods of handling plutonium safely. Remote handling equipment has made possible the isolation of the operators from the direct environment of the plutonium for many operations. Completely interlinked groups of ventilated dry boxes have proven most advantageous for other operations. Enclosure of parts in special containers has permitted some operations without exposure of plutonium to the atmosphere. Local exhaust ventilation and general room ventilation have been combined to limit the spread of plutonium aerosols and to direct the air flow toward the most contaminated areas and away from the operators. Good housekeeping has been a vital part of the control program. Regular monitoring of working areas, routine air sampling, and the use of protective clothing and respiratory protective equipment are described. The problems associated with air cleaning and waste disposal are discussed and practical solutions offered. An important part of the control program is routine analysis of urine samples from exposed personnel and evaluation of the data obtained. A medical program covering all Los Alamos employees contributes significantly to the control of the plutonium problem. The record of the Los Alamos Scientific Laboratory in its 14 years of experience with plutonium is reviewed briefly as a measure of the effectiveness of the control program.

3 A/CONF.15/P/1829
Los Alamos Scientific Lab., N. Mex.
RECENT DEVELOPMENTS IN FACILITIES FOR HANDLING INTENSE ALPHA SOURCES. W. J. Maraman. 11p. $0.50(OTS).

Prepared for the Second U. N. International Conference on the Peaceful Uses of Atomic Energy, 1958.

The design criteria incorporate operational workability, material transfer mechanisms, personnel safeguards, materials of construction, ventilation, and equipment maintenance. The module concept for chemical, metallurgical, and analytical work and enclosures for specific equipment are discussed and illustrated. Transfer mechanisms, conveyor tunnels and sequential operations in glove boxes are used to minimize the contamination hazard where material is moved into or from an enclosure. In addition to the normal industrial safety practices, exacting precautions are taken to prevent lacerations or burns of personnel and explosions within the glove box. Austenitic stainless steels are the best all-round material of construction. The potential fire hazard of plutonium and uranium metal has restricted the use of many plastic and other flammable materials. Enclosure and operating-area ventilation systems are separate, the exhaust from glove boxes is drawn through successive banks of fire-resistant ultrafilters and operating-area air is discharged through a single filter bank.

4 AERE-C/M-150

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

A DOUBLE GLOVEBOX SYSTEM FOR USE WITH α-EMITTERS. C. J. Mandleberg. July 29, 1952. Decl. Nov. 22, 1956. 8p.

A double walled glovebox is described which can be used for handling α emitters when operation of the normal type of box would be too hazardous. Special techniques of glove changing and introduction of liquid oxygen into such a box are also described.

5

Atomic Energy Research Establishment, Harwell, Berks (England)

A SIMPLE AIR EJECTOR AS A SUCTION MOTOR FOR DRY BOXES, by J. R. Catlin, L. Coward, D. Darling, W. T. Spragg and C. G. Webb, and APPENDIX: A DESIGN FOR THE MANUFACTURE OF AN AIR EJECTOR FROM STANDARD COPPER ALLOY PIPE FITTINGS FOR OBTAINING REDUCED PRESSURE IN DRY BOXES, by P. G. Reynolds. 1952. 12p. (AERE-C/M-152)

The use of a simple adjustable air ejector made of glass tubing as a means of providing suction to dry boxes is described. Experimental work to determine the maximum rate of flow for minimum pressure applied resulted in an ejector which gives satisfactory performance. Superiority of the air-ejector system over the use of blower motors is discussed. An appendix presents a design for a similar ejector made of standard Cu-alloy pipe fittings. The ejector gives a suction of 10 in. water gage when the compressed air supply is at approximately 10 psi.

6

Atomic Energy Research Establishment, Harwell, Berks (England)

A DRY BOX FOR α, β, γ WORK; by G. B. Cook and F. Morgan. June 11, 1951. 6p. (AERE-C/R-724)

A dry box has been designed and constructed to afford protection against α-active dust and intense β and γ activities. The box used at Harwell was designed to fit into the existing fume cupboards. It is built largely of wood with the front and the front parts of the right-hand wall and top made of perspex. The over-all dimensions are 70 by 70 by 70 cm with a well in the base to accommodate a centrifuge. Protection is provided by a lead brick wall, supported on the floor of the fume cupboard, covering the entire front face. A lead-glass brick allows direct vision into the box. Remote handling through the wall is possible using tongs. The box is ventilated by suction from an electric motor and fan through a Porton-type filter set at the back of the top surface. The effluent gases are led by a pipe to the normal ventilation ducts. In operation, the box was found adequate for relatively small jobs. Several suggestions are made from experience for improvements.

7

Atomic Energy Research Establishment, Harwell, Berks (England)

SYMPOSIUM ON THE HANDLING OF RADIOACTIVE AND TOXIC SUBSTANCES HELD IN TWO SESSIONS ON SEPTEMBER 10-11th AND SEPTEMBER 13-14th 1951 AT BUCKLAND HOUSE, NEAR FARINGDON, BERKSHIRE. G. R. Hall, ed. Mar. 3, 1952. 68p. (AERE C/R-958)

The topics for general discussion at the Symposium on Handling Radioactive and Toxic Substances covered the use and design of glove boxes, remote control methods employed in handling radioactive materials, housekeeping and laboratory decontamination, and painting systems for use in active areas.

8 AERE-C/R-2188

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

APPARATUS FOR THE PREPARATION, ANALYSIS AND INVESTIGATION OF PLUTONIUM SOLUTIONS. D. E. Glanville, D. W. Grant, and G. L. Strachan. Feb. 28, 1957. 26p.

The apparatus and glove box arrangement used in the work on the thermal stability of Pu solutions is described in detail and an assessment is made of its success in use. Some new techniques are described, including a clean method of carrying out evaporations in a Mk. 1A glove box, an arrangement for using a burette in such a box, and a method for making semi-quantitative spectrophotometric measurements at temperatures above 100°C.

9 AERE-E/M-70

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

IMPROVED LOW PRESSURE AIR EJECTOR AS A DRY BOX SUCTION UNIT. R. A. G. Welsher. June 30, 1953. 10p.

An investigation to obtain and improve the low-pressure suction flow of an air ejector used for dry box evacuation and to reduce the cost of such ejectors made from copper alloy pipe fittings is described in the Appendix of AERE C/M 152. A filter unit was added to prevent the transfer of contamination from the dry box to the main exhaust ducting. Optimum design figures are recommended.

10

Atomic Energy Research Establishment, Harwell, Berks (England)

A COLLAPSIBLE DRY BOX OF FLEXIBLE P.V.C. SUPPORTED IN A STEEL FRAME. R. A. G. Welsher. Dec. 9, 1953. 7p. (AERE-E/M-78)

A method of constructing a dry box from flexible P.V.C. complete with suction unit and supported by a tubular steel frame is described, together with a collapsing technique for storage or disposal. Possible lines of development are indicated.

11 AERE-ES/M-21

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

LUBRICATION IN DRY BOXES. J. Sheldon. May 1957. 3p.

12

Atomic Energy Research Establishment, Harwell, Berks (England)

A NEW DESIGN OF FILTER FOR DRY-BOXES, TYPE D/47, by W. G. Busbridge. 1952. 5p. (AERE HP/M-34)

The memorandum describes a small filter for interposition between dry-boxes and the suction pump which is used to ensure that external leakage does not occur, so that suction lines and pumps do not become contaminated. The filter has three components in series which are designed to ensure the maximum service life consistent with high efficiency filtration.

13 (AERE-M-796) APPARATUS FOR DETERMINING THE MECHANICAL PROPERTIES OF ALPHA-ACTIVE MATERIALS. M. J. Notley and P. M. French (United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England). Dec. 1960. 10p.

Apparatus for determining the hardness and tensile properties of plutonium alloys at temperatures up to 1000°C is described.

14 (AERE-M-941) AN ELECTROMAGNETIC STIRRER FOR GLOVE BOX USE. K. W. Bagnall and P. S. Robinson (United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England). Oct. 1961. 6p.

An electromagnetic stirrer which has no moving part other than the polythene-encased rotor was designed for use in glove boxes.

15 AERE-M/M-78
Atomic Energy Research Establishment, Harwell, Berks (England)
A PORTABLE ARGON PURITY INDICATOR. W. F. Biddle and J. Sheldon. Aug. 6, 1954. 10p.

An apparatus suitable for sampling argon from active dry boxes is described. Indication of purity is by the color of a high-voltage discharge through a continuous-flow sample at 20 m/m of mercury pressure.

16 AERE-R-3067
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
SOME ASPECTS OF FIRES IN GLOVE BOXES. C. Jackson, T. W. Hodge, D. H. Swingler, and A. J. Smith. Oct. 1959. 27p. BIS.

A series of tests was carried out to determine the magnitude of the stresses to which a glove box and its associated fittings would be subject if a fire occurred within the box. From this information an attempt was made to forecast the probable effect of accidental fires. A few fire-extinguishing agents were tested in the light of estimated requirements.

17 (AHSB(S)R-18) SOME SAFETY CONSIDERATIONS IN RELATION TO GLOVE BOX DESIGN. V. Griffiths (United Kingdom Atomic Energy Authority. Authority Health and Safety Branch, Risley, Lancs, England). 1962. 36p.

Procedures are reviewed for reducing the risk of fire, explosions, and other occurrences leading to rupture of glove box containment. Comments are included on methods of extinguishing fires and on other aspects of glove box safety.

18 ANL-5499
Argonne National Lab., Lemont, Ill.
THE PROCESS EQUIPMENT AND PROTECTIVE ENCLOSURES DESIGNED FOR THE FUEL FABRICATION FACILITY NO. 350. A. B. Shuck and R. M. Mayfield. Jan. 1956. 217p. Contract W-31-109-eng-38. $1.00 (OTS).

Concepts, design, mock-up construction, and testing of equipment and hoods for the fabrication of reactor fuels containing plutonium or U^{233} are described. The building to house the hood and equipment systems is described briefly. Particular emphasis is placed upon the process equipment requirements, radiological and toxicological hazards, hooding concepts, hood designs and construction. The hoods of this design consist of aluminum alloy frames fabricated from extrusions which are so designed that $^3/_8$-inch thick transparent allyl plastic or aluminum plates may be installed in preformed grooves by means of restrained, tight-sealing, neoprene gaskets. Manipulation within the hoods is by means of arm-length neoprene gloves sealed to glove rings on the transparent panels. Flanges and gasket grooves allow bolting together of any number of hood modules, with or without partitions, into assemblies to form interconnecting hood lines. A modular design was worked out to allow the use of many standardized parts and to provide flexible conformity to wide variety of equipment and operations through the modification of standardized hood sections. The three hood systems housing equipment for work on bare fuel alloys, for the transition operations of jacketing, and for work on clad materials are described hood line by hood line.

19 ANL-5743
Argonne National Lab., Lemont, Ill.
GLOVES FOR PROTECTIVE ENCLOSURES. Final Report [On] Metallurgy Program 1.5.3. D. A. Davis, J. E. Ayer, and R. M. Mayfield. May 1957. 22p. Contract W-31-109-eng-38. $0.25(OTS).

A study of the glove problem has been made by the ANL Glove Committee as a necessary prerequisite to any attempt at coordination or standardization. This report consists of a compilation of the findings of the Committee and the resulting compromises which are felt necessary to the resolution of the problem. Materials, methods of manufacturing and general properties of gloves are described. Glove design has been analyzed and suggestions are made in regard to an acceptable standard. Permeability characteristics of various glove compounds are reviewed and the effect of moisture contamination upon hypothetical systems is tabulated. An electrical test is proposed for the determination of glove soundness.

20 (ANL-6652) HELIUM-PURIFICATION UNIT FOR HIGH-PURITY INERT-ATMOSPHERE BOXES. M. S. Foster, C. E. Johnson, and C. E. Crouthamel (Argonne National Lab., Ill.). Dec. 1962. Contract W-31-109-eng-38. 17p.

A device for purifying and recycling the helium atmosphere of two dry boxes having a combined volume of 60 ft^3 is described. Trace impurities are removed by passing the helium through a palladium-catalyst container and a molecular sieve bed and cooling to −195°C before passing through an activated charcoal bed. Flow rates of 10 scfm and purity levels are estimated. Regeneration procedures are given. Construction prints and a schematic diagram of the helium-purification unit are shown.

21 (ANL-6671) DENSITY MEASUREMENTS IN GLOVEBOXES. WITH DENSITY DATA ON MONOBROMOBENZENE, CAST THORIUM, THORIUM–URANIUM, AND

THORIUM–PLUTONIUM ALLOYS. B. Blumenthal (Argonne National Lab., Ill.). Sept. 1963. Contract W-31-109-eng-38. 29p.

By taking into consideration temperature differences between the glovebox atmosphere and the liquid, it was possible to make density measurements in gloveboxes by the hydrostatic weighing method with monobromobenzene as a liquid with an accuracy of ±0.005 g/cm^3. This is an improvement by an order of magnitude over the prior state. This accuracy allows structural changes to be detected in thorium–uranium and thorium–plutonium alloys

22 (BLG-64) DESIGN AND OPERATION OF THE PLUTONIUM CERAMICS LABORATORIES AT MOL. R. Billiau, B. Blumenthal, J. Draulans, and E. Vanden Bemden (Société Belge pour l'Industrie Nucléaire, Brussels and Brussels. Centre d'Etude de l'Energie Nucléaire). [nd.] 37p. (BN-610703)

A laboratory is described that is devoted to the study of Pu-containing fuel elements. The laboratory is designed to provide complete containment of α-emitters. Individual glove boxes are equipped for the preparation of U and Pu oxide compacts and for studies of their properties. The general layout of the laboratory, including its ventilation, power supply, leaktight glove boxes and their pressure control systems, filters, glove ports, connecting ports, and other pertinent details, is described. Elementary safety rules and first aid instructions are given.

23 (BNL-823(p.57-65)) HOT LABORATORY DIVISION. L. G. Stang, Jr. (Brookhaven National Lab., Upton, N. Y.).

Plastic glove boxes were reinforced as a result of tests carried out to determine effects of increased internal pressure. "D" waste inventory reached a low of 23,000 gal.

24 THE ADAPTATION OF COMMERCIALLY AVAILABLE STOCK PARTS INTO AN INEXPENSIVE GLOVE-BOX TRAIN. A. J. Banslaben and H. L. Finston (Brookhaven National Lab., Upton, N. Y.). Proc. Hot Lab. Equip. Conf., 10th, Washington, D. C., 1962: 293-8(1962). (BNL-6293)

By adapting commercially available stock parts designed for other purposes, an interconnecting train of glove boxes was fabricated at a considerable saving in cost over that required for a custom-designed system. They key feature is the utilization of a glass-fiber reinforced polyester vat liner commonly used in chemical processing. Introduction ports, transfer locks, and ventilation system were fabricated from PVC pipe and fittings and Teflon-sealed valves. Components can be assembled with conventional shop tools and a vacuum-tight bond effected with glass-fiber tape and polyester resin. The system is admirably suited to the handling of alpha-emitters.

25 PLASTIC GLOVED BOX (Engineering Materials). (Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Aiken, S. C.). An assembly and 1 drawing. (CAPE-861)

The box is useful in housing short-term experiments with radioisotopes to contain the emitted beta and low energy gamma radiation or limited amounts of alpha activity. The box is 46$^7/_8$ in. by 34$^1/_4$ in. by 20$^1/_8$ in. It has two ports 8$^{11}/_{16}$ in. in dia. The box is constructed of fire-resistant, self-extinguishing, polyester resin that is reinforced with glass fibers. The design combines strength with lightness and economy.

26 GLOVE BOX—INTRODUCTION PORT (Engineering Materials). (Brookhaven National Lab., Upton, N. Y.). 3 units. (CAPE-951)

The port used for introducing materials into a glove box is a door made in two sections. The inner section is $^1/_2$ in. thick and 10$^1/_4$ in. in dia. The outside of the door is 9$^7/_8$ in. in dia. and $^1/_2$ in. thick. Light teflon-covered "Q" rings separate the two parts of the door. A teflon washer is used at the knob.

27 PLUTONIUM RESEARCH GLOVEBOXES (Engineering Materials). (Argonne National Lab., Ill.). (CAPE-1024)

This package contains 141 drawings. Gloveboxes used for plutonium research in the Fuels Technology Center in metallurgy research are described. The boxes are constructed of aluminum extrusions, are modular in design, and are flexible for application with many types of research equipment. The boxes, if properly assembled, are suitable for use with high-purity inert-gas atmospheres. There are 8 standard sizes. These are designated by the letters "S" for single and "D" for double which indicate the depth, length, and height respectively. There are 8 different combinations of modules, e.g., DDS, SSS, DSD, etc. The aluminum extruded frame normally accommodates $^3/_8$ in. thick safety glass panels and either $^1/_2$ or 1 in. thick aluminum panels. A variety of hardware was designed which permits the transfer of material or installation of utilities while maintaining the integrity of the sealed enclosure.

28 EMISSION SPECTROGRAPH FACILITY—GLOVE BOX (Engineering Materials). (Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho). (CAPE-1038)

This package contains 25 drawings. The facility includes analytical equipment such as mass spectrometers, emission spectrographs, x-ray diffractometers, chromatographs, and flame photometers. Modifications to this facility, which consist of the addition of a lead-shielded cave or glove box and related utility services, are described. The glove box, which is located on a stand 38 in. high, is 59 in. long, 35.5 in. deep, and 31 in. high. It has 2 glove ports, 3 access ports, 2 viewing windows on the front, and an access door on the side. The box has 1.5-in.-thick lead shielding on the bottom, front, and sides, and 1-in.-thick lead shielding on the back and top. A centrifuge well 20.5-in. × 19.75 in. × 12.875 in. deep is located under the box. The well is shielded by 2 in. of lead on the front, bottom, and sides, and 1 in. of lead on the back. The filter housing and blower system used with the box are described.

29 PLUTONIUM FABRICATION PILOT PLANT EQUIPMENT (Engineering Materials). (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). (CAPE-1062)

This package contains 14 drawings. The equipment is used in plutonium chemistry and consists of a precipitator, drum filter, calciner, fluorinator, and glove box.

30 CEA-809

France. Commissariat à l'Énergie Atomique, Paris. CONSTRUCTION DES BOîTES À GANTS POUR LA MÉTALLURGIE DU PLUTONIUM. (Construction of Dry-boxes for Plutonium Metallurgy.) E. Grison and R. Pascard. Mar. 1958. 10p.

The dry boxes used at Châtillon are of two main types: (a) boxes with a metal frame work of welded angle-pieces and panels of plexiglas, bakelite, or duralumin.

They include a standard panel which enables them to be connected to the contaminated repair workshop; (b) boxes made entirely of welded plastic. The working face only is of plexiglas held by screw-clamps to a pure rubber joint. These boxes, which cannot be connected to the contaminated workshop, are generally reserved for small pieces of chemical apparatus. None has yet been used for working under argon, although their insulation is excellent. After an interval of several hours, in fact, no decrease in the pressure inside the box can be detected. Several means can be adopted to ensure that the joints between panels and mountings are absolutely airtight.

31 CEA-811
France. Commissariat à l'Énergie Atomique, Paris.
BOITES POUR MANIPULATION D'EMETTEURS β-ENERGIQUES. (Dry Boxes for Manipulation of High-energy β Emitters.) R. Boclet and H. Laurent. Mar. 1958. 13p.

Because of the thinness of latex on neoprene gloves and the high intensity of bremsstrahlung radiation, manipulation of pure high-energy β^- emitters is impossible in ordinary dry boxes. There are many types of boxes equipped with heavy lead or steel protection, but their use for radioelements such as P^{32}, Sr^{90}, or Y^{90} is not justified. Units known as "tong boxes" which, while retaining much of the flexibility of operation found in dry boxes, provide adequate protection were constructed. One curie of P^{32} placed in the center of the enclosure gives about 15 mr/8 h at the part of the wall closest to the source.

32 CF-55-10-132
Oak Ridge National Lab., Tenn.
DETERMINATION OF THE OPTIMUM PROCEDURE FOR OBTAINING INERT ATMOSPHERES IN NON-VACUUM DRYBOXES. S. I. Cohen and J. M. Peele. Oct. 26, 1955. 12p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40 (mf OTS).

This investigation was carried out to ascertain the optimum procedure for obtaining inert drybox atmospheres by merely purging or sweeping with an inert gas. It was found that heavier-than-air gases should be introduced at the bottom of the drybox and exited at the top, lighter-than-air gases should be introduced at the top of the drybox and exited at the bottom, purging efficiency is decreased with mixing, and purging efficiency is increased as the flow rate is increased.

33
Atomic Energy Project (Canada)
MEMORANDUM ON THE USE OF DRY BOXES FOR HANDLING ACTIVE MATERIAL (CI-178 Revised, July 1950); by P. B. Aitken. 11p. (CRC-451)

34 (DP-724) CONTAINMENT BOX FOR RADIOACTIVE MATERIALS. Albert E. Symonds and W. Harold Leith (Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Aiken, S. C.). July 1962. Contract AT(07-2)-1. 10p.

A general purpose glove box was developed that combines corrosion resistance with lightness, economy, and ease of fabrication. The box is made from a fire-resistant, self-extinguishing polyester resin reinforced with glass fibers.

35 (GAMD-1931) DRYING OF GLOVE BOX ATMOSPHERES. G. B. Engle (General Atomic Div., General Dynamics Corp., San Diego, Calif.). Dec. 15, 1960. Contract AT(04-3)-314. 5p.

The results of work to obtain and maintain dry argon atmospheres are presented. Procedures for operating dry boxes equipped with the drying system are outlined. The system of a silica gel tower followed by a commercial electro-dryer was chosen for use with the glove boxes. Although BaO and P_2O_5 had better drying powers, they were less attractive for long term drying operations.

36 HW-26500
Hanford Atomic Products Operation, Richland, Wash.
A SECTIONAL GLOVED BOX. D. C. Kaulitz and W. E. Roake. Feb. 8, 1955. 17p. Contract W-31-109-Eng-52.

The design and construction of a sectional glove box are described. The basic body section consists of a three-foot-long open-ended structure.

37 HW-64258
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
GLOVE BOX INTEGRITY STUDY. R. A. Ciccarelli. Mar. 8, 1960. 23p. Contract AT(45-1)-1350. OTS.

A program is described which was designed to determine the leak rates for drybox neoprene gloves, plastic posting bags, and sphincter seals. An evaluation of a self-sealing weather strip molding as an alternate method of mounting window panels is also given. Conclusions regarding component in leakage are discussed and recommendations for design of test instrumentation and steps to minimize in leakage are included.

38 (HW-64888) PLUTONIUM RECLAMATION FACILITY—HUMAN ENGINEERING CONSIDERATIONS FOR GLOVE BOX DESIGN. C. M. Thomas (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). Apr. 26, 1960. Contract AT(45-1)-1350. 13p.

To assist in scoping alternates in the design of the Plutonium Reclamation Facility for feasibility, dimensional relationships, and cost estimates, a human engineering study was undertaken. This study was to define the limitations of an individual working through glove ports in a hood adapted to the specific requirements of the new facility. Equipment could then be designed compatible with these known area limitations, minimizing the accessibility problem. Fundamental motion patterns and limitations for an "average operator group" were developed for the specific criteria of the proposed facility. The envelopes generated by those basic patterns were then arranged to determine the best glove port relationship while adhering to the established criteria. Minimum eye ports were then developed which coincide with the recommended glove port pattern. In general, a vertical plane 18 in. from the glove port face, with a hood inside height of 49 in., is the recommended maximum accessible area compatible with the established criteria. Equipment necessitating contact should be concentrated at glove port center line height (56 in. to floor or step) and directly across from an eye port at approximately 10 to 12 in. Glove port horizontal spacing is recommended at 16 in. on center, using a right/left glove concept. Maximum areas indicated are for direct line access; restrictions which force the hands to detour around equipment will reduce the limits accordingly.

39 HW-58101
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
PRESSURE CONTROL OF STATIC-TYPE, GLOVE—

OPERATED HOODS. Preliminary Report. C. D. Swanson. Nov. 4, 1958. 66p. Contract W-31-109-Eng-52. $1.75(OTS).

This study was initiated to determine the performance requirements of a ventilation control system suitable for use with static-type glove hoods. Hoods of this type are used to enclose machining operations or other work areas where toxic radioactive materials are to be processed or stored, and where the flow of atmospheric gas through the hood is to be kept at a minimum for economic reasons.

40 (HW-68023) DEVELOPMENT OF GAMMA AND NEUTRON RADIATION DATA FOR THREE ALTERNATE DESIGN CONCEPTS FOR THE PLUTONIUM RECLAMATION FACILITY, PROJECT CAC-880. H. A. Moulthrop (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). Jan. 4, 1961. 56p.

Effects of gamma and neutron radiation are calculated for a Plutonium Reclamation Facility. Shielding requirements to give a dose rate around the equipment of approximately 2 mrem/hour for each of three design alternates are given. With ½ inch of lead on the hermetically sealed equipment, the working area dose rates are lowered to below 1.0 mrem/hour. With the one inch of lead shielding presence of fission products in the plutonium stream becomes a controlling factor in the extent to which gamma dose rates can be reduced in the working area. The impracticality of performing glove box operation through an 8-inch hood wall as necessary with a 6-inch plexiglas neutron shield requires either acceptance of a 10 mrem/hour minimum radiation dose rate through one inch of lead or a change of design to reduce neutron dose rates. Extrapolation of potential dose rates to the hands for plutonium indicates a possible exposure of 100 mr/hour or more in terms of equivalent body dose rates. Elimination of all glove box operations with the hermetic equipment approach suggests its eventual adoption on all plutonium processing facilities involving contact mainteance.

41 (HW-68442) CAC-880 Pu RECLAMATION FACILITY—Z PLANT GLOVE BOX DESIGN STUDY. G. P. Kesel and R. C. Baker (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). Feb. 13, 1961. Contract AT(45-1)-1350. 33p.

Design studies for the Plutonium Reclamation Facility called for the main process equipment to be mounted on walls of a canyon cell with all piping from each vessel brought out through plugs in the 2-ft-thick concrete wall to a shielded glove box hood where all interconnecting equipment such as piping, valves, controls, and pumps are located. The space requirements precluded designing the main process glove boxes with the size limitations recommended by the initial study. Therefore, a study was made to extend the size of the hoods. Recommendations are given for glove-box depth, maximum distance from glove ports to top or bottom of hood, horizontal glove port spacing, viewing windows and their location, vertical spacing of glove ports, working and equipment location areas with the hoods, and required platform heights.

42 (HW-80750) METHOD OF CUTTING GLOVE PORTHOLES IN SAFETY PLATE AND LEADED GLASS. S. B. Bates (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). Nov. 6, 1958. Contract AT(45-1)-1350. 3p.

A method was devised for cutting circular glove portholes in safety plate glass used in hoods. An adjustable arbor attachment was made for the saw. The method comprises cutting a center rectangle in the glass, cutting through the rectangle to the edge of the desired circle, immersing the glass in a hot water tank to soften the glass, and removing the last pieces with glass pliers.

43 (HW-SA-2740) THE RADIOLOGICAL PHYSICS OF PLUTONIUM. C. M. Unruh (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). Aug. 30, 1962. Contract AT(45-1)-1350. 15p.

Plutonium metal processing operations were developed with the utilization of equipment and methods to provide containment for contamination control, shields for radiation exposure control, and limitations on plutonium mass, concentration, and solution volume for criticality control. Containment of plutonium materials in glove boxes and hoods prevents the internal body deposition of plutonium radionuclides. The long biological half-life, the high energy of the emitted alpha particles, and the body's selective localization of plutonium combine to result in the low maximum permissible body burden for plutonium radionuclides. Radiation shielding is generally required to reduce personnel exposure to gamma radiation, x radiation, and neutron radiations that are emitted by the plutonium radionuclides. The specific amount of shielding required is a function of the plutonium radionuclides present, the quantity and physical distribution of the material, and the time lapse between purification and fabrication of plutonium fuel elements. High exposure plutonium from power reactors and from plutonium recycle programs will have significant quantities of the plutonium radionuclides 239, 240, 241, and, to a lesser degree, 242. The gamma radiation dose rates resulting from the daughters of Pu^{241} will increase as the daughters, americium-241 and uranium-237, build up in the processed material. Expedient fabrication of freshly separated plutonium will tend to avoid the higher gamma radiation dose rates from high exposure plutonium. The spontaneous fission rate of Pu^{240} will result in increased neutron dose rates as the percentage of this radionuclide increases. In handling of any plutonium materials, strict adherence to criticality controls is necessary. Criticality controls may be accomplished through design by the use of always critically safe vessels or by the rigid practice of administrative controls on processing operations. Although criticality control by vessel design is generally preferable, the judicious practice of both administrative and design criticality control is a common practice. The use of remote processing and handling techniques for plutonium materials is generally desirable and is encouraged.

44 (HW-SA-2904) HANFORD PLUTONIUM FUEL DEVELOPMENT LABORATORY. L. G. Merker and I. D. Thomas (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). Feb. 13, 1963. Contract AT(45-1)-1350. 14p. (CONF-39-28)

From American Nuclear Society Meeting, Salt Lake, City, Utah, June 1963.

The Plutonium Fabrication Pilot Plant (PFPP) is described. Glove-box-enclosed equipment is provided for plutonium fuel research, development of new fabrication processes, and fabrication of experimental reactor fuels containing plutonium. The design philosophy of the facility is containment and directional ventilation control. The glove boxes are constructed of stainless steel with acrylic plastic panels. Plastic glove ports are ordinarily cemented to the panels.

45 PLUTONIUM FUEL-CASTING FACILITY. L. G. Merker and C. H. Bloomster (General Electric Co., Richland, Wash.). Proc. Conf. Hot Lab. Equip., 11th, New York, 1963, 169-74(1963). (HW-SA-3029; CONF-187-10).

An induction-heated glove-box-enclosed casting facility was used at Hanford for the melting and casting of experimental plutonium-containing fuel alloys. The alloys are prepared in furnaces with removable clay-graphite crucibles, supported by rammed alumina containment shells. The furnaces, which have capacities of 25 and 50 pounds of aluminum, are tilted by rotary hydraulic actuators. Furnace power is supplied from a 30 kw, 4,200 cycles/sec motor generator set. The upper temperature limit of the furnaces is approximately 1500°C. A 300 ft^3 static-inert atmosphere glove box encloses the furnaces and is operated at a negative pressure of one inch of water. The glove box pressure is maintained by an automatic ventilation system which also provides for controlled purging and high emergency exhaust flows. A refrigerative cooling system makes possible the use of static-inert atmospheres during the melting and casting operations. Atmospheres of less than one percent oxygen can be maintained with purge rates of less than 20 ft^3/hr. The casting facility design allows easy conversion to a fully remote operation. Thermal reactor fuel materials containing a total of over 80 kilograms of plutonium were processed through the facility, including plutonium with Pu^{240} contents as high as 20%.

46 IDO-14409

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

APPARATUS FOR REMOTE, SMALL SCALE, LIQUID-LIQUID EXTRACTIONS. Fred W. Dykes and Richard G. Masterson. May 21, 1957. 9p. Contract AT(10-1)-205. $0.15(OTS).

An improved apparatus for small-scale liquid-liquid extractions is described. The apparatus is used in the preparation of highly radioactive sample aliquots for conventional analysis.

47 IGO-TM/CA-015

United Kingdom Atomic Energy Authority. Industrial Group. Capenhurst Works, Capenhurst, Ches., England.

A FLEXIBLE POLYTHENE GLOVE BOX. A. Hughes. Nov. 1957. 8p.

The need for a glove box capable of maintaining an inert atmosphere arose during the sampling and analysis of the alkali metals. The conventional rigid glove box was found to be unsuitable in practice and also inefficient in theory. The requirement was met by improvising a flexible glove box from thin polythene sheet. The alternative solution to this problem would have required an expensive vacuum glove box with its attendant pumping unit.

48 (LADC-5775) A RE-CIRCULATING WET VACUUM CLEANING AND SCRUBBING SYSTEM FOR DECONTAMINATION. P. J. Peterson, D. C. Carlson, and R. W. Walker (Los Alamos Scientific Lab., N. Mex.). [1960]. Contract W-7405-eng-36. 5p.

A recirculating wet vacuum cleaning and scrubbing system was devised for decontamination of the interior of alpha sealed boxes. The system utilizes a pump capable of handling both air and water to recirculate the decontamination solution. The solution (plus box air) is pumped to the reservoir under a pressure of ~12 lb/in.^{2} and at a rate of ~1.5 l/min. The reservoir is a standard alpha-transfer can separated into two sections, the lower part serving as the solution reservoir and the upper section providing space for storage of the hose leading the vacuum pickup head. This permits remote introduction and removal of the system while maintaining an alpha tight seal on the box. Main advantages of the system are listed and a diagram is given.

49 (LAMS-2962) RADIATION HAZARD RESULTING FROM TRITIUM DIFFUSION IN GLOVE BOX OPERATIONS. George N. Krebs, Jr. (Los Alamos Scientific Lab., N. Mex.). Aug. 6, 1963. Contract W-7405-eng-36. 13p.

Tritium exposure to personnel handling tritium compounds in glove boxes can be significantly reduced by the wearing of surgeon's gloves while working in the dry-box gloves. To investigate this reduction quantitatively and to determine criteria for the frequency of glove change, mathematical analyses of the diffusion of HTO through dry-box rubber gloves with and without surgeon's gloves was made. The relative amounts of HTO absorbed by the worker as a function of time in the two cases was then compared. For tritium concentrations of 1C/m^3 in the glove-box atmosphere, a change of surgeon's gloves every 15 to 20 min is recommended as a safe working procedure

50 NAA-SR-1227

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

HOT CELL APPARATUS FOR PYROPROCESSING EXPERIMENTS. James R. Foltz, Weldon J. Gardner, and Fred D. Rosen. June 15, 1956. 67p. Contract AT-11-1-GEN-8. $10.80(ph OTS); $3.90(mf OTS).

Apparatus for performing experiments on high-temperature processing by remote methods is described. Techniques for control of radioactive contamination are discussed. A description of the shielded enclosure is also given.

51 (NAA-SR-6488) MOLTEN PHOSPHATE REACTOR FUELS. V. DESIGN AND CONSTRUCTION OF A VACUUM-LOCK, INERT-ATMOSPHERE DRY BOX. W. S. Ginell, M. A. Hiller, L. F. Grantham, and T. L. Young (Atomics International. Div. of North American Aviation, Inc., Canoga Park, Calif.). May 31, 1962. Contract AT (11-1)-Gen-8. 25p.

The general design and construction of a stainless-steel, inert atmosphere box is described. Special features such as the gas purification system, dew point measurement apparatus, automatic pressure control system, and vacuum air lock are described in some detail. The box was operated routinely at impurity levels of 0.1 to 0.5 ppm by weight of water in argon.

52 NOLC-318

Naval Ordnance Lab., Corona, Calif.

INERT-ATMOSPHERE CHAMBER FOR CHEMICAL OPERATIONS. D. L. Herring. Jan. 13, 1956. 33p. (NAVORD-4567).

An inert-atmosphere chamber ("dry box") was designed and constructed for handling of nonvolatile chemicals sensitive to moisture and/or oxygen, necessary to research in modified inorganic polymers. The NOLC dry box has been successfully used in operations connected with the synthesis of polymers from metal hydrides, halides, organo-metallic reagents, and so forth.

53 NUMEC-P-30

Nuclear Materials and Equipment Corp., Apollo, Penna.

DEVELOPMENT OF PLUTONIUM BEARING FUEL MATERIALS. Progress Report for Period April 1 through

June 30, 1960. July 18, 1960. 36p. Contract AT(30-1)-2389. OTS.

Major effort was directed toward assembly of glove boxes and installation and checking out of equipment. Fourteen glove boxes have been installed and connected to the ventilation system. Preparatory to working with plutonium, significant studies were carried out on the preparation and characterization of UO_2. Testing of the ventilation system demonstrated a need for further work on the plant absolute-filter housing to achieve absolute tightness. Details were worked out for "closing" the glove boxes after installation of equipment. The acceptance criterion of 0.01%/hr pressure loss at a box vacuum of 2 in. of water is easily achieved. Fabrication and evaluation of fuel shapes, fuel reprocessing, and reactor physics and engineering parametric studies are discussed briefly.

54 NYO-3916
Tufts Coll., Medford, Mass.
THE REACTION OF ORGANOSODIUM COMPOUNDS WITH URANIUM TRIBROMIDE. (WITH STUDIES ON THE NATURE AND SEPARATION OF REACTION PRODUCTS). Annual Report for Year Ending June 1, 1954. Thomas R. P. Gibb, Jr., Edward J. Goon, and Edwin B. Damon. June 15, 1954. Decl. Oct. 7, 1955. 49p. Contract AT(30-1)-1355.

The reaction of sodium in biphenyl, amylsodium, sodium benzophenone ketyl, and sodium naphthalene glycol ether with UBr_3 is reported. Evidence is given that colloidal U is formed in certain instances but is too reactive to be isolated except in partially oxidized form. Reduction by organosodium reagents in the presence of H_2 gas does not lead to U hydride in the reactions studied. Various observations on the reactivity of finely divided U and UBr_3 with possible leaching agents are described. Uranium powder reacts with water, dilute base, isopropyl alcohol and, to some extent, with ether-methanol and acetone, but not with liquid ammonia. Uranium tribromide reacts with isopropyl alcohol and sodium isopropoxide forming isopropylates and with liquid ammonia probably to form the insoluble triamide. The density and x-ray-diffraction pattern of U hydride as a function of H_2 content have been measured, and a preliminary report is given indicating partial removal of H at low temperature does not greatly increase the density above that of UH_3. A special drybox and certain anaerobic techniques are described together with a microscope hot-stage for observations in vacuum or under high gas pressures.

55 (ORNL-3070) A REVIEW OF GLOVE BOX CONSTRUCTION AND EXPERIMENTATION. C. J. Barton (Oak Ridge National Lab., Tenn.). June 14, 1961. Contract W-7405-eng-26. 112p.

A series of fires and explosions in U. S. Atomic Energy Commission facilities handling α-active materials during the last five years resulted in reconsideration of safety problems associated with glove boxes and other equipment used to contain these materials. The literature on construction and operation of glove boxes for work with toxic inorganic materials not requiring biological shielding is reviewed as a contribution to this re-examination, with special emphasis on methods and equipment for working safely with plutonium and other α-active materials. An effort was made to point out the direction of current trends in this field. Detailed discussions of glove box designs and methods of experimentation in these enclosures are not included in this report but sufficient information is furnished for finding needed details in the referenced material. Methods for the detection and measurement of α-active materials and of impurities in controlled atmospheres are discussed. In addition, the literature on controlled atmosphere enclosures, glove boxes for non-toxic inorganic materials, and the technique of experimenting with such enclosures is reviewed. Some previously unpublished developments are reported.

56 (ORNL-3086) CALCULATED TRANSIENT PRESSURES DUE TO IMPULSE AND RAMP PERTURBATIONS TO VENTILATING SYSTEMS IN BUILDINGS 3019, 3026, 3508, AND 4507. J. J. Perona, W. E. Dunn, and H. F. Johnson (Oak Ridge National Lab., Tenn.). Aug. 15, 1961. Contract W-7405-eng-26. 63p.

As part of a general hazard review survey conducted by the Chemical Technology Division of its facilities, transient pressures due to impulse and ramp perturbations to the cell ventilating systems of buildings 3019, 3026, and 4607 and the closed glove box system of 3508 were calculated. From the portions of the pressure curves above atmospheric pressure, volumes of gas outleakage were estimated; thus the amount of activity released can be calculated if an estimate of the activity concentration is available. The volumes of outleakage for all four ventilating systems were small for reasonable sizes of perturbations. For an impulse perturbation causing an instantaneous rise of +8.0 in. H_2O, the length of time above atmospheric pressure and estimated outleakages for PRFP cells in 3019 are 1.5 sec and 3.1 ft^3, respectively; for volatility cell 1 in 3019, 0.33 sec and 0.45 ft^3; for cell A in 3026, 2.1 sec and 3.0 ft^3; for a glove box in 3508, 0.066 sec and 0.04 ft^3; and a cell in 4507, 0.26 sec and 0.03 ft^3.

57 (RCC/R.119) A VERSATILE APPARATUS FOR THE HEATING AND EVAPORATION OF LIQUIDS IN SHIELDED BOX SYSTEMS. J. C. Charlton (United Kingdom Atomic Energy Authority. Research Group. Radiochemical Centre, Amersham, Bucks, England). Jan. 1961. 14p.

An apparatus developed for heating and evaporating liquids in shielded box systems consists of a vapor bath in which a 40 ml. centrifuge tube can be heated, together with a device for the removal of vapor from the centrifuge tube in a stream of air. Evaporation was rapid and trouble-free. The equipment can readily be handled remotely and is small enough to be "bagged-out" of the box.

58 (RFP-175) PLUTONIUM HANDLING FACILITIES FOR RADIOGRAPHY. A. L. Dighton, J. C. Sampson, and W. D. Stump (Dow Chemical Co. Rocky Flats Plant, Denver). Apr. 12, 1962. Contract AT(29-1)-1106. 22p.

Since any radiography must be performed in an enclosed system, an enclosed glove box was constructed to facilitate radiographic operations. Tests show that no significant detail is lost in radiographing dense materials greater than 0.020 inch through 0.120 inch of aluminum using energies in the 1 Mev range.

59 (TID-4100(1st Rev., Suppl. 12)) SUPPLEMENTAL INSERT SHEETS FOR ENGINEERING MATERIAL LIST. Richard E. C. Duthie (Office of Technical Information Extension, AEC). June 1961. 82p.

Lists of engineering materials including hot laboratory equipment, instruments, metallurgical equipment and processes, nuclear radiation instruments, nuclear reactors and facilities, plant designs and processes (chemical), particle accelerators, and rockets and missiles are presented.

60 (TID-7599) PROCEEDINGS OF THE EIGHTH CONFERENCE ON HOT LABORATORIES AND EQUIPMENT, SAN FRANCISCO, CALIFORNIA, DECEMBER 13-15, 1960. (American Nuclear Society, Chicago). 556p. OTS.

Fifty-two papers presented at the Eighth Conference on Hot Laboratories and Equipment held at San Francisco, California, December 13 to 15, 1960, are given. The papers are grouped under the following headings: hot laboratory facilities and hot cells; general purpose manipulators and viewing; shielding and experiments; and glovebox design and specialized equipment. Fifty-one of these papers are covered by separate abstracts.

61 (TID-7599(p.210-23)) A VERSATILE UNIVERSITY LABORATORY FOR STUDIES ON THE BASIC CHEMISTRY OF ALPHA EMITTERS. Fritz Weigel (Munich. Universität. Institut für Anorganische Chemie).

The facility described is equipped with special enclosures for the following type of work: aqueous and dry chemistry, x-ray diffraction, emission spectroscopy, and micrometallurgy of weighable amounts of α-emitting elements and their compounds. The enclosures, which are described in detail, are of the type which was first introduced into this kind of work at the Berkeley Lawrence Radiation Laboratory. The particular advantages for this type of laboratory for teaching and research of graduate students are discussed. It is shown that the otherwise hazardous work with strong α-emitters becomes relatively simple in the gloved box, and it becomes possible to work with several different radionuclides at the same time, something which is impossible on the open bench because of the danger of cross contamination.

62 (TID-7599(p.332-6)) THE USE OF SOLVENT-SOLUBLE FILMS IN DECONTAMINATION. J. W. Schulte, F. T. Fitzgibbon, and D. S. Shaffer (Los Alamos Scientific Lab., N. Mex.).

Experimental results using soluble films as a simple and effective means of remotely decontaminating hot cell and drybox equipment are presented. Experience over a three year period proved that equipment, coated with a film of Apiezon W or Flo-Master ink prior to contaminating, can be decontaminated from >20 r/hr to ~20 mr/hr by stripping the film with a suitable organic solvent. Preliminary results with H_2O-soluble films indicate that films and contamination can be removed with H_2O, high-pressure air–H_2O mixtures, or steam. Possible applications for these techniques in the control of contamination are discussed.

63 (TID-7599(p.485-93)) LOW COST GLOVEBOXES. R. F. Malecha, H. O. Smith, J. H. Schraidt, J. V. Natale, N. E. Ross, and H. O. Brown, Jr. (Argonne National Lab., Ill.).

A glove box, simple in construction, universal in plutonium handling capabilities, and economical to build was desired. A thorough study was made of the means and methods involved in producing a suitable low cost glove box with a clean interior. Tests proved the feasibility of using safety glass fastened and sealed to a metal frame with an automobile type weatherstrip. Modular structural elements allow glove boxes of many lengths to be built from a few basic carbon steel components. The experience with the glove boxes now installed and in operation verifies the original conviction that a versatile glove box could be produced at a low cost.

64 (TID-7599(p.494-505)) ATMOSPHERE HANDLING AND CONTROL FOR A GLOVEBOX FACILITY. L. F. Coleman, J. H. Schraidt, R. L. Breyne, and J. V. Natale (Argonne National Lab., Ill.).

A glove box facility was built which provides a high integrity barrier to the spread of contamination. All ventilation components and instruments are noncomplex commercially available items. Each glove box may be operated on either a once-through or a recirculating ventilation system. This combines the advantages of the complete independence of the once-through system when necessary with the low gas consumption rate possible with the recirculating system when its use is permissible. The system permits the choice of room air, dry air, nitrogen, or argon as the atmosphere in any glove box, and guarantees a negative pressure in each glove box.

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

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

66 (TID-16020) REPORT ON GLOVE BOXES AND CONTAINMENT ENCLOSURES. Nelson B. Garden, ed. (Ad Hoc Committee on Glove Boxes). June 20, 1962. 147p.

Criteria and guide lines are presented for the design, construction, and operation of safe, economical, and efficient glove boxes and associated facilities based upon present conditions and anticipated changes. Comprehensive discussion of glove box materials and components, safety and fire prevention methods, health physics problems, operational considerations, and brief descriptions of AEC installations are included.

67 (TID-16203) DISASSEMBLY OF A HIGH LEVEL PLUTONIUM GLOVE BOX SYSTEM. James A. Johnson (Argonne National Lab., Ill.). May 1962. Contract [W-31-109-eng-38]. 27p. (UAC-6414)

Dismantling operations of the Pu Metallurgy Research Laboratory, first put into operation 7 years ago at Argonne National Laboratory, began in Sept. 1961. Multi-gram quantities of Pu and U had been handled in the 16 interconnected glove boxes that comprised the glove box train. All boxes were separated along with all systems located externally to the train which they served. The dismantling process required 8 weeks. Approximately 300 ft^3 of high-level-alpha dry waste was removed during this period along with hundreds of feet of contaminated and non-contaminated pipe and tubing, pumps, gauges, and regulatory devices. There were no incidents of internal or external radiation exposure during this period and only 1 incident of a gross spread of alpha contamination

68 (TID-16826) FIRE AND EXPLOSION TESTS OF PLUTONIUM GLOVEBOXES. H. V. Rhude (Argonne National Lab., Ill.). July 1962. Contract [W-31-109-eng-38]. 11p. (ANL-FGF-342A; UAC-6669)

To test the fire and explosion resistance of new plutonium metallurgy gloveboxes and to obtain information pertinent to fire control, fire and explosion tests were conducted in one of the gloveboxes. It was found that over 10% oxygen is required for non-metal, and that over 5% oxygen is required for freely burning metal fires. However, metal chips will burn with as little as 1% oxygen if additional heat is furnished. Standard dry chemical, Met-L-X, and carbon dioxide extinguishers were excellent for non-metal fires. An eutectic salt mixture was excellent for metal fires.

69 (TID-17595) INVESTIGATIONS OF RADIOACTIVE FUEL-BEARING GLASSES. Second Annual Report, April 1, 1959–March 31, 1960. P. A. Lockwood (Owens-Corning Fiberglas Corp. Basic and Applied Research Center, Newark, Ohio). June 30, 1960. For Rensselaer Polytechnic Inst., Troy, N. Y. Contract AT(30-1)-1995, Subcontract R.P.I. 441.37-1. 33p.

Effects of processing variables on strength of fibers of silica-urania glasses made by acid leaching are reported. Composition and melting studies to eliminate UO_2 devitrification in RX-70 glass (50% U_3O_8 by weight) resulted in little improvement. Liquidus was 2470°F and sensitive. Forming fibers at 2500 to 2550°F should avoid most of the difficulty. Samples of glass fibers were made for use in gas phase chemical reaction promotion and gas-cooled power reactor studies; for fuel element work; and for basic research studies. The samples comprised: natural and U^{235} enriched urania glass fibers, plain and aluminum coated; plate glass fibers, aluminum coated; "E" glass-clad urania and cobalt glass fibers; mats of air blown fibers, U^{235} enriched, loaded into fuel element cans. A practical glove box for melting and fiberizing plutonium-containing glass was designed. Losses of U^{235} in laboratory batching, melting, and fiberizing procedures for urania glasses were found to be 3 to 7%, well above the 1% previously assumed. Methods of analyzing glass for U_3O_8 content were investigated.

70 UCRL-3635
California. Univ., Berkeley. Radiation Lab.
OFF-GAS TREATMENT IN BERKELEY ENCLOSURES. M. D. Thaxter, H. P. Cantelow, and C. Burk. Jan. 7, 1957. 16p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

Developments at UCRL in off-gas treatment are reviewed. A multiple-purpose gas scrubber and a total capture system for slug-dissolver off gas are described.

71 (UCRL-6936) HAZARDS CONTROL QUARTERLY REPORT NO. 8, JANUARY–MARCH 1962. (California. Univ., Livermore. Lawrence Radiation Lab.). Contract W-7405-eng-48. 45p.

Developmental work is described in which techniques were evolved for determining inward air leak rates of inert atmosphere glove boxes. In investigation of pressure drop across an idle blow it was found that manifold capacity can be lost to the resistance of an idle, series-connected blower. Assembly of a high-volume air sampler is reported along with addition of 135- and 225-cfm high-efficiency filters to the LRL stock. Development of an increased-sensitivity gas monitor is reported. Studies of Pu^{238} dosimetry revealed that measurement of radiation from this isotope requires pulse-height analysis to determine the effective energy when the spectrum is significantly modified. Collection and analysis of tetranitromethane in air is descirbed. Other safety developments during the period concern emergency protective clothing kits, ladder prong guards, fire hydrant flow data reduction, fire hydrant retardant coatings, antislip floors, chemical resistant polyester coatings, packaging of alpha- and beta-contaminated waste, and application of automatic data processing in hazards control.

72 (UCRL-7035) HAZARDS CONTROL QUARTERLY REPORT NO. 9, APRIL–JUNE 1962. (California. Univ., Livermore. Lawrence Radiation Lab.). Contract W-7405-eng-48. 47p.

Work was started on the development of a thermoluminescent radiation dosimeter for use as a personnel monitor. An estimate was made of the effectiveness of an air intake system in capturing falling radioactive particles and its relation to the radiation dose rate in a fall-out shelter. Test concentrations of CO in air varying from 0 to 300 ppm were prepared using a portable gas blending unit. Equipment is described for use in the calibration of alnor velometers and other air flow measuring instruments. An evaluation was made of thermoswitches set to energize an alarm at glove box temperatures of 140°F as fire detectors. A portable tester is described for use in the detection of pin-hole leaks in glove box gloves. A system is described for the routine cleaning and refurbishment of respiratory masks. Two relatively inexpensive flooring materials were found to be satisfactory for minimizing the detonation-by-dropping hazard in high-explosive areas. Corrugated rubber matting and heavy duty linoleum were both found satisfactory although both were found to have disadvantages in either the safety or service categories. A survey was made of desirable properties in resilient flooring coverings. Three epoxy-type coatings were tested for resistance to water, caustic solutions, solvents, and oxidizing acids. An automatic data processing system was developed for recording fire extinguisher maintenance.

73 (UCRL-7571) HAZARD CONTROL. Quarterly Report No. 14, July–September 1963. (California. Univ., Livermore. Lawrence Radiation Lab.). 74p.

Materials for thermoluminescent dosimetry and heat-resistant adhesives were investigated, and the buildup of a dose-indicating signal in an apparently discharged dosimeter was studied. The detection efficiencies and probabilities for a site periphery monitoring system were calculated, and a method was devised for calculating the burial depth of airborne particles collected on membrane filters. Also, spectral distributions of D_2O-moderated Pu^{238}–Be neutron sources were obtained by Monte Carlo calculation. Eye protection around lasers was studied. A portable continuous alpha air monitor, a portable high-volume air sampler, a remotely controlled calibration facility for neutron and gamma instruments, and a calibration point check system for Juno survey meters were developed. Additionally, the vapor pressure of Hg was redetermined, and a concrete vault, highly contaminated in a nuclear excursion, was successfully decontaminated. Modifications to the tritium monitor, performance of the dual blower system for glove-boxes, and studies on flooring materials and adhesives are summarized.

74 (UCRL-9660) REMOTE PLASTIC BAG PASS-OUT UNIT FOR HIGH-LEVEL RADIOCHEMICAL OPERATIONS. E. S. Fleischer, T. C. Parsons, and P. W. Howe (California. Univ., Berkeley. Lawrence Radiation Lab.). Aug. 1961. Contract W-7405-eng-48. 12p.

A system is designed for making remote sealed-bag passouts from a multicurie-level chemistry processing enclosure. The polyethylene bags are changed remotely without exposing contaminated surfaces while always maintaining a low leak rate seal. The system employs an interchange box (passout box) attached to the chemistry enclosure. Integrated with the box is a hydraulically operated jack that raises and lowers the bags, and a welder-cutter for sealing them. A single master-slave manipulator teamed with the above units handles all operations.

75 A COMPACT INERT-ATMOSPHERE ENCLOSURE FOR ALPHA AND LOW-LEVEL BETA-GAMMA OPERATIONS. Will D. Phillips (Univ. of California, Berkeley). Proc. Hot Lab. Equip. Conf., 10th, Washington, D. C., 1962: 330-2(1962). (UCRL-10369)

The design of a compact, inexpensive inert-atmosphere enclosure constructed of sheet metal and plexiglas is given. The enclosure was intended for use with alpha and low-level beta-gamma emitters, but is suitable for any oxygen-free or moisture-free work. The basic enclosure consists of a welded and flanged sheet metal box open at the top. It is 20 in. wide, 17 in. from front to back, and 10 in. high, and has an approximate volume of 2.2 ft^3. The cost for one of the enclosures is estimated at under $300.

76
Atomic Energy Project, Univ. of Rochester
DESIGN FOR A NEOPRENE GLOVE FOR USE IN DRY BOXES. Robert H. Wilson. July 28, 1953. 13p. (UR-265)

When currently available gloves of pure gum rubber proved unsuitable for use in dry boxes because of adsorption of radon, lack of inherent strength, and lack of resistance to chemicals, it was decided to undertake the construction of a special neoprene glove which would meet specifications. Such a glove has now been produced of a specially compounded low-porosity lattice. The lower elasticity of neoprene as compared to pure gum has been compensated by use of an unusually thin film, ranging from 0.006 in. to 0.014 in. which yields a high degree of feel. The glove is available in medium and large sizes, 39 to 40 in. long, and is designed to fit a 9-in. port at this length. Both sizes have a neutral thumb, in order to fit either hand comfortably.

77 USNRDL-TR-157
Naval Radiological Defense Lab., San Francisco.
GLOVE BOX AND ASSOCIATED EQUIPMENT FOR THE REMOVAL OF RADIOACTIVE FALLOUT FROM HEXCELL COLLECTORS. A. E. Greendale and M. Honma. May 1, 1957. Project NS 088-001.

A glove box and associated equipment necessary to decontaminate large tray radioactive fallout collectors are described. Volumetrically the glove box is about four times the capacity of a standard box and contains four glove ports so that two persons may work at the same time if necessary. Advantages offered by the use of this equipment are listed. The operations involved in the decontamination of the hexcell collectors have resulted in an efficient procedure. The uses of this box may be extrapolated to other hazardous and toxic chemical or biological problems.

78 WASH-170(Del.)(p.170-84)
California. Univ., Berkeley. Radiation Lab.
SITE AND CONTRACTOR ACTIVITIES AND PROGRAMS, U. C. RADIATION LABORATORY. M. D. Thaxter. p.170-84 [of] THIRD ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT LOS ALAMOS SCIENTIFIC LABORATORY, SEPTEMBER 21, 22, AND 23, 1953 (deleted). 15p.

The Radiation Laboratory handles over 99% of its isotope curies in Berkeley boxes. The air cleaning problems are intimately connected with the use of these boxes. A description is presented of the boxes and the air-cleaning system.

79 WASH-170(Del.)(p.218-21)
California. Univ., Berkeley. Radiation Lab.
AIR CLEANING—NEW DEVELOPMENTS AT U. S. RADIATION LABORATORY. M. D. Thaxter. p.218-21 [of] THIRD ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT LOS ALAMOS SCIENTIFIC LABORATORY, SEPTEMBER 21, 22, AND 23, 1953 (deleted). 4p.

A small vertical gas scrubber is described for the entire or partial removal of corrosive vapors. A completely closed ventilation system glove box is described for high specific activity material.

80
LOW-COST PLASTIC SEALER. H. Susskind (Brookhaven National Lab., Upton, N. Y.). Nucleonics 12, No. 11, 61 (1954) Nov.

A device for sealing plastic in dry-box operations is described. The sealer utilizes both heat and pressure to effect a good seal in less than 20 sec.

81
SMALL DRY BOX FOR PHOSPHORS. Wayne A. Cassatt, Jr. and W. Wayne Meinke (Univ. of Michigan, Ann Arbor). Nucleonics 13, No. 5, 63-4(1955) May.

A dry box is described which provides sufficient room for polishing and mounting crystals and which attains a dry atmosphere by overnight exposure to a dessicant.

82
HANDLING ALPHA-ACTIVE, PYROPHORIC MATERIALS. PART 1. WHAT IS THE BEST APPROACH? Nucleonics 14, No. 3, 61-5(1956) Mar. PART 2. GLOVEBOX DESIGN AND CONSTRUCTION. Nucleonics 14, No. 4, 65-71(1956) Apr. PART 3. GLOVEBOX-ATMOSPHERE CONTROL. Nucleonics 14, No. 5, 77-82(1956) May. L. R. Kelman, W. D. Wilkinson, A. B. Shuck, and R. C. Goertz (Argonne National Lab., Lemont, Ill.).

A comprehensive discussion is given of the handling of α-active, pyrophoric materials. Part 1 includes discussions on the philosophy and rules of handling α emitters and descriptions of fuel element handling facilities. Part 2 surveys the design and construction of gloveboxes. The survey includes such topics as materials used, tightness, visibility, glove problems, and working with gloves. Part 3 discusses the atmospheric control in glove boxes. Included are topics such as the selection of an inert atmosphere, auxiliary equipment, and emergency ventilation.

83
MOISTURE PERMEABILITY OF GLOVE MATERIALS FOR CONTROLLED-ATMOSPHERE BOXES. J. H. Rowan (Union Carbide Nuclear Co., Oak Ridge, Tenn.). Anal. Chem. 28 402-3(1956) Mar.

The moisture permeability of glove materials has been found to be the limiting factor in the maintenance of dry atmosphere boxes. A comparison of available materials for this use has shown the superiority of butyl rubber over all other materials tested.

84
INERT-ATMOSPHERE DRY BOX. Thomas R. P. Gibb (Tufts Univ., Medford, Mass.). Anal. Chem. 29, 584-7 (1957) April.

The design of a dry box for analytical manipulations, such as weighing, grinding, and transferring in an atmosphere of inert gas, particularly N_2, is presented.

85

GLOVE BOX DESIGN AND OPERATION. J. A. Lee (AERE, Harwell). Nuclear Power 2, 139-41(1957) Apr.

The problems of handling radioactive and toxic materials are discussed as to the safety aspects, design, maintenance. and health physics of glove boxes.

86

SOME FACILITIES FOR THE STUDY OF PLUTONIUM AND ITS ALLOYS. G. K. Williamson, D. M. Poole, and J. A. C. Marples (Atomic Energy Research Establishment, Harwell, Berks). J. Inst. Metals 85, 431-6(1957) June.

Five glove-boxes for the safe handling of the highly toxic and reactive metal plutonium and its alloys are described. Facilities are provided for alloy preparation, x-ray examination, heat treatment, and metallography. The apparatus is simple, is easy to use, requires little maintenance, and can readily be modified and extended whenever necessary.

87

THE HANDLING OF RADIOACTIVE MATERIALS. R. Martin (Centre d'Etudes Nucleaires, Saclay, France). Rev. de la sécurité 8p. (1957). (In French)

The physical properties and biological effects of radiations are reviewed. Procedures and equipment for handling small quantities of radioactive materials are described.

88

THE PREPARATION OF POWDER SPECIMENS FROM ACTIVE AND TOXIC METALS FOR USE IN CONVENTIONAL X-RAY DIFFRACTION STUDIES. A. Moore, D. B. Wright, and A. J. Martin (Atomic Weapons Research Establishment, Aldermaston, Berks., Eng.). J. Sci. Instr. 35, 301-3(1958) Aug.

An argon dry box and an associated procedure is described for the preparation of specimens for use in Debye-Scherrer powder cameras at high and low temperatures. Special features allow filings to be annealed at >1200°C, and quenched, if necessary, in vacuo: there is no need for filings to be sealed in a container for this purpose. Filings can be sealed in silica quills (~0.025 in. OD and wall thickness ~0.005 in.) for use as specimen by a small electrical furnace. The dry box is designed to enable an operator to be fully protected and to have fine control over the specimen at all stages of its preparation.

89

GLOVEBOX FOR WORK WITH RADIOACTIVE MATERIAL. H. Dreiheller and E. H. Graul (Philipps-Universität, Marburg/Lahn, Germany). Atompraxis 4, 52-3(1958). (In German)

A description is given of a specially constructed glovebox which can be used as a closed system for work with dangerous radioactive isotopes, and which offers protection against incorporation and β radiation. The glovebox is made of 10 mm-thick transparent plastic, and is accessible from the front and rear with gloves. It can also be used advantageously for work under protective gas atmosphere.

90

AIR TIGHT BOX FOR MANIPULATION IN A CONTROLLED ATMOSPHERE. M. Rapin. Inds. atomiques No. 1-2, 2p.(1958). (In French)

Alpha-emitting metals must be handled in an air-tight enclosure, where a constant depression is maintained. Boxes with certain faces made of plexiglas, on which are fixed gloves for manipulations inside the box, are used for this purpose. Many devices were used for making up the framework of the box and for ensuring the solidity of the joint between this framework and the plexiglas windows.

91

GLOVE BOXES AND SHIELDED CELLS FOR HANDLING RADIOACTIVE MATERIALS. A Record of the Proceedings of the Symposium on Glove Box Design and Operation held in the Cockcroft Hall, A.E.R.E., Harwell, on February 19th to 21st, 1957. G. N. Walton, ed. New York, Academic Press, Inc., 1958. 523p.

This volume is divided into two parts. Part one is devoted to unshielded boxes and includes safety, design and manufacture, constructional materials, decontamination, layout in laboratories, inert atmospheres, handling of Po, operations with gaseous materials, metallurgical glove box practice in the USA, development for metallurgical studies, adaptation of standard boxes to metallurgical operations, metal fabrication plants, and large scale operations. The second part discusses shielded cells and includes shielding calculations, viewing and handling equipment, design of shielded cells, operations on β-ray emitters, Pu handling for a critical experiment, operations on multicurie cesium sources, and operations on irradiated fissile materials.

92

BOXES OF NEW DESIGN FOR THE WORK WITH RADIOACTIVE SUBSTANCES. N. I. Gusev, P. N. Paleĭ, I. G. Sentyurin, and I. S. Sklyarenko (V. I. Vernadskii Institute of Geochemistry and Analytical Chemistry, Academy of Sciences, USSR, Moscow). Zhur. Anal. Khim. 14, 606-11 (1959) Sept.-Oct. (In Russian)

Glove boxes of new design are suggested which permit transferring radioactive substances, chemical glassware, and small apparatus from one box to another without any hazard of radioactive contamination of hands and the laboratory air.

93 ANALYTICAL LABORATORIES FOR THE HANDLING OF PLUTONIUM. Charles F. Metz and Glenn R. Waterbury (Los Alamos Scientific Lab., N. Mex.). Talanta, 6: 149-53(1960).

For the safe handling of plutonium in analytical chemical laboratories, equipment is required capable of handling up to 1-g quantities of the radioactive material per analytical sample and the storage of 100-g quantities in the form of unused samples and residues. Special enclosures, known as dryboxes, or glove boxes, were designed for this purpose. The analytical chemistry laboratories at the Los Alamos Scientific Laboratory which are so equipped are described. The philosophy of handling plutonium is also discussed. These boxes are so designed that all required operations in chemical analyses may be performed safely without contamination of the room and with a minimum of risk to the analyst. Included are operations such as weighing, dissolving, precipitation, filtering, evaporating, centrifuging, and igniting of precipitates and also electrometric, polarographic, spectrophotometric, and spectrochemical techniques. The designs of individual boxes are varied to permit various operations, and at the same time they may be arranged interchangeably in circumstances requiring several boxes in a row. For routine and semiroutine analyses, these boxes are arranged for an assembly-line type of operation. The sample to be analyzed is introduced at one end of the assembly, successive steps in the analysis are performed as the sample is moved progressively through the assembly, and the residue is temporarily stored at the other end of the assembly in a suitable container. These boxes are fabricated of stainless steel, with windows of Lucite or safety glass. All metal exposed on the inside is painted with a strippable plastic-base paint. Glove ports are located at a convenient height to permit easy use of rubber gloves. Experience has shown that plutonium in solution can be safely handled in these enclosures without rubber gloves being on the ports but that for plutonium in solid form, rubber gloves must be attached to the glove ports. These enclosures are equipped with all the usual laboratory services. Doors between boxes are of an unusual design, vertically operated by compressed air. Provisions are included for the operation of equipment such as centrifuges and pH meters within the boxes, yet permitting their removal in an uncontaminated condition. Ventilation is provided through filters for all gloved boxes. It is so regulated by means of dampers in the exhaust ducts that it does not interfere with operations. In case of open-front boxes, the flow of air is maintained at a minimum face velocity of 100 ft/min. Stainless steel as an exhaust duct material was found to be unsatisfactory, especially for those boxes in which acids are fumed. Polyvinyl plastic was used for the more recently installed ducts and was found to be quite satisfactory. The descriptive material is adequately illustrated by 20 photographs.

94 THE DETERMINATION OF PLUTONIUM BASED ON NATIONAL BUREAU OF STANDARDS POTASSIUM DICHROMATE. C. E. Pietri and J. A. Baglio (New Brunswick Lab., N. J.). Talanta, 6: 159-66(1960).

A description of the design and operation of the New Brunswick Laboratory's plutonium analytical facility is presented. The potentiometric titration of high-purity plutonium is discussed. A new laboratory, using gloved boxes of improved design, was built to study the chemistry of plutonium, develop methods of analysis, and prepare plutonium compounds suitable for standards. The laboratory is equipped for spectrographic, wet-chemical, instrumental, and low-level radiochemical analyses. High-purity plutonium (99.96%) is determined by a potentiometric titration with National Bureau of Standards primary standard $K_2Cr_2O_7$. Plutonium metal dissolved in 4N H_2SO_4 is reduced to Pu(III) in a Jones reductor and titrated to Pu(IV) with standard $K_2Cr_2O_7$. Polarized gold electrodes are used to indicate the end-point. A relative standard deviation of 0.04% was obtained for 70- to 141-mg samples. The average results were within 0.01% of the purity of the plutonium metal as determined by spectrographic analysis at Hanford. The advantages of primary standard $K_2Cr_2O_7$ vs. $Ce(SO_4)_2$ as used in other methods are discussed, as well as the detection of the end-point by polarized electrodes vs. the reference-indicator electrode system.

95

IMPROVEMENTS IN OR RELATING TO EQUIPMENT FOR THE HANDLING, PROCESSING OR TREATMENT OF DANGEROUS SUBSTANCES. John Robert Vernon Dolphin (to United Kingdom Atomic Energy Authority). British Patent 847,363. Sept. 7, 1960.

Improved equipment for handling and treating radioactive and/or toxic substances is described which comprised a circular chamber formed by a domed double-skinned covering, the space between the skins being maintained at low pressure, and having a window and associated glove ports. Within the chamber, there is a rotary table actuated by a motor so that it is moved into position for manipulations on its surface. The chamber also has an air-tight door with an air lock for servicing the equipment from the inside. The advantages of such a chamber over a series of conventional chambers are given.

96

THE ENGINEERING ASPECTS OF THE WATER VAPOR PERMEABILITY OF GLOVE MATERIALS. J. E. Ayer, R. M. Mayfield, and D. R. Schmitt (Argonne National Lab., Ill.). Nuclear Sci. and Eng. 8, 274-6(1960) Sept.

Gloveboxes are frequently used for the protection of personnel and containment of an inert atmosphere within which operations upon pyrophoric or physiologically hazardous materials are performed. Leakage or diffusion of water vapor through gross leaks or through gloves may necessitate purification of the inert atmosphere. Since the required capacity of the purification system involves a summation of in-leakage from all sources, quantitative information on the role of the glove as a contributing factor is of importance. The engineering application of an investigation into the role of the permeability of glove materials is indicated. Water vapor permeability through various glove materials was determined mathematically as a function of film thickness, partial pressure of water vapor differential across the film, film surface area, and the permeability constants for a particular "compound." Calculations indicate that a sample glove exposed to air at 75°F and 50% relative humidity on one surface and to a very low humidity on the other side will contribute 0.22 g of water vapor per day to a glovebox system. The same glove in use by an operator will contribute up to 2.8 g of water per day due to the increased partial pressure of water vapor differential between the two glove surfaces. These calculations allow the quantitative determination of water permeation through gloves and its effect upon the desired purity or operating dew point of a protective atmosphere system and its purification equipment.

97 LIVING WITH RADIATION. 2. FIRE SERVICE PROBLEMS. The Problems of the Nuclear Age for the Layman. Francis L. Brannigan and George S. Miles. Office of Health and Safety, AEC. 1960. 137p. $1.00 (GPO).

Part II of "Living with Radiation" extends the discussion of the fundamentals covered in Part I into the area of fires and other emergency situations. It should be of interest not only to professional firefighters but also to those charged with the control of radiation hazards. It provides an insight into the problems that may arise in an emergency, and it should be useful in preplanning for the competent control of such situations.

98 THE PREVENTION AND CONTROL OF FIRES IN GLOVE BOXES CONTAINING PLUTONIUM. R. R. King (General Electric Co. Richland, Wash.). p.71-7 of "Proceedings of the Ninth Conference on Hot Laboratories and

Equipment, Chicago, Illinois, November 7-9, 1961." Chicago, American Nuclear Society, 1961.

Numerous and varied fire hazards exist in glove boxes containing plutonium. They range from oils, solvents, and paper products to pyrophoric metals. The glove box itself (i.e., gloves, plastic bags, Plexiglas panels, exhaust filters) is vulnerable. A dry chemical type extinguisher discharged into the glove box through a quick-coupling will safely extinguish all but the metal and filter fire. Burning plutonium can be safely contained by smothering with MgO sand. No effective method has been devised to extinguish a filter fire but a wire mesh prefilter minimizes the hazard by acting as an oil mist eliminator and fire stop.

99 CERTAIN DETAILS CONCERNING THE EQUIPMENT OF GLOVE BOXES. N. N. Khvostov (Central Scientific-Research Laboratory of Sanitation and Epidemiology. Ministry of Transportation, USSR). Med. Radiol., 6: No. 1, 68-71(Jan. 1961). (In Russian)

Bearing in mind the experiences in the operation of foreign laboratories, a special design of devices for changing the oversleeve gloves and for the removal of active samples without disturbing the hermeticity of the box is given.

100 THE PLUTONIUM FUEL FABRICATION FACILITY AT ARGONNE NATIONAL LABORATORY. A. B. Shuck (Argonne National Lab., Ill.). p.58-63 of "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Illinois, November 7-9, 1961." Chicago, American Nuclear Society, 1961.

A laboratory and pilot plant for the development of a variety of plutonium reactor fuel elements is described. This facility is housed in a building designed to control contamination hazards both within and outside the building. Processes and equipment are enclosed in gas-tight gloveboxes. Equipment is arranged departmentally, rather than in production lines, to achieve maximum process flexibility. Oxidation and fire hazards are controlled by use of a helium atmosphere. Fabrication process equipment is provided for fabrication of plutonium alloys by a variety of means, for jacketing and bonding, and for finishing and assembly operations on a wide variety of fuel elements.

101 GLOVEBOXES FOR PLUTONIUM METALLURGY RESEARCH AT ARGONNE NATIONAL LABORATORY. L. R. Kelman, J. L. Armstrong, W. H. Livernash, and H. V. Rhude (Argonne National Lab., Ill.). p.64-70 of "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Illinois, November 7-9, 1961." Chicago, American Nuclear Society, 1961.

Free standing gloveboxes with stringent requirements for tightness and flexibility were developed to enclose plutonium research equipment. Various styles of gloveboxes were made from aluminum extrusions welded into a framework. Safety glass windows, aluminum panels and service flanges are O-ring gasketed to the framework. The gloveboxes can be used individually or easily connected into a line. Articles are posted in and out through vinyl pouches. Rubber gloves are clamped on plastic glove ports which are gasketed to the windows. The gloveboxes are normally used with 0.1 to 0.2 scfm of nitrogen flowing through them, but other atmospheres may be used.

102 THE EXPANDING ROLE OF CONTAINMENT ENCLOSURES. Nelson B. Garden. p.56-7 of "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Illinois, November 7-9, 1961." Chicago, American Nuclear Society, 1961.

Containment enclosures and their uses are described. Standardization of methods and equipment is discussed.

103 LOW-TEMPERATURE RESEARCH ON TRANSURANIC METALS. K. Mendelssohn (Oxford Univ.). p.622-6 of "Advances in Cryogenic Engineering. Volume 6." K. D. Timmerhaus, ed. New York, Plenum Press, Inc., 1961.

Techniques for studying the cryogenic properties of Pu, Np, and other transuranic elements are described. Two methods for dealing with the radioactivity of these elements are outlined. The samples may either be encapsulated and studied in a conventional cryostat, or examined in a specially designed glove box. The electric resistivities of Np, Pu, and Al–Pu alloys are shown as functions of temperature from 1.5 to 300°K. The results are explained in terms of phase transitions and spin ordering.

104 FIBERGLASS REINFORCED PLASTIC GLOVEBOXES FOR PLUTONIUM ANALYTICAL RESEARCH. J. P. Hughes and A. G. Jastrab (Argonne National Lab., Ill.). p.78-86 of "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Illinois, November 7-9, 1961." Chicago, American Nuclear Society, 1961.

An economical fiberglass reinforced plastic glovebox was designed for use in an analytical plutonium laboratory to eliminate chemical corrosion, decrease decontamination time, and increase flexibility of operation. Materials of construction were tested for chemical, fire, and heat resistance and decontamination efficiency. Coupling of boxes into a train and sealing gasketed windows in position, giving a helium-tight enclosure, was made with Thiokol adhesives. Boxes constructed during development stages were used for periods up to two years.

105 MACHINING RADIO-ACTIVE PLUTONIUM. Metalworking Production, 106: 49-51(Jan. 3, 1962).

Precision turning of Pu in inert Ar and N_2 atmospheres using a specially designed glove-box lathe is described. Gas pressure inside box is kept below atmospheric pressure. Materials used in box construction are polyvinyl chloride, perspex, neoprene, and steel. (Rev. Metal Lit., 19: No. 4, Apr. 1962)

106 IMPROVEMENTS IN OR RELATING TO EQUIPMENT FOR HANDLING DANGEROUS SUBSTANCES. Kenneth Winfield Bagnall and Daniel Stewart Robertson (to United Kingdom Atomic Energy Authority). British Patent 887,367. Jan. 17, 1962.

An apparatus for carrying out operations on toxic or radioactive substances comprises a circular gastight chamber with a turntable situated within. A window is provided in the wall of the chamber, and glove ports are provided in both the table and the base plate of the chamber. The table may be rotated to register the gloveports for transport of objects into or from the chamber.

107 GLOVE BOX ATTACHMENT. Harvey L. Butts (to U. S. Atomic Energy Commission). U. S. Patent 3,020,647. Feb. 13, 1962.

This invention comprises a housing unit to be fitted between a glove box port and a glove so that a slidable plate within the housing seals off the glove box port for evacuation of the glove box without damage to the glove. The housing and the glove may be evacuated without damage to the glove since movement of the glove is restricted during evacuation by the slidable plate.

108 ESTIMATING HAND EXPOSURE TIME. D. C. Bowden and C. M. Thomas (General Electric Co., [Richland, Wash.]). Nuclear Eng., 7: 152-3(Apr. 1962).

A motion picture analysis is made of the hand exposure time of glove box work. The results show that significant exposure occurs only during a small portion of the total work.

109 FIRE AND EXPLOSION TESTS OF PLUTONIUM GLOVE-BOXES. H. V. Rhude (Argonne National Lab., Ill.) Trans. Am. Nucl. Soc., 5: 328(Nov. 1962).

110 THE ADAPTATION OF COMMERCIALLY AVAILABLE STOCK PARTS INTO AN INEXPENSIVE GLOVE-BOX TRAIN. A. J. Banslaben and H. L. Finston (Brookhaven National Lab., Upton, N. Y.). Trans. Am. Nucl. Soc., 5: 327(Nov. 1962).

111 IMPROVEMENTS IN OR RELATING TO LABORATORY CENTRIFUGES. Clive Jackson (to United Kingdom Atomic Energy Authority). British Patent 893,737. Apr. 11, 1962.

A small laboratory centrifuge operable at high rotational speeds is designed for insertion into a glove box and for remote manipulation. The centrifuge comprises a vessel of inverted conical or frusto-conical shape and provided with a centrally apertured cover and with means for end-mounting on the spindle of a driving motor. In operation, solids are packed against the top of the bowl, and when the centrifuge stops, the clear liquid drops away from the packed solid matter and may be drawn off by a suction tube.

112 PROCEEDINGS OF THE TENTH CONFERENCE ON HOT LABORATORIES AND EQUIPMENT. Held in Conjunction with American Nuclear Society Winter Meeting, Washington, D. C., November 26-28, 1962. (American Nuclear Society, Chicago). 1962. 351p.

Forty-six papers are included; separate abstracts were prepared for 40. Six of the papers were previously abstracted in NSA. These include information on EBR-II fuel dismantling equipment, mechanical decanning of EBR-II fuel elements, mechanical equipment for dejacketing spent SRE Core-1 fuel, improved macro camera for hot cell application, applications of basic alpha instrumentation, and fire and explosion tests of plutonium glove-boxes. A separate author abstract is included.

113 RESEARCH FACILITY FOR THE SYNTHESIS AND FABRICATION OF REFRACTORY PLUTONIUM MATERIALS. F. A. Saulino, J. C. Andersen, and K. M. Taylor (The Carborundum Co., Niagara Falls, N. Y.). Proc. Hot Lab. Equip. Conf., 10th, Washington, D. C., 1962: 277-86 (1962).

A facility for studying the synthesis and fabrication of refractory plutonium materials is described. The outstanding features of the facility are its compactness, reliability, low operating cost, and the unusually high purity of the atmosphere in the helium glove boxes (2-3 ppm oxygen and less than 1 ppm water vapor). The high purity helium atmosphere results from the leak tightness of the system and the highly effective zirconium-titanium alloy getter system. In addition to the usual health and safety precautions, possible trouble areas are continuously monitored by an extensive alarm system.

114 AN ENGINEERING-SCALE HIGH-ALPHA FACILITY FOR PLUTONIUM FLUORIDE VOLATILITY PROCESS STUDIES. G. J. Vogel, E. L. Carls, W. J. Mecham, and A. A. Jonke (Argonne National Lab., Ill.). Proc. Hot Lab. Equip. Conf., 10th, Washington, D. C., 1962: 287-92(1962).

An outline of the Fluoride Volatility Process is presented along with descriptions of the alpha containment boxes and equipment and discussion on the ventilation air and process off-gas handling schemes, critical path method for planning and scheduling construction jobs, and purchase cost data for various sizes of Chemical Engineering Hood, Alpha Modular (CENHAM) boxes. In the process the separation of fuel element components (uranium, plutonium, and fission products) is based on the chemical and physical properties of the fluorides formed by fluorinating a dejacketed element at 500°C in a fluidized bed reactor.

115 UNITED NUCLEAR CORPORATION PLUTONIUM FACILITY. Dumont Rush (United Nuclear Corp., White Plains, N. Y.). Proc. Hot Lab. Equip. Conf., 10th, Washington, D. C., 1962: 313-20(1962).

A plutonium facility was designed and built to produce fuel samples and obtain data on their irradiation behavior for long burnups at high power generation rates. The facility has ten glove boxes and two hoods for the preparation of plutonium fuel elements and samples, and for out-of-pile examination for weight, dimension, density, microscopic structure, thermal expansion at high temperature, melting point, vapor pressure and quantitative chemical composition. In all but the chemistry boxes and hoods, the box atmosphere is either nitrogen or helium, with careful control over oxygen and water vapor content, and maintained at less than ambient pressure. The facility is engaged in a mixed-carbide fuel development program and during more than a year of operation there has been no detectable alpha contamination outside the boxes.

116 FRP GLOVEBOX FOR CHEMICAL RESEARCH. Tomitaro Ishimori (Japan Atomic Energy Research Inst., Tokyo), Kenju Watanabe, Kazuo Tomimura, and Hatsuo Matsumoto. Nippon Genshiryoku Gakkaishi, 5: 325-32 (Apr. 1963). (In Japanese)

A fiberglass reinforced plastic (FRP) glovebox is made for chemical studies of α-emitters after being tested for chemical corrosion, heat and fire resistance, decontamination, mechanical strength, air tightness, and air flow pattern. The FRP box shows very good chemical resistance for many reagents except concentrated sulfuric acid, acetone, and chloroform. The body of the box shows enough resistivity for fire accidents owing to the collapse of a beaker containing 100 to 200 ml of organic solvent such as TBP, toluene or diethyl ether. However, the fire test also indicates that the function of glovebox is often lost by breakdown of attachments such as air filter, glove, and exhaust pipe.

117 A CONTROLLED ATMOSPHERE CHAMBER. Charles L. Gordon and Rolf B. Johannesen. J. Res. Natl. Bur. Std., 67A: 269-71(May-June 1963).

An inert atmosphere chamber for the transfer of reactive materials is described. It has the advantages of being inexpensive, easily cleaned, and can be evacuated.

118 LOOKING INTO GLOVE BOXES. Nucl. Eng., 8: 234-6(July 1963).

A review is presented of glove boxes and their design, use, and manufacture. The design philosophy is discussed, and the Harwell standard boxes are described.

119 LABORATORY GLOVEBOXES TO WORK WITH RADIOACTIVE AEROSOLS. Aleksander Siemaszko, Marian Nowak, Roman Broszkiewicz, and Juliusz Siejka (Inst. of Nuclear Research, Polish Academy of Sciences, Warsaw). Nukleonika, 8: 268-71(1963). (In Polish)

Both a dusting box and a liquid-spray box are described. Both are constructed of plexiglas reinforced and sealed with aluminum angle. The dusting box consists of a box within a box for added safety and to provide an intermediate chamber for measuring the degree of radioactive deposit. The liquid spray box is a single walled box equipped with an aerosol gun. Both types of chambers have air-circulation and filter systems. Remote handling mechanisms are also included.

120 A SIMPLIFIED PROCEDURE FOR ALTERATION AND MAINTENANCE OF PLUTONIUM GLOVEBOXES. H. V. Rhude and L. R. Kelman (Argonne National Lab., Ill.) Proc. Conf. Hot Lab. Equip., 11th, New York, 1963, 347-51(1963).

A portable housing was developed which greatly simplifies plutonium glovebox alterations or maintenance which might release contamination. With this housing alterations and maintenance can be done in the laboratory where the glovebox is used, without hindering research in adjacent gloveboxes. The housing is essentially a very shallow glovebox that can be moved up to another glovebox and attached to it by means of tape and a plastic transition piece. Although originally developed to change a broken window, the housing was adapted to other maintenance jobs. With the techniques developed for its use, the housing was used to introduce or remove equipment through a window opening, to service contaminated equipment attached to a glovebox, to repair or alter contaminated pipes and ducts, and to prepare contaminated gloveboxes for moving from one building to another.

121 IMPROVEMENTS IN OR RELATING TO TRANSFER SYSTEMS FOR GLOVE BOXES OR LIKE CELLS. Frederick John May and Arnold Stanley Kearney (to United Kingdom Atomic Energy Authority). British Patent 946,477. Jan. 15, 1964. Filed Apr. 25, 1961.

A system was developed for transferring toxic substances and particularly radioactive materials into a glove box or similar cell. A transfer chamber is connected to the glove box and a closure selectively isolates the chamber from the glove box and/or the outer atmosphere. The transfer chamber is provided with an air bleed through the chamber into the glove box. The air bleed is associated with a nonreturn valve and adjusting means are provided outside the chamber to regulate the air bleed.

122
A PORTABLE HOT LABORATORY. E. Mestre, S. Trouve, and R. Rapin (Commisariat a l'Énergie Atomique, Saclay, France). p.55-70 in "Proceedings of the Seventh Hot Laboratories and Equipment Conference."

A self-contained hot laboratory enclosure which can be disassembled and erected in a short time is described. Also, some of the equipment and operating procedures are reviewed.

123 SAFETY IN GLOVE-BOX DESIGN AND OPERATION. L. N. Howell. p.87-94 of "Nuclear Safety. Vol. 5, No. 1."

Glove-box design considerations are discussed. Procedures and practices in glove-box operation are described. The prevention and control of fires and explosions in glove boxes are discussed.

FIRE HAZARDS AND CONTROL

124 AECU-3100
Atomic Energy Commission, Washington, D. C.
RADIATION HAZARDS IN FIREFIGHTING. Safety and Fire Protection Technical Bulletin No. 4. [1955]. 39p.

Safety and Fire Protection Technical Bulletins 1-3 are not available.

Firefighting techniques are discussed for use when radioactivity is a factor. It is pointed out that radiation should be neither feared nor ignored but should be regarded as another hazard to be taken in stride as a result of education and understanding.

125 ANL-5974
Argonne National Lab., Lemont, Ill.
IGNITION BEHAVIOR AND KINETICS OF OXIDATION OF THE REACTOR METALS, URANIUM, ZIRCONIUM, PLUTONIUM, AND THORIUM, AND BINARY ALLOYS OF EACH. A Status Report. J. G. Schnizlein, P. J. Pizzolato, H. A. Porte, J. D. Bingle, D. F. Fischer, L. W. Mishler, and R. C. Vogel. April 1959. 207p. Contract W-31-109-eng-38. $3.50(OTS).

The importance of prevention of fires and explosions involving uranium, zirconium, plutonium, and thorium, which are of particular interest to the nuclear energy program, made imperative the study of their ignition behavior and oxidation kinetics. Methods of measurements of ignition characteristics of uranium and zirconium were developed and used to determine the effects of variables, such as surface preparation, metallurgical history, specific area (sample size), additives to the metal, and oxygen content and presence of moisture in the oxidizing gas. The study of ignition characteristics was supported by study of the effects of similar variables on the kinetics of oxidation of uranium and zirconium and binary alloys of each. The oxidation of uranium always proceeded in two linear stages over the temperature range of 125 to 295°C at pressures of 20, 50, 200, and 800 mm of oxygen. The temperature dependences of both stages indicate an activation energy dependent on pressure. The presence of ten additive elements in uranium metal caused only very small effects on the oxidation. The oxidation of zirconium was independent of pressure and proceeded according to a cubic rate law over the temperature range from 400 to 900°C, with an activation energy of 42.7 kcal per mole. For those additives soluble in zirconium at 700°C, the effects on the initial cubic rate law for oxidation are explained in terms of valency according to the Wagner-Hauffe Theory. For those additives insoluble in alpha zirconium, no single theory is felt to be adequate. The breakaway phenomena observed for many of the twenty alloys is explained in terms of a 15 per cent deviation of the additive ionic radius from the ionic radius of zirconium. Surveys of the literature on the oxidation of plutonium and thorium are presented in preparation for the study of their behavior.

126 CEA-tr-X-133
INSPECTION GÉNÉRALE POUR LA LUTTE CONTRE L'INCENDIE. (General Inspection for Fire Fighting.) Translated into French from Circular No. 23 of Statens Brandinspektion, Stockholm, Sweden. 46p.

The precautions and procedures to be used by the fire department during disasters at installations where radioactive material is present are presented. The properties of radioactive substances and the dangers inherent in their manipulation are discussed.

127 (HW-71743) PROBABLE VOLATILIZATION OF PLUTONIUM DURING A FIRE. R. K. Hilliard (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). Dec. 1, 1961. Contract AT(45-1)-1350. 18p.

Fire hazards involving plutonium are discussed. The available experimental information was evaluated and compared with theoretical volatilization rates in order to make an estimate of the amount of plutonium released to the atmosphere in a fire. It was determined that the probable maximum release of plutonium is 0.08%. The most likely mechanism for releasing plutonium to the atmosphere appeared to be the dispersal of small plutonium oxide particles by air currents.

128 (HW-74194) THE USE OF CELLOSOLVE IN NaK DISPOSAL. C. G. McCormack (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). [nd]. Contract AT(45-1)-1350. 5p.

A cellosolve-kerosene system and the protection of liquid nitrogen as a fire extinguisher reduced the opening of irradiated NaK-containing capsules to a virtually routine status. Cellosolve, or ethylene glycol monoethyl ether, is a clear liquid, slightly more dense than kerosene. The specific gravity is 0.93 at 20°C, and the flash point is 44°C. Cellosolve may be poured directly into a container of kerosene and NaK.

129 (IDO-12028) STANDARD HEALTH & SAFETY REQUIREMENTS. ID Manual Appendix 0500-1. [D. H. Dierk, ed. and comp.] (Idaho Operations Office. Health and Safety Div., AEC.). [Sept. 1963]. 284p.

Standard health and safety requirements are presented for the National Reactor Testing Station. The guide compiles into one reference the codes and standards established in the AEC Manual and also incorporates state-wide codes that are applicable. All phases of industrial hygiene, fire prevention and protection, industrial safety, and health physics are included. Nuclear reactor safety is not included.

130 (MSAR-63-19) EXTINGUISHMENT OF ALKALI METAL FIRES. Quarterly Progress Report No. 3, September 15 to December 16, 1962. S. J. Rodgers and W. A. Everson (MSA Research Corp., Callery, Penna.). Jan. 14, 1963. Contract AF33(657)-8310. 12p.

A study is made of methods and extinguishants for extinguishing alkali metal fires. Results of inert gas blanketing and low oxygen partial pressures on alkali metal fires are included. Properties of polyurethane foam and high boiling organic liquids as fire extinguishing agents are given along with such other agents as graphite, inorganic salts, carbon wool, mineral oil, and commercial products.

131 NP-5614
Mine Safety Appliances Co.
LIQUID METAL TECHNOLOGY. FINAL REPORT. (A review of the work from May 1949 to May 1954 with abstracts of reports issued). R. C. Werner. Mar. 29, 1955. 77p. Contract N9onr-85801.

A final summary is presented of the various activities which have been carried out on liquid Na and NaK plumbing systems. Results on heat transfer, flow properties, corrosion tests, accessibility, Na cleaning, and tests on valves, bellows, pumps, etc. are included. Approximately half of the report consists of abstracts of the various technical reports and memos which have been issued under the contract.

132 (NP-tr-847) IONIC FIRE-ALARMS. K. Pawlik. Translated by R. Bluhm (U.K.A.E.A. Atomic Energy Research Establishment, Harwell, Berks, Eng.) from Deut. Farben-Z., 14: 397-8(1960). 6p.

An alarm is described that can sense an impending fire before any visible smoke or high temperatures are produced. The alarm uses a flow ionization chamber in conjunction with an α-emitter. Air passing through the chamber is ionized by the α radiation and migrates to the electrodes, thus causing a current to flow. Gas particles produced in smoldering materials are heavier than normal air molecules, and thus have a longer "residence time" between the chamber electrodes than the air molecules. The reduction of chamber current caused by the presence of the heavier and slower-moving smoldering gases is used to trigger the alarm.

133 PWAC-347) LIQUID METAL FIRE CONTROL, JUNE 15, 1961. T. P. McGrath and E. E. VanBrunt, Jr. (Pratt and Whitney Aircraft Div., United Aircraft Corp. Connecticut Aircraft Nuclear Engine Lab., Middletown). July 1, 1961. Contract AT(11-1)-229. 84p.

The feasibility of a drain and sump system as a method for controlling burning liquid metal without the use of an extinguishing agent was demonstrated in tests performed with lithium and NaK. The effectiveness of Met-L-X (NaCl plus protective coating agent) in controlling and eventually extinguishing lithium fires on metal floors when the depth of lithium was approximately one-half inch was also demonstrated. A large fraction of the liquid metal discharged on to the drainage system flowed to the sump when the floor and V-trough were sloped seven degrees. In three tests with lithium during which a fire occurred, 75 to 80% of the burning lithium ran into the sump and extinguished itself. One test was made with floor and V-trough slopes of five and three degrees, respectively. With this configuration the flow of lithium was very poor and no lithium was collected in the sump. In the two NaK tests performed (floor and V-trough sloped seven degrees), 40 and 55% of the NaK ran into the sump where it was extinguished. It was assumed that with fires involving large amounts of liquid metal, even greater percentages of liquid metal would be collected and extinguished provided a minimum floor and V-trough slope of seven degrees was used. One-eighth inch and one-quarter inch thick mild steel floors proved satisfactory for use in the drainage system. The burning liquid metal did not damage the floor and the slight warpage of the plates was not great enough to impede the flow of the liquid metal. Ignition of the liquid metal in air apparently depended to a large degree on the amount of spattering of the metal. More rapid ignition was observed when extensive spattering occurred. The NaK, which produced a greater degree of spattering than the lithium, burned more readily. High temperature insulation (Johns-Manville "Superex" and 85 percent magnesia) was completely destroyed when exposed to a stream of 1200F lithium. When lithium or NaK at ambient temperature was mixed with each of the three ambient organic materials, JP-5 jet fuel (MIL-J-5624E), lubricating oil (MIL-L-7808) and monoisopropylbiphenyl (MIPB), the only reaction observed was the very slow formation of gas bubbles on the surface of the NaK as it was added to the JP-5 and lubricating oil. When the organics at 200F were added to the lithium or NaK at ambient temperature the results were essentially the same as in the previous tests with the following exceptions: gas bubbles were formed when MIPB was added to the NaK; also, there was no visible reaction between the lubricating oil and NaK. When organic materials at 200F were added to burning lithium or NaK, typical oil fires resulted on the surfaces of the metals. Various extinguishing agents were applied to these fires to test their effectiveness. Dry Chemical ($NaHCO_3$ plus a drying agent to provide a free flowing material) effectively extinguished lithium-JP-5, NaK-JP-5, and NaK-MIPB fires. Dry Chemical was not effective on lithium and NaK lube oil fires, the former because of an apparent lube oil-lithium reaction, Met-L-X also proved ineffective on a lithium-lube oil fire in the one test made. However, Dry Chemical followed immediately by Met-L-X did extinguish a lithium-lube oil fire. Application of Dry Chemical to burning lithium alone caused the fire to increase in intensity. It was concluded that Dry Chemical should not be used on lithium fires. A test of Dry Chemical on burning NaK was not run. In facilities where both liquid metal and organics and their attendant fire hazards are present at the same time, fire protection systems should be provided to handle both types of fires. It was not determined whether a single piped system using a mixture of Dry Chemical and Met-L-X would operate satisfactorily.

134 TID-5365

Division of Organization and Personnel. Safety and Fire Protection Branch, AEC.

ZIRCONIUM FIRE AND EXPLOSION HAZARD EVALUATION. Interim Report. Aug. 7, 1956. 29p.

Recent developments from attempts to reappraise metallic Zr hazards are reported. Three categories for Zr incidents are set up and the incidents in each category described. Mechanism theories, hazard evaluations, and recommended action for minimizing hazards are given.

135 TID-8206

Office of Health and Safety, AEC.

A COMPENDIUM OF INFORMATION FOR USE IN CONTROLLING RADIATION EMERGENCIES, INCLUDING LECTURE NOTES FROM A TRAINING SESSION AT IDAHO FALLS, IDAHO, FEBRUARY 12-14, 1958. Allen Brodsky and G. Victor Beard, Comps. and Eds. Feb. 1960. 102p. OTS.

Information is summarized which may be needed by trained personnel in exercising rapid and professional judgment during the period immediately following an unexpected radiological incident. Past experiences in radiation accidents are reviewed. The shipment of radioactive materials and the control of fires during radiation emergencies are discussed. The results of fuel element burn tests are reviewed and monitoring activities are described.

136 (TID-14979) GLASS FABRIC SWATCH TESTS ON SODIUM AND NaK FUMES FOR ATOMICS INTERNATIONAL. John D. Harms (American Air Filter Co., Inc., Louisville, Ky.). June 9, 1961. Contract [AT(11-1)-Gen-8]. 11p.

Tests were made on the feasibility of using a glass bag cloth collector for removing Na and Na–K fumes. Results of studies on uncoated fabric indicated that Medardi 600 glass fabric is superior to 501/54 fabric. Studies of precoated Menardi 600 fabric showed that efficiencies >90% on Na or Na–K fumes can be obtained with precoat loadings of asbestos as low as 5 g/ft^2.

137 CONTROL OF BERYLLIUM FIRE HAZARDS IN A FIRE TEST SERIES. Robert J. Everett and Roy O. Mills (Sandia Corp., Albuquerque, N. Mex.). Am. Ind. Hyg. Assoc. J., 24: 584-7(Nov.-Dec. 1963). (TID-18082; SCDC-3092)

As part of the SNAP-10A (Space Nuclear Auxiliary Power) project, beryllium hazards were measured in four controlled fires. Over 125 air samples and swipe samples were taken during the tests; only eight samples showed concentrations of Be above the minimum detectable level. Controls and procedures described insured safe test conditions. Areas needing further study are noted.

138 (TRG-Report-342) THE EXTINGUISHING OF PLUTONIUM FIRES. J. Holliday and W. A. Conway (United Kingdom Atomic Energy Authority. Reactor Group, Dounreay, Caithness, Scotland). June 15, 1962. 13p.

A fusible ternary eutectic salt mixture of barium, sodium, and potassium chlorides was developed as an extinguishant for metallic fissile material fires. The powder extinguished fires involving massive and finely divided uranium and massive plutonium, but was not successful with fires involving finely divided plutonium, combustion continuing under the powder. Tests indicated that a fusible ternary eutectic of sodium, potassium, and lithium fluorides would act as a more efficient extinguishant and would be capable of extinguishing fires involving finely divided plutonium. The mixture was used successfully on fires involving plutonium, both in the massive and finely divided states.

139 (UCRL-7355) HAZARDS CONTROL QUARTERLY REPORT NO. 12, JANUARY–MARCH 1963. (California. Univ., Livermore. Lawrence Radiation Lab.). Contract W-7405-eng-48. 38p.

A semiautomatic reader is described that was developed for use with lithium fluoride dosimeters. Developmental work on a new type of personnel γ dosimeter is reported. A technique was developed for the determination of U^{235} collected in two types of filter medium. A monitor system for sewage is described and a method for determining Be contamination on ceramics is discussed. A high expansion foam for fire control with a minimum of water was developed, an improvement in the design of half-mask respirators allows better portability and increased efficiency of operation, and a sprayable polyurethane safety flooring system was developed and tested for use in high-explosive handling areas.

140 (UCRL-7450) HAZARDS CONTROL QUARTERLY REPORT NO. 13, APRIL–JUNE 1963. (California. Univ., Livermore. Lawrence Radiation Lab.). Contract W-7405-eng-48. 55p.

A plot of radioiodines produced by thermal fission of U^{235} as a function of time after fission is presented, and a high-expansion fire control system for glove boxes using argon–aqueous ammonium lauryl sulfate foams is described. In development of analytical and measuring methods, an infrared spectrophotometric analysis of vapors in calibration bottles is reported along with modification of the Davis halide meter for continuous atmospheric monitoring of methyl chloroform and development of arc sensitivity conversion factors for use with a 3.4-meter spectrograph in the case of 33 elements. In other work a long-service sprayable polyurethane flooring material was developed which provides safety in high-explosive handling areas. Shielding for the proposed increased Cockcroft-Walton ion accelerator beam power level is discussed. Results of floor finish evaluations are given in which three were selected as superior in regard to antislip qualities, lasting appearance, and cost. The description of a method to convert from fail-safe fire detection circuit to a fully supervised circuit is included along with nomographs for simplification of air-sampling calculations.

141 (UCRL-Trans-840(L)) FIRE PROTECTION IN ATOMIC ENERGY RESEARCH INSTALLATIONS. Joern Braun. Translated by Sergey Shewchuck (Univ. of California Lawrence Radiation Lab., Livermore) from VFDB (Ver. Förder. Deut. Brandschutzes) Z., 11: 9-12(1962). 11p.

Special problems involved in the control of fires in reactor buildings and auxiliary installations are discussed. It is pointed out that personnel of fire departments must know the functions of the various atomic energy research installations. The fundamental principles of nuclear physics that are applicable in training firemen are outlined.

142 (Y-811(Suppl.)) ALKALI METALS AREA SAFETY GUIDE (SUPPLEMENTAL ISSUE). Preston L. Hill (Union Carbide Nuclear Co. Y-12 Plant, Oak Ridge, Tenn.). May 15, 1961. Contract W-7405-eng-26. 36p.

The Safety Guide was prepared to serve as a reference of basic principles and practices deemed necessary to carry out operations with alkali metals with the least hazard to personnel and equipment. The principles and practices are presented for: indoctrination of employees; general plant safety procedures; personnel safety gear and protective equipment; fire prevention and firefighting; injuries to personnel; opening, repairing, or otherwise servicing tanks, lines, or valves containing alkali metals; handling the alkali metals; disposal of waste materials and alkali metals; cleaning equipment containing alkali metals; operation of valves; correct use of tools; and chemicals, general use.

143
FIRE PREVENTION BY NUCLEAR DETECTION. Atomics 6, 40, 53(1955) Feb.

A sensitive nuclear fire detector is described which contains strips of α-emitting radioactive material. The interception of α particles by the smallest trace of smoke is sufficient to trigger off a special relay tube. The source is everlasting and the relay tube consumes no current while the detector is on guard.

144
RADIOACTIVE MATERIALS AND INDUSTRIAL FIRE PROTECTION. F. R. Farmer (United Kingdom Atomic Energy Authority). Atom No. 22, 9-16(1958) Aug.

Information is presented on the development of safe practices for fire protection and fire prevention where radioactive materials might be involved. Discussions are included on: hazards of radioactive materials and regulations for the application of radioactive materials, the increasing use of radioactive materials in industry, the behavior of radioactive materials exposed to high temperatures or fire, and the industrial user's obligations.

145
HOW TO USE PYROPHORIC MATERIALS SAFELY. L. H. Peer and J. T. Reichling (Knolls Atomic Power Lab., Schenectady, N. Y.). Mill & Factory 65, No. 2, 79-83(1959) Aug.

Pyrophoric materials include such things as finely divided zirconium, titanium, hafnium, uranium, and thorium. Safe handling, use, storage, disposal, and firefighting techniques for these pyrophoric materials are discussed. Safety hazards in the drilling, grinding, turning, milling, tapping, and shaping of uranium and thorium are presented.

146 SAFETY CONSIDERATIONS IN PLUTONIUM METALLURGY TECHNOLOGY. Ellis L. Stout (Los Alamos Scientific Lab., N. Mex.). p.245-56 of "Plutonium 1960." London, Cleaver-Hume Press Ltd., 1961. (In English)

Safety engineering aspects of the Los Alamos plutonium facilities are discussed. The hazardous properties of plutonium require special techniques of accident loss control and, therefore, a high cost of specialized equipment must be rigorously maintained. The discussion is particularly concerned with nuclear safety. Fire protection and extinguishment methods for plutonium laboratories are of concern, also. Measures discussed include inert gas systems, smothering with various dry powders, quenching with high flash point oils, and controlled burning. Procedures for handling emergency conditions and alarm systems are also given.

147
RADIATION CONTROL, FOR FIRE AND OTHER EMERGENCY FORCES. Andrew A. Keil. Boston, National Fire Protection Association, 1960. 249p.

Radioactive materials are usually present in such extremely small quantities as to present no real fire or explosion hazard even when their chemical nature is such that they do burn or explode. Nevertheless, when involved in fires or other emergencies, they may become a serious health hazard to the general public as well as to the firefighting forces. It is imperative that fire department officials know, before the fire or emergency occurs, exactly where radioactive materials are stored, handled, or used within the boundaries of their areas of responsibility. Descriptions are included of actual situations involving radioactivity which have been faced by fire and emergency forces. Procedures for the safe handling of radioactive materials are reviewed.

148 RECENT DEVELOPMENTS IN THE STUDY OF METAL-WATER REACTIONS. Leo F. Epstein (General Electric Co., Pleasanton, Calif.). Progr. in Nuclear Energy, Ser. IV, 4: 461-83(1961).

The nature of metal-water reactions and their relation to reactor safety problems are discussed and reviewed. The rather involved steps through which a reactor system would have to pass to attain a dangerous metal-water reaction are described and explained; attention is given to the events which might occur. It is pointed out that there is

149 PEACETIME RADIATION HAZARDS IN THE FIRE SERVICE. ORIENTATION UNIT—INSTRUCTOR'S

GUIDE. Circular No. 641. (Department of Health, Education, and Welfare. Office of Education, Washington, D. C. and Office of Industrial Relations, AEC). 1961. 52p. (OE-84014). $0.35(GPO).

An instructor's guide and a series of charts are presented for instruction concerning peacetime radiation hazards in the fire service. Topics covered include locating local nuclear energy hazards, the general problem of radiation, characteristics and problems of both external and internal radiation, review of the common forms of radiation and the hazard they present, nuclear reactor problems pertinent to the fire service, the fire department's responsibility in the nuclear age, and special firefighting techniques used at nuclear incidents.

150 PEACETIME RADIATION HAZARDS IN THE FIRE SERVICE. ORIENTATION UNIT—STUDENT MANUAL. Circular No. 642. (Department of Health, Education, and Welfare. Office of Education, Washington, D. C. and Office of Industrial Relations, AEC). 1961. 39p. (OE-84015). $0.30(GPO).

A manual designed to be used by fireman trainees participating in the orientation unit on peacetime radiation hazards is presented. Topics covered include radioactive iodine to trace thyroid gland disorders, measuring metal wear, use of radioactive materials for quality control in industry, treatment of disease by radiation, difference between radioactive and fissionable materials, radiation warning symbol, samples of radiation warning signs, external radiation, internal radiation, effects of long range penetrating external radiation, effects of short range less penetrating external radiation, external radiation dosages, time as protection against external radiation, shielding as protection against external radiation, three common types of radiation, typical Geiger-Mueller counter dial, typical ionization chamber dial, masks as protection from internal radiation, mask removal procedure, contamination control during firefighting operations, radioactive contamination of smoke and water, radioactive half life, types of radiation and their hazards, the nuclear chain reaction, concept of criticality, suggested radiation prefire plan, and typical radiation prefire plan sketch of building.

151 IMPROVEMENTS IN OR RELATING TO ELECTRICAL CONDITION-DETECTING APPARATUS, SUCH AS FOR USE IN FLAME-DETECTION. (to Minneapolis-Honeywell Regulator Co.). British Patent 890,854. Mar. 7, 1962.

A flame and/or smoke detecting apparatus using a Geiger-Mueller sensing device is designed which may operate in the standby condition for a long time and which prevents false indication of fire in the event of power interruption. The Geiger-Mueller device is of the non-self-quenching type, and a quenching circuit is provided with time delay means to maintain the Geiger-Mueller device insensitive until the circuit is fully operative, such as after a power failure. Fire is indicated when the device responds to u-v light either emitted by the flame or reflected from an auxiliary source by the smoke.

152 ON A RADIOISOTOPE-BURNING-ARRANGEMENT FOR STUDY OF RADIOACTIVE CONTAMINATION GENERATED BY FIRES. T. Moriya (Fire Research Inst.), T. Jin, and S. Horiuchi. Proc. Japan Conf. Radioisotopes, 5th, No. 3, 55-6(1963). (In Japanese)

An arrangement was built to study experimentally the degree of radioactive contamination which may occur in and around a radioisotope institute when a fire breaks out in the area. The arrangement consists of a coal-gas burning chamber, a radioisotope-burning furnace, a water-shower-cooler, a filter box, and a turbofan. Radioisotopes can be burnt with combustible substances under conditions similar to a fire in the radioisotope-burning furnace of the arrangement. The ratio of the part of the active substance in the furnace that flows upward as gas to the part that remains as ash in the furnace can be determined by means of the burning experiment using the furnace. As it is supposed that the gas discharged from the furnace during combustion has considerable radioactivity, a special method was adopted to remove radioactive dusts and mists from the gas and to discharge them safely into the atmosphere.

153 FIXED AUTOMATIC AND MANUAL SYSTEM TO CONTROL FIRES. John P. Hughes, Thomas E. Franck, and Fred J. Schmitz (Argonne National Lab., Ill.). Proc. Conf. Hot Lab. Equip., 11th, New York, 1963, 285-94(1963).

A method of extinguishing fires in glove boxes and hoods with carbon dioxide either automatically or manually before absolute filters could be clogged presents a safety feature for the chemist in plutonium-research laboratories. The automatic carbon dioxide release is electrically controlled through a rate-compensated electric heat detector that reacts to a temperature of 160°F. The heat detector releases electrically the carbon dioxide to a sealed nozzle where gaseous carbon dioxide forms as it flows through an orifice to completely fill the enclosure 15 seconds after discharge and continually flows for a minimum of 2 minutes. The liquid carbon dioxide discharged activates a pressure sensitive switch; this notifies the Fire Protection Department, sounds an alarm bell, and lights a neon lamp at the enclosure annunciator box.

154 PLANNING FOR HOT [RADIOACTIVE] FIRES. Frances L. Brannigan and George S. Miles. Natl. Safety News, 87: No. 5, 18-19; 170; 172; 203(May 1963).

An outline for prefire planning between the fire department and plant management is presented. Things to do in all cases, in case of external radiation hazard, in case of internal radiation and contamination hazard, and nuclear accidents are listed.

155 POWDERS FOR EXTINGUISHING FIRES. Lawrence H. Cope (to United Kingdom Atomic Energy Authority). U. S. Patent 3,095,372. June 25, 1963. Priority date July 6, 1959, Great Britain.

The development of a powder suitable for extinguishing fires of burning U, Pu, or Th is described. The powder consists of a mixture of powdered inorganic chlorides and/or fluorides inert towards the burning metal. The mixture has a melting point below the melting point of the burning metal such that fusion of the powder takes place locally where the powder contacts the burning metal. A frit is formed around the locally fused portion of the powder, excluding the ambient atmosphere from the metal. Absorption of latent heat by fusion of the locally fused portion of the powder exerts a chilling effect on the metal. Examples of preferred powder mixtures are given. The mixture can be prepared by grinding the components together, but preferably the components are fused together before grinding to facilitate melting upon application to a fire. After a fire has been extinguished, U or Pu may be recovered from the residues by leaching with water to remove the soluble chlorides.

156
KEEPING UP WITH FIRE PROTECTION DEVELOPMENTS. Safety Maint. 122, 32-9(1961) Nov.

157
WHAT'S NEW IN FIRE PROTECTION. R. J. Bender. Power. 106, 57-63(1962) Sept.

158
FIRE RESISTANT FLUID. Iron and Steel Eng. 39, 222-3(1962) May.

159
NEW FLAME-RETARDANT POLYETHYLENE COMPOUND. T. Yoshida. Wire and Wire Prod. 37, 882-4 (1962) July.

160
USB MARKETS NEW BORATE FIRE RETARDANT. Chem. and Eng. News. 40, 32(1962) May 28.

161
FLAME-RESISTANCE TESTING OF PLASTICS. S. S. Feuer and A. F. Torres. Chem. Eng. 69, 138(1962) Apr.

162
FIRE-RESISTANT LUBRICANTS; GROWING ACCEPTANCE FORECAST. Power. 104, 84(1961) Oct.

163
HOW TO HANDLE CHEMICAL FIRES. Safety Maintenance. 126, 33-4(1963) July.

164
HOW TO HANDLE DEGREASER (TRICHLORETHYLENE) FIRES. Safety Maintenance. 126, 34(1963) Oct.

165
AUTOMATIC EXTINGUISHING SYSTEM PROTECTS LIQUID-METAL TEST LOOP. G. J. Schoessom and E. D. Zeratsky. Fire Eng. 116:5, 372-3(1963) May.

166
EXPERIMENTS IN EXTINGUISHING LIQUID-FUEL FLAMES WITH HIGH-EXPANSION FOAMS. E. L. Grumer and D. Burgess. U. S. Bureau of Mines - Report Investigations 6068. 1962. 10p.

167
NEW BREW FOR FIRE; FOAM AND DRY CHEMICAL. D. N. Meldrum. Safety Maint. 124, 48-51 (1962) Nov.

168
MODELS AND FIRE RESEARCH. D. I. Lawson. National Fire Protection Assn. -- Quarterly. 53:2, 147-54(1959) Oct.
(use of scale models in fire behavior studies.)

169
RADIATION HAZARDS IN FIRE FIGHTING. J. E. Lockwood. Fire Eng. 112:2, 110-12, 132-3(1959) Feb.

170
INCREASING USE OF HAZARDOUS METALS POSES NEW EXTINGUISHING PROBLEMS. R. B. Woolley. Fire Eng. 110:8, 796-9(1957) Aug.
(extinguishers for titanium, zirconium, and magnesium fires.)

171
RESEARCH IN FLAME EXTINGUISHING. Safety Maint. 123, 38-40(1962) Apr.

172
FIRE-FIGHTING CHEMICALS LIST GROWS; DAP COMBINATIONS SHOW PROMISE. Chem. and Eng. News. 40, 57-8(1962) Dec. 17.

173
ENGINEERING FOR FIRE PROTECTION. T. E. Burke. Air Conditioning Heating and Ventilating. 59, 60-7(1962) Dec.

174
REVIEW OF DRY CHEMICALS; FIRE EXTINGUISHING AGENTS. Safety Maintenance. 127, 42-4(1964) Apr.

175
RADIOACTIVE MATERIAL FIRES. Safety Maintenance. 119, 32(1960) Apr.

176
CHEMICAL ASPECTS OF FIRE EXTINGUISHMENT. A. B. Guise. Ind. and Eng. Chem. 51, Suppl. 73A-75A(1959) Nov.

177
FIRE AND VENTILATING SYSTEMS IN BUILDINGS. J. R. Kell. Instn. Fire Engrs. Quarterly. 23:52, 348-3(1963) Dec.
(fire hazards in ducts and ventilation systems.)

178
QUENCHING OF FLAMES OF VARIOUS FUELS IN NARROW APERTURES. K. N. Palmer and P. S. Tonkin. Combustion and Flame. 7:2, 121-7(1963)
(use of perforated metal sheeting to arrest flames.)

179
EXTINGUISHING AGENTS FOR COMBUSTIBLE METALS AND SPECIAL CHEMICALS. E. D. Zeratsky. Safety Maintenance. 120, 28-30(1960) Aug.

180
FIRE-FIGHTING INSTALLATIONS IN CHEMICAL INDUSTRY. J. D. Shapland. Chem. and Process Eng. 43:1, 5-8(1962) Jan.

181
FIRE RESEARCH AT MIDWEST RESEARCH INSTITUTE. H. H. Young. Nat. Fire Protection Assn. -- Quarterly. 55:4, 459-61(1962) Apr.

182
FIRE-VENTING. Aircraft Production. 24:3, 86-8 (1962) Mar.

183
EXTINGUISHING AGENT DEVELOPMENTS. National Fire Protection Assn. -- Quarterly. 54:2, 135-81 (1960) Oct.

184
MODERN FIXED FIRE CONTROL SYSTEMS. D. M. O'Brien. Fire Eng. 111:8, 727-30(1958) Aug.

185
FIRE DETECTION SYSTEM. Industrial Chemist. 36, 118(1960) Mar.

186
NEW ELECTRONIC FIRE DETECTOR. Safety Maintenance. 120, 49(1960) Dec.

187
WHAT'S NEW IN FIRE PROTECTION. B. G. A. Skrotzi. Power. 106:9, 57-63(1962) Sept.

EXPLOSION HAZARDS AND CONTROL

188
EXPLOSION SUPPRESSION -- NEW SAFETY TOOL. C. B. Hammond. Chem. Eng. 68, 85-8(1961) Dec. 25.

189
EXPLOSION-PROOF EQUIPMENT; HOW IT WORKS, WHERE IT SHOULD BE USED. J. W. Jenkins. Plant Eng. 16, 135-7(1962) Sept.

190
HOW EXPLOSION-PROOF EQUIPMENT WORKS. S. G. Twist. Safety Maint. 124, 42-4(1962) July.

191
AT LONG LAST, A DEPENDABLE EXPLOSION DETECTION SYSTEM. Plant Management and Engineering. 22, 52-3(1960) Nov.

192
BEATING EXPLOSIONS TO THE PUNCH. ISA Journal. 8, 30(1961) Jan.

193
EXPLOSION SUPPRESSION. Plant Engineering. 14, 124-5(1960) Nov.

194
INTRINSICALLY-SAFE ELECTRONIC INSTRUMENTATION; PREVENT EXPLOSIONS. W. F. Hickes. ISA Journal. 8, 42-6(1961) July.

195
NEW SYSTEM SUPPRESSES EXPLOSIONS. Safety Maintenance. 120, 32-6(1960) Nov.

196
NIP DANGEROUS EXPLOSIONS IN THE BUD. S. Elonka. Power. 105, 182-3(1961) Aug.

197
NIP EXPLOSIONS IN THE BUD. Mill and Factory. 67, 131-2(1960) Nov.

198
SYSTEM SNUFFS EXPLOSIONS IN MILLISEC. Canadian Chemical Processing. 44, 80(1960) Oct.

199
SYSTEM SUPPRESSES INCIPIENT EXPLOSIONS. Fenwal, Inc. Iron and Steel Eng. 37, 145(1960) Nov.

200
HOW THEY START ... EXPLOSION, FLASH, AND SIMPLE COMBUSTION. R. Beach. Industry and Power. 70:5, 49-51(1956) May.

201
DUST EXPLOSIONS IN FACTORIES. REVIEW OF LITERATURE. K. C. Brown and G. J. James. Great Britain. Safety in Mines Research Establishment - Report 201. June 1962. 67p.
(explosion venting and other protective measures.)

202
NEW TECHNIQUE KEEPS LITTLE EXPLOSIONS FROM BECOMING BIG ONES. Oil and Gas Journal. 58:48, 68-9(1960) Nov. 28.
(explosion detection and suppression.)

203
STOP EXPLOSION DAMAGE IN YOUR PLANT. Factory. 118:11, 88(1960) Nov.
(explosion detection and protective components.)

204
EXPLOSION KILLER; PRESSURE BUILDUP TRIGGERS FAST ACTING SUPPRESSOR. Machine Design. 32, 14-15(1960) Oct.

205
FIRE AND EXPLOSION TESTS OF PLUTONIUM GLOVEBOXES. H. V. Rhude. National Fire Protection Assn. -- Quarterly. 56:4, 335-41(1963) Apr.

206
SUPPRESSORS TAME EXPLOSION WHEN PLANT SAFEGUARDS FAIL. Iron Age. 186:19, 174-5 (1960) Nov. 10.
(suppressant, venting, advance inerting, isolation, and equipment shutdown.)

207
EXPLOSION PROTECTION OPERATING EXPERIENCE. G. J. Grabowski. National Fire Protection Assn. -- Quarterly. 52:2, 109-19(1958) Oct.
(explosion and flame suppression, venting, high-speed isolation, and advance inerting.)

208
INDUSTRIAL EXPLOSION PROTECTION. D. W. Merewood. Brit. Chem. Eng. 3:4, 188-90(1958) Apr.
(explosion venting, suppression, advance inerting, and isolation.)

LABORATORY FACILITIES AND EQUIPMENT

209 A/CONF.15/P/543
Argonne National Lab., Lemont, Ill.
HOT LABORATORY FACILITY FOR PHYSICAL MEASUREMENTS ON IRRADIATED PLUTONIUM. R. C. Goertz. 11p. $0.50(OTS).

Prepared for the Second U. N. International Conference on the Peaceful Uses of Atomic Energy, 1958.

A new facility is being developed to carry out physical measurements on irradiated plutonium-bearing fuel elements. The shielded enclosure (cave) will be sealed tight enough to contain the radioactive particulate material and a portion of it will be tight enough to contain a high purity inert atmosphere. Handling and manipulation within the enclosure are to be performed entirely by remotely controlled slave-robots, manipulators, and cranes. Viewing will be by means of shielding windows, periscopes, and television. Slave-robots are to have capabilities of setting up, operating, and repairing or removing any of the equipment to be used in the facility. The ability of one slave-robot to repair another similar unit is the first requirement for achieving the over-all objective. In addition, the other equipment used in the caves must be designed so that the slave-robots, along with the other manipulators and cranes, can repair or replace them. The emphasis will be on repair rather than replacement because much of the equipment for experimental research will be new and unproven. A simple slave-robot, Model 1, has been built and improved models are under development. One of these is expected to be built in 1958 and still another improved model in 1959.

210 A/CONF.15/P/2095
DESIGN OF HIGH AND SEMI-LEVEL RADIOCHEMICAL FACILITY. Vojtěch Macháček, Mario Hubáček, Eduard Kos, Miloš Panýr, and Miloš Weber (Czechoslovak Academy of Sciences, Prague). 21p.

A radiochemical research center presently under construction is described. It consists of hot, semi-hot, alpha radiation, physical chemistry, and radiometric laboratories. A laundry for washing work clothes and containers for the collecting, checking, and subsequent treatment of radioactive wastes are also included. The position of the hot cells, their structural design, and the operation of individual cells are described. The system of vertical and horizontal transport of samples without the use of shielding containers is discussed.

211 (AEC-tr-4482(p.619-27)) CONSTRUCTION OF RADIOISOTOPE HANDLING LABORATORY. T. Hamada and M. Okano.

A laboratory designed for the distribution of radioisotopes is described. The principle of the design, the structure of the laboratory, the equipment in each standard unit, the distribution of ventilation, and the finishing materials for the building interior and equipment are discussed.

212 (AEC-tr-4482(p.628-44)) RADIOISOTOPE LABORATORY FACILITIES AT SHOWA ELECTRIC MANUFACTURING COMPANY. S. Sonoda, T. Shigeki, and A. Matsumoto.

The radioisotope laboratory described is divided into the main divisions of tracer research facilities and irradiation application facilities. Installation of fixed facilities was avoided as much as possible in order to provide flexibility of arrangement of equipment to meet the individual objectives of the experiments. Descriptions of all the equipment are included.

213 (AEC-tr-4482(p.645-53)) A BASIC PLAN FOR A GENERAL RADIOISOTOPE LABORATORY. M. Fujii.

A basic plan for a general radioisotope laboratory is described. The facilities include an irradiation room, operation room, hot cave, instrument operation laboratory, applied chemistry laboratory, materials testing laboratory, fertilizer testing preparation room, distribution room, storage room, measurement laboratory, synthesizing laboratory, tracer laboratory, green house, health control room, dispensary, clinic and waiting room, x-ray room, examination room, Van de Graaff room, betatron room, preparatory operation room, and dark room. Ventilation, air-conditioning, drainage, and disposal of wastes are discussed.

214 **AERE-E/M-63**
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
A DESIGN OF AIR EJECTOR FOR USE IN RADIOACTIVE LABORATORIES. J. R. Catlin and L. D. G. Coward. Nov. 1952. Decl. Mar. 1958. 9p. $0.32(BIS).

A design is evolved for the economic manufacture of a vacuum ejector to produce 25.3 in. of Hg vacuum, for use in lieu of water/air ejectors where the production of effluent such as in radiochemical laboratories may be a disadvantage.

215 AERE-I/M-43
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
A SELECTED READING LIST ON RADIOLOGICAL PROTECTION AND LABORATORY DESIGN. (References selected from literature published between 1946 and 1956). R. J. Millett, comp. Apr. 1957. 5p.

216 AERE-Inf/Bib-58
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
SOME REFERENCES TO THE CONSTRUCTION OF HOT LABORATORIES, THEIR FITTINGS, ETC. Jan. 18, 1950. Decl. Dec. 20, 1956. 4p.

217 ANL-4670(Del.)
Argonne National Lab., Lemont, Ill.
HOT LABORATORIES AND EQUIPMENT. PAPERS PRESENTED AT ATOMIC ENERGY COMMISSION DIVISION OF REACTOR DEVELOPMENT INFORMATION MEETING MAY 16, 17, AND 18, 1951. 317p. Contract W-31-109-eng-38. $50.40(ph OTS); $11.80 (mf OTS).

Facilities and equipment for handling radioactive materials are described. Sources of information on materials and equipment are discussed. A catalog of isometric drawings annotated with pertinent information is described.

218 (ANL-6489) THE FACILITY 350 HELIUM-ATMOSPHERE SYSTEM. Final Report, Metallurgy Division Program 1.5.5. R. M. Mayfield, W. G. Tope, and A. B. Shuck (Argonne National Lab., Ill.). Dec. 1962. Contract W-31-109-eng-38. 45p.

The He atmosphere system in Argonne's Facility 350 is described in detail. The system is straightforward, employing drying and carbon towers for the removal of moisture, oxygen, and other impurities. The bulk of the 15,000 ft^3 of He atmosphere is continuously recirculated at nearly atmospheric pressure. Purification is accomplished at 140 psig on a portion of the gas that is passed through the drying tower at room temperature and the carbon towers at −46°C (−50°F). The operation is continuous, requiring a minimum of maintenance and operational manpower. The He atmosphere is supplied to the glove-boxes with impurity levels below 3,000 ppm nitrogen, 1,000 ppm oxygen, and 50 ppm moisture. Such purity levels prevent oxidation and combustion of the Pu materials being processed. Experimental data concerning the adsorption of oxygen from He by activated carbon over a range of temperature and pressure conditions are reported.

219 (BLG-68) CONDITIONS DE TRAVAIL ET DE SECURITE DANS LES LABORATOIRES DU SERVICE DES RADIOISOTOPES A MOL. (Working Conditions and Safety in Radioisotope Production Laboratories at Mol). R. Constant and J. Mekers (Brussels. Centre d'Etude de l'Energie Nucleaire). Dec. 1961. 49p.

The rules adopted in the radioisotopes production laboratories of the CEN are discussed. The aim of these rules is to protect the individuals against the hazards of irradiation and contamination. The safety measures taken to prevent any incident connected with the manipulation of radioisotopes are also described.

220 BNL-302(Del.)
Brookhaven National Lab., Upton, N. Y.
THE THIRD INFORMATION MEETING ON HOT LABORATORIES, MAY 26-28, 1954. Decl. with del. Feb. 18, 1957. 79p. $12.30(ph OTS); $4.50(mf OTS).

Topics discussed at this conference include: the design and operation of a high-level fission product recovery pilot plant; electrical control methods applicable to remote control of fabrication processes; design of a miniature pilot plant for high-level separations processes; radiometallurgical equipment at Hanford; the preparation of kilocurie quantities of Xe^{135}, design of the Idaho Chemical Processing plant; remote control aspects of the ANP fuel irradiation program; the organization and responsibilities of a radioactive materials laboratory; the cost of design, construction, and operation of a radioactive materials laboratory; design modifications in a lathe for radioactive machining; the performance of shielding window materials at high radiation intensity; design modifications in standard small equipment items developed at BNL; and design modifications in apparatus for the study of irradiated liquid metal fuel and breeder systems.

221 BNL-3283
Brookhaven National Lab., Upton, N. Y.
WATER SUPPLY AND DRAINAGE QUANTITIES FOR RADIOACTIVITY LABORATORIES. John M. Ruddy. July 9, 1957. 7p. $1.80(ph), $1.80(mf) OTS.

The laboratory liquid waste effluent at Brookhaven National Laboratory is discussed in relation to the number of personnel and flow-rate per fixture per day of contaminated and uncontaminated waste.

222 REMOTE ANALYTICAL FACILITY (Engineering Materials). (Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho). (CAPE-631)

The facility provides space for technical development of new processes dealing with expended fuel elements and for analytical process control. The building is constructed of reinforced concrete, is 88 × 83 ft, and is divided into three parallel areas: analytical, decontamination, and multicurie cells. The analytical area contains both remote and conventional laboratories. The remote laboratory contains 32 Berkeley-type boxes which are arranged in two lines. Also included are manipulators, dollies, carriers, conveyors, tongs, and cabinets.

223 METALLOGRAPHIC EQUIPMENT USED IN HRLEL (Engineering Materials). (Oak Ridge National Lab., Tenn.). (CAPE-921)

This package contains 21 drawings. The High Radiation Level Examination Laboratory (HRLEL) employs only remote control equipment. A cut-off machine, used successfully in high radiation, and a vibratory polisher specimen holder, used with the Syntron Polisher, are two items of metallurgical equipment that are described. The vibratory polisher is a modified Syntron Polisher that is used in metallography. The modifications consist of the addition of 24-hour timers and a new specimen holder which eliminates small crevices, and is self-aligning. Ultrasonic cleaning is facilitated with the elimination of crevices.

224 FACILITY AND EQUIPMENT FOR THE HRLEL (Engineering Materials). (Oak Ridge National Lab., Tenn.). (CAPE-1014)

This package contains 36 photos and 505 drawings. The High Radiation Level Examination Laboratory (HRLEL) was designed for use in studying the influence of nuclear radiation on different substances under various environmental conditions in order to develop improved structural, moderator, control, fuel and shielding materials. The HRLEL is located in a two-story brick building with a partial basement. Thirteen main cells are located on the first floor in three straight-line banks arranged in the form of a "U." The operating cells are 6 ft wide, 10 ft deep and 14 ft high. The two corner cells are somewhat wider. The 13 cells contain 15 oil-filled lead-glass windows with a pair of master slave manipulators at each window. Most of the laboratory equipment is portable for greater flexibility and better operating efficiency. Periscopes, cameras, stereomicroscopes, telescopes, and television cameras are employed in inspecting exposed or accessible surfaces of opaque materials and interiors of transparent objects. Ultrasonic and eddy current techniques are used in the nondestructive testing methods to study nonbonding and cracks. Commercial apparatus was modified to produce remote control equipment for use in the caves. A gamma scanning device is used to study fuel burnup and induced-activity measurements. This device consists of a mechanical positioner, collimator, and a scintillation counter. The gamma spectrometer is a fully transistorized, 250-channel analyzer with a readout typewriter, oscilloscope, and an x-y point recorder. Gas-pressure buildup causing rupture in metal clad fuel elements is studied which necessitated equipment to pierce capsules of steel, nickel, and beryllium; and sampling equipment to attain aliquots of fission gases. Milling machines, abrasive cutoffs, and pipe cutters are used in destructive testing. Balances, defilming and replication equipment are used to study chemical corrosion, mechanical erosion, and crud deposition. Metallographic examination is employed to study internal structures. Two types of metallographs, Ruchert Telatoms and Bausch & Lomb were modified for remote operation. Auxiliary equipment used in metallographic examination includes ultrasonic cleaners, electroplating equipment, presses, grinders, polishers, hardness testers, and etchers. The metallurgical equipment also includes transfer mechanisms. X-ray diffraction analysis is used to examine solid or powdered polycrystalline materials. Shielded containers are used to transport waste and for storage. See also CAPE-556, Syntron Polisher, and CAPE-921, Metallurgical Equipment Used at the HRLEL, for materials describing other equipment.

225 CEA-1152
France. Commissariat à l'Énergie Atomique, Paris.
SORBONNES BLINDEES POUR MANIPULATIONS RADIOACTIVES. (Shielded Enclosure for Handling Radioactive Material.) H. Laurent and J. M. Courouble. Mar. 1959. 19p.

Two enclosures linked by an air-lock are described. They are designed for the safe handling of 5 curies of 0.3 to 0.5 Mev γ emitters, and each is composed of a semi-tight case, ventilated, clad in 80-mm steel plate, and suited for a wide variety of physics and chemistry operations. The equipment required for any given operation can be installed in the shortest possible time, access to the enclosure being via a removable front. Visual control is assured through a lead-glass screen. Each enclosure is fitted with a master-slave manipulator, Argonne model 7, and plugs and air-locks are provided for the introduction of liquids and solids.

226 (CEA-2311) PROTECTION DU PERSONNEL CONTRE LA CONTAMINATION ATMOSPHERIQUE PAR LE PLUTONIUM, DANS LES LABORATOIRES. (Protection of Personnel Against Atmospheric Contamination by Plutonium in the Laboratory). P. Feliers, J. Pomarola, and A. Risselin (France. Commissariat à l'Énergie Atomique. Centre d'Études Nucléaires, Fontenay-aux-Roses). 1963. 19p.

Various problems about measurement of atmospheric contamination by plutonium in laboratories are considered. In particular are studied sampling methods, continuous measurement for alarm, criteria used for fixation of the concentrations to be measured, sensitivity of apparatus, and effects of natural atmospheric contamination. The means actually available for measurement of contamination and their limits of use are brieflv analyzed.

227 (CEA-tr-R-534) QUELQUES PROBLEMES DE LA TECHNIQUE DE L'EXPERIMENTATION RADIOCHIMIQUE. (Some Problems with the Technique of Radiochemical Experimentation). A. A. Goriunov (Goriounov). Translated into French from Zhur. Anal. Khim., 11: 590-8(1956). 25p.

A series of auxiliary devices for radiochemical experimentation is described. They are: a protective cover for counting chambers, a vertical case for Al absorbers, celluloid capsules, a pressing mold and heater for molding celluloid capsules, and an evaporator for drying radioactive samples. This equipment has given good results in use and is recommended.

228 (CEA-tr-X-499) PRÉCAUTIONS À PRENDRE PAR LES INGÉNIEURS CHIMISTES CONTRE LES DANGERS D'IRRADIATION. (Precautions to Protect Chemical Engineers Against Dangers of Irradiation). S. Sakagishi. Translated into French from Bunseki Kagaku, 9: 910-15 (1960). 31p.

An outline is presented of radiation safety of personnel, with attention to: radiation and characteristics of radiation accidents; permissible doses; bases for permissible doses for superficial contamination; fundamentals of the handling of radioactive substances; radioactivity thresholds in the laboratory area; laboratory equipment and safe operational procedures; storage and transport of radioisotopes; decontamination; treatment of radioactive wastes; and first aid for radiation accidents.

229 CF-58-6-67
Oak Ridge National Lab., Tenn.
A GENERAL PURPOSE ALPHA-GAMMA HOT LABORATORY. H. M. Glen. June 17, 1958. 14p. Contract [W-7405-eng-26]. $3.30(ph), $2.40(mf) OTS.

The design of a general purpose hot laboratory that embodies the maximum permissible safety for operating personnel handling source material containing air-borne alpha-gamma emitters is described. Laboratory components such as the cell bank and supporting facilities are discussed. Floor plans are included.

230 CF-58-10-126(Rev. I)
Oak Ridge National Lab., Tenn.
EUROCHEMIC ASSISTANCE: ANALYTICAL. L. T. Corbin. June 23, 1959. 5p. Contract [W-7405-eng-26]. $1.80(ph), $1.80(mf) OTS.

Information on the analytical requirements for a combination control and development laboratory which is to be associated with a Purex-type solvent extraction processing plant is presented. Additional comments by personnel of the ORNL Analytical Chemistry Division on questions directed to them for the Eurochemic Assistance Program are also given.

231 CF-60-6-64
Oak Ridge National Lab., Tenn.
SAFETY, HEALTH PHYSICS, AND OPERATING PROCEDURES FOR CHEMICAL TECHNOLOGY DIVISION BERYLLIUM FACILITY. K. S. Warren and L. M. Ferris. June 16, 1960. 13p. OTS.

A summary of the safety precautions, operating techniques, and monitoring methods required for efficient use of the Chemical Technology Division Be facility is presented.

232 PROCEEDINGS OF THE ELEVENTH CONFERENCE ON HOT LABORATORIES AND EQUIPMENT. Held in Conjunction with American Nuclear Society Winter Meeting, New York, N. Y., November 18-21, 1963. (American Nuclear Society, Hinsdale, Ill.). 84p. $10.00(ANS) (CONF-187)

233 DP-186
Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.
RADIATION CONTROL AT THE SAVANNAH RIVER LABORATORY. Gordon M. Nichols. Nov. 1956. 15p. Contract AT(07-2)-1. $0.20(OTS).

A general discussion of the philosophy, organization, and functions of the Radiation Service organization of the Savannah River Laboratory is presented, together with a brief summary of operations to January 1956.

234 HW-17769(Del.)
Hanford Works, Richland, Wash.
TERMINAL REPORT ON THE RADIOLANTHANUM LABORATORY. I. LABORATORY AND LABORATORY EQUIPMENT DESIGN. J. K. Figenshau. July 21, 1950. Decl. with deletions Feb. 19, 1957. 140p. Contract [W-31-109-eng-52]. $21.30(ph OTS); $6.90(mf OTS).

The status of the planning of the analytical control laboratory for the radiolanthanum (RaLa) process at its termination was summarized. The design of laboratory apparatus and equipment is included.

235 HW-25108
Hanford Works, Richland, Wash.
APPLICATION OF PLASTIC BAGS AND SHEETING FOR OPERATION AND MAINTENANCE ACROSS A CONTAMINATION BARRIER. Homer A. Moulthrop. Oct. 24, 1952. Decl. Dec. 6, 1955. 74p. [Contract W-31-109-eng-52.] $12.30(ph OTS); $4.50(mf OTS).

A description is given of the use of Vinylite sheeting for performing work and for making material transfers across a contamination barrier, the primary purpose being the elimination of open air transfers while performing the work. Special equipment and techniques involved are illustrated with 38 full-page photographs and detailed operational procedures are also presented. Illustrations include the use of plastic tunnels for entry of personnel into large contaminated enclosures. Arrangement of access ports and equipment to permit accessibility through plastic barriers is recommended for new installations.

236 HW-58220(Rev.)
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
OPERATING MANUAL FOR 105-C METAL EXAMINATION FACILITY. J. M. Fouts. May 16, 1960. 58p. Contract AT(45-1)-1350. OTS.

Equipment is described for the 105 Metal Examination Facility (MEF). The 105 MEF consists of four water-filled basins and a decontamination area. Operating instructions are given for the slug breaker, ultrasonic test equipment, dejacketing equipment, microscope, camera, weigher, cleaner, etc.

237 (HW-69587(Rev.)) SAFETY REVIEW OF HANFORD LABORATORIES PILOT PLANT FACILITIES. Revised by W. A. Snyder (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). Nov. 10, 1961. Contract AT(45-1)-1350. 15p.

The safeguards incorporated by design features and administrative controls in Hanford laboratories and pilot scale facilities employed in handling fission products and plutonium are discussed. The facilities discussed are the Hot Semiworks, High-Level Radiochemistry Facility, Plutonium Fabrication Pilot Plant, Plutonium Metallury Laboratory, and Radiometallurgy Laboratory.

238 IDO-14396
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
ANALYTICAL CONTROL LABORATORY OPERATING MANUAL. M. J. Painter and G. A. Huff, comps. and eds. Mar. 21, 1957. 140p. Contracts AT(10-1)-205. $0.70 (OTS).

This manual describes briefly the theory and operational procedure of apparatus and instruments used in the Analytical Control Laboratory. Also, it contains pertinent facts and information dealing with Control Laboratory operation. The manual is divided into twelve major sections; General Information, Safety and Security, Accountability, Precision and Accuracy, Records, Dilution Factors, Laboratory Equipment (Warm Laboratory), Remote Apparatus ("B" Line), Remote Apparatus ("A" Line), Training and Testing, Table of Conversion Factors and References.

239 (JAERI-5009) DESIGN AND CONSTRUCTION OF THE HOT LABORATORY. (Japan Atomic Energy Research Inst., Tokyo). 1963. 105p. (In Japanese)

Construction of a hot laboratory for handling highly radioactive materials such as reactor fuel elements and structural components irradiated in reactors was started in 1959. The laboratory consists of two sections, metallurgical and chemical, and contains metallurgical and chemical hot caves, and analytical and semi-hot cells. The metallurgical hot cave is composed of four cells in a row with shielding capacities of 2,000 to 10,000 Mev-curies, and the chemical hot cave has two cells with 10,000 Mev-curie capacity. Both are shielded with 1 m thick high density concrete walls. The analytical cells are arranged in two rows with seven in each row, with 15-cm-thick lead-brick shielding. The semi-hot cells are of the self-standing type with 10-cm-thick lead-brick shielding. Seven analytical cells and three semi-hot cells are completed. Details of the design and construction of the building and caves including auxiliary facilities and equipment are described.

240 JPRS-453-D
TECHNOLOGY OF SAFETY AND LABOR PROTECTION IN WORK WITH RADIOACTIVE ISOTOPES. Translated from Vrachebnoe Delo, 329-32(1957). 4p. $0.50(OTS).

The status of radiation protection procedures in laboratories and agencies engaged in work involving the use of radioisotopes is discussed.

241 JPRS-2737
RADIOISOTOPE LABORATORY OF TIMIRYAZEV ACADEMY. V. V. Rachinskii (Rachinskiy) and F. P. Platonov. Translated from Izvest. Timiryazev. Sel'skokhoz. Akad. No. 6, 239-50(1959). 21p. OTS.

The design and equipment of a laboratory for the study of radioactive substances are described.

242 KAPL-387
Knolls Atomic Power Lab., Schenectady, N. Y.
PROJECT SIR—REVISED PROPOSAL FOR THE RADIOACTIVE MATERIALS LABORATORY AT THE KNOLLS ATOMIC POWER LABORATORY. H. H. Race, R. H. Horton, J. P. Howe, J. R. Low, H. H. Zornig, F. A. Vernon, and C. H. Betts. Aug. 3, 1950. Decl. Feb. 25, 1957. 44p. Contract W-31-109-eng-52. $12.30(ph OTS); $4.50(mf OTS).

A facility needed for metallurgical examination of radioactive materials required during the design phase of the SIR program is described. The major objectives of this method of operation and some cost saving changes in cell design are summarized. Sections are included on the cost estimate, time schedule, metallurgical work program, operational requirements, building design and specifications, and cell design and specifications.

243 NEW HOT LABORATORY FACILITIES AT LOS ALAMOS. Charles R. Wherritt, Paul Franke, R. E. Field, and A. R. Lyle (Los Alamos Scientific Lab., N. Mex.). Proc. Hot Lab. Equip. Conf., 10th, Washington, D. C., 1962: 55-62(1962). (LADC-5442)

New Hot Laboratory Facilities which support three major research programs directed by the Los Alamos Scientific Laboratory of the University of California are described. For the Nuclear Rocket Propulsion Program, a hot cell addition to the Radio Chemistry Building at Los Alamos will be completed early in 1963, and construction is expected to start soon on the hot cell addition to the Maintenance, Assembly and Disassembly Building at the Nuclear Rocket Development Station in Nevada. Integral hot laboratories are designed in the facilities for the Ultra High Temperature Reactor Experiment and the Fast Reactor Core Test at Los Alamos.

244
Building Research Advisory Board, National Research Council and National Academy of Sciences
LABORATORY DESIGN FOR HANDLING RADIOACTIVE MATERIALS. RESEARCH CORRELATION CONFERENCE, NOVEMBER 27 AND 28, 1951. May, 1952. 140p. (NP-3875; Research Conference Report No. 3)

A conference on the design of a laboratory for handling radioactive materials, covering the air supply and exhaust system, control and shielding of isotopes, finishing of surfaces, and radioactive waste disposal, is reported in detail.

245 (NP-12125) AN ANNOTATED BIBLIOGRAPHY ON LABORATORY BUILDINGS. Bibliography No. 16. A. Brass, comp. (National Research Council of Canada. Div. of Building Research, Ottawa). June 1959. 17p.

A bibliography of selected references on design of laboratory buildings is presented. Comment concerning the information presented is included for part of the listings. A total of 95 references is included.

246 (PAEC(D)PH636) RETENTION OF RADIOACTIVE CONTAMINATION BY SURFACING MATERIALS. Pericles T. Meneses, Asterio Palma, and Raymundo Pilapil (Philippines. Atomic Energy Commission. Atomic Research Center, Manila). June 1963. 6p.

The decontamination properties of 8 commercially available coatings for table tops and fume hoods for use in radioisotope laboratories were evaluated. The radioisotopes used were Fe^{55-59}, Co^{60}, Cs^{137}, Na^{22}, P^{32}, Sr^{89}, and mixed fission products. The decontamination procedure consisted of washing once with water, 3 times with a detergent solution (Tide), once with a complexing agent (a 0.1 M solution of EDTA), and scouring with a scouring agent (a 50% Henlex solution). Lucite, polyethylene, and Fil-Hispano tiles were found to be the materials most easily decontaminated by the procedure used.

247 (RCC/R.119) A VERSATILE APPARATUS FOR THE HEATING AND EVAPORATION OF LIQUIDS IN SHIELDED BOX SYSTEMS. J. C. Charlton (United Kingdom Atomic Energy Authority. Research Group. Radiochemical Centre, Amersham, Bucks, England). Jan. 1961. 14p.

An apparatus developed for heating and evaporating liquids in shielded box systems consists of a vapor bath in which a 40 ml. centrifuge tube can be heated, together with a device for the removal of vapor from the centrifuge tube in a stream of air. Evaporation was rapid and trouble-free. The equipment can readily be handled remotely and is small enough to be "bagged-out" of the box.

248 SCR-5
Sandia Corp., Albuquerque, N. Mex.
SOME PROPOSED RESEARCH ACTIVITIES PERTAINING TO RELIABILITY. R. O. Frantik. SOME NOTES ON THE ESTIMATION OF RELIABILITY. R. L. Calvert. Feb. 1958. 26p. OTS.

The portion of this report by R. O. Frantik is a rewritten version of AECU-3354.

An outline of the major problems which have appeared in reliability research at Sandia Corporation is presented and generalizations based on this experience are discussed.

249 TID-2501(Del.)(p.367-70)
Los Alamos Scientific Lab., N. Mex.
SOME CONSIDERATIONS INVOLVED IN THE DESIGN OF A LABORATORY FOR WORK WITH ALPHA ACTIVE MATERIALS. F. M. Walters. p.367-70 [of] NUCLEAR SCIENCE AND TECHNOLOGY. (EXTRACTS FROM JOURNAL OF METALLURGY AND CERAMICS. ISSUE NOS. 1 TO 6, JULY 1948—JANUARY 1951.) 4p.

Factors requiring consideration in designing laboratories for chemical and metallurgical research on alpha-active materials are discussed, and plans for a proposed building at Los Alamos designed to meet the special requirements are presented with explanations, including the first floor plan for the building.

250 TID-2502(Del.)(p.113-29)
Brookhaven National Lab., Upton, N. Y.
THE HOT LABORATORY AT BROOKHAVEN NATIONAL LABORATORY. W. E. Winsche, L. G. Stang, Jr., Gerald Strickland, P. Richards, G. J. Selvin, F. Horn, and G. Bennett. p.113-29 [of] NUCLEAR SCIENCE AND TECHNOLOGY. (EXTRACTS FROM REACTOR SCIENCE AND TECHNOLOGY. VOL. 1, ISSUES 1 TO 3, APRIL—DECEMBER 1951). 17p. (TID-5020).

The Hot Laboratory has been specifically designed and built to handle and process multicurie amounts of radioactive materials. It is operated by a permanent staff in such a way that others can also use the various facilities required for this type of work. A wide variety of facilities is available, and use is already being made of them as indicated by the scope of the research and operations program presently under way. The general philosophy used in designing the buildings is outlined, and the facilities themselves are described in detail.

251 TID-7014
Division of Construction and Supply, AEC.
AEC HOT CELLS AND RELATED FACILITIES. Ellery R. Fosdick. May 1958. 108p. $1.75(OTS).

Shielded enclosures equipped with viewing devices and remote-handling equipment for use in experiments and processes involving radioactivity are referred to as hot cells. The hot cell includes the biological shield enclosing the working space, viewing devices, special ventilating equipment, and special equipment for use in the hot cells, such as manipulators, cranes, machine tools, and measuring devices. A hot cave is the same as a hot cell. A junior hot cave is a small-sized hot cave. A summary is presented of pertinent data on hot cells in use at various AEC installations.

252 TID-7554(p.260-92)
Brookhaven National Lab., Upton, N. Y.
RADIOISOTOPE FACILITIES ASSOCIATED WITH A RESEARCH REACTOR. L. G. Stang, Jr. p.260-92 [of] PROCEEDINGS OF THE INTER-AMERICAN SYMPOSIUM ON THE PEACEFUL APPLICATION OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY, MAY 13-17, 1957. 33p.

Typical operations that are encountered in handling radioactive material in a radiochemistry laboratory are outlined. Techniques, facilities, and equipment are described and illustrated. 27 figures.

253 TID-7556(p.45-8)
Knolls Atomic Power Lab., Schenectady, N. Y.
THE HOT LABORATORY FACILITY AT KNOLLS ATOMIC POWER LABORATORY. D. D. LaRocque. p.45-8 [of] SIXTH HOT LABORATORIES AND EQUIPMENT CONFERENCE, MARCH 19-21, 1958, INTERNATIONAL AMPHITHEATRE, CHICAGO, ILLINOIS. 4p.

The hot laboratory facilities at KAPL are illustrated, and the functions are summarized. Supporting facilities are listed.

254 TID-7556(p.49-61)
Argonne National Lab., Lemont, Ill.
HOT LABORATORY PROBLEMS IN ISOLATING GRAM QUANTITIES OF TRANSPLUTONIUM ELEMENTS. C. H. Youngquist and P. R. Fields. p.49-61 [of] SIXTH HOT LABORATORIES AND EQUIPMENT CONFERENCE, MARCH 19-21, 1958, INTERNATIONAL AMPHITHEATRE, CHICAGO, ILLINOIS. 13p.

It is shown how the experience gained in processing small research quantities of irradiated plutonium will be applied to the processing of irradiated plutonium fuel assemblies. The material being processed is about 300 times greater than the earlier research samples and will present problems in methods and equipment for processing. In addition, the proportionately higher neutron emission from the transplutonium elements will require the use of neutron caves as a substitute for glove boxes.

255 TID-7556(p.69-72)
Oak Ridge National Lab., Tenn.
HOT CELL OPERATIONS, SOLID STATE DIVISION, OAK RIDGE NATIONAL LABORATORY. E. S. Schwartz. p.69-72 [of] SIXTH HOT LABORATORIES AND EQUIPMENT CONFERENCE, MARCH 19-21, 1958, INTERNATIONAL AMPHITHEATRE, CHICAGO, ILLINOIS. 4p.

The physical layout of hot cell operations at ORNL is illustrated, and equipment and services are discussed. A brief description of the facility and organization is given as a background for further discussion.

256 TID-7556(p.73-80)
General Electric Co. Aircraft Nuclear Propulsion Dept., Idaho Falls, Idaho.

NEW MULTI-CELL FACILITY IN IDAHO. D. C. Durrill and R. D. Dwigans. p.73-80 [of] SIXTH HOT LABORATORIES AND EQUIPMENT CONFERENCE, MARCH 19-21, 1958, INTERNATIONAL AMPHITHEATRE, CHICAGO, ILLINOIS. 8p.

Construction of a new facility comprising four small hot cells is nearly complete at the Aircraft Nuclear Propulsion test station operated by the General Electric Company in Idaho. Special features include split-level operating areas, concrete-filled vault-type doors for personnel and equipment entry, a remotely-operated underfloor dolly system, and a remote vacuum cleaning and wash down system.

257 TID-7556(p.96-9)
Westinghouse Electric Corp. Bettis Atomic Power Div., Pittsburgh.
BETTIS HOT LABORATORY OPERATIONS. R. R. Fouse. p.96-9 [of] SIXTH HOT LABORATORIES AND EQUIPMENT CONFERENCE, MARCH 19-21, 1958, INTERNATIONAL AMPHITHEATRE, CHICAGO, ILLINOIS. 4p.

The physical layout of the Bettis Hot Lab. is briefly reviewed and illustrated. Support facilities and services are listed.

258 TID-7556(p.100-12)
Brookhaven National Lab., Upton, N. Y.
SOME SAFETY RECOMMENDATIONS PERTINENT TO HOT LABORATORIES. L. G. Stang, Jr. p.100-12 [of] SIXTH HOT LABORATORIES AND EQUIPMENT CONFERENCE, MARCH 19-21, 1958, INTERNATIONAL AMPHITHEATRE, CHICAGO, ILLINOIS. 13p. (BNL-3641).

259 TID-7556(p.113-16)
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
HOT LABORATORY PANEL DISCUSSION AT THE SIXTH HOT LABORATORIES AND EQUIPMENT CONFERENCE, 1958 NUCLEAR CONGRESS, MARCH 16-21, 1958. L. D. Turner. p.113-16 [of] SIXTH HOT LABORATORIES AND EQUIPMENT CONFERENCE, MARCH 19-21, 1958, INTERNATIONAL AMPHITHEATRE, CHICAGO, ILLINOIS. 4p.

The layout of the Radiometallurgy Laboratory at Hanford is illustrated and equipment is discussed. Operation and services are briefly reviewed.

260 TID-7556(p.135-54)
Westinghouse Electric Corp. Bettis Atomic Power Div., Pittsburgh.
REMOTE METALLOGRAPHIC EQUIPMENT AND PRACTICES. F. M. Cain and F. O. Bingman. p.135-54 [of] SIXTH HOT LABORATORIES AND EQUIPMENT CONFERENCE, MARCH 19-21, 1958, INTERNATIONAL AMPHITHEATRE, CHICAGO, ILLINOIS. 20p.

A review of equipment and practices used in the remote metallographic facility at Bettis is presented. The modifications of various pieces of equipment are outlined in addition to their operation and advantages. Deviations from normal operations or special techniques are discussed for specific operations. There are sections on the construction of the basic cell, the supporting equipment such as the liquid waste disposal system, design and operation of a remote sectioning machine, mounting techniques, grinding and polishing procedures, etching equipment and techniques, transfer and storage facilities, photography, hardness testing, and operating techniques for specific materials as related to the problems encountered in processing radioactive materials.

261 (TID-7599(p.210-23)) **A VERSATILE UNIVERSITY LABORATORY FOR STUDIES ON THE BASIC CHEMISTRY OF ALPHA EMITTERS. Fritz Weigel (Munich. Universität. Institut für Anorganische Chemie).**

The facility described is equipped with special enclosures for the following type of work: aqueous and dry chemistry, x-ray diffraction, emission spectroscopy, and micrometallurgy of weighable amounts of α-emitting elements and their compounds. The enclosures, which are described in detail, are of the type which was first introduced into this kind of work at the Berkeley Lawrence Radiation Laboratory. The particular advantages for this type of laboratory for teaching and research of graduate students are discussed. It is shown that the otherwise hazardous work with strong α-emitters becomes relatively simple in the gloved box, and it becomes possible to work with several different radionuclides at the same time, something which is impossible on the open bench because of the danger of cross contamination.

262 (TID-7677(p.603-28)) AIR-FLOW PERFORMANCE IN FUME HOOD EXHAUST SYSTEMS IN CENTRAL RESEARCH AND ADMINISTRATION BUILDING 4500-SOUTH, ORNL. R. H. Forde (Oak Ridge National Lab., Tenn.).

A series of performance tests was conducted to determine causes and possible corrections for fume leakage problems in air-handling systems in Building 4500-South, ORNL. It was concluded that the convection currents induced by the heat inside the hoods were the basic cause of the disturbance in flow pattern. Various types of panels were installed to deflect the air flow inside the hood and to contain the air at the increased pressure resulting from internal heat sources.

263 TID-8016
Technical Information Service, AEC.
CONSTRUCTION OF FACILITIES FOR RADIOACTIVE WORK. C. N. Perleberg, Knolls Atomic Power Lab. Nov. 1, 1956. 9p. $0.50(OTS).

One of Its Monograph Series "The Industrial Atom."

The auxiliary facilities constructed at Knolls Atomic Power Laboratory for radioactive work are described. The concrete shielding is an aggregate composed of ferrophosphate and has a weight of 290 to 300 lb/ft^3. The air supply and exhaust system uses Chemical Warfare Service filters to remove any radio contaminants. The air outside the lab is monitored to insure that no radioactivity is being released above acceptable limits. The waste processing and storage are described.

264 (TID-14742) RADIOISOTOPE TECHNOLOGY. Manual for AEC-NSF Institute. Lloyd E. Brownell (Michigan. Univ., Ann Arbor). June 1961. Contract [AT(11-1)-975]. 574p.

Principles of radioisotope technology are reviewed from the standpoint of radiation protection during scientific and industrial applications of radiation. Topics discussed include safety in work with radioisotopes, the design and use of radiation laboratories, nuclear radiation detection and measurement, methods of radiation dosimetry, counting equipment, gamma shielding, experimental techniques in tracer studies, and experiments in radioisotope technology.

265 (UCRL-9659) CLOSE-CAPTURE ABSORPTION SYSTEM FOR REMOTE RADIOISOTOPE CHEMISTRY. Neil C. Spencer, Thomas C. Parsons, and Patrick W. Howe (California. Univ., Berkeley. Lawrence Radiation Lab.). Aug. 17, 1961. Contract W-7405-eng-48. 29p.

Molecular sieves are used as the basic adsorber in a close-capture air recirculation system designed primarily for remote operation with master-slave equipment. A compact evaporator-dissolver unit provides a vessel for dissolution of an Al slug containing the radioactive material and provides an evaporator head under which volume reduction may be carried out within a specially prepared centrifuge cone. One movable condenser serves both operations. Resistance films of Pt provide heat for the centrifuge cone and for a jet of air impinging on the surface of the liquid being evaporated. Moisture and acid vapors from the chemical operations are pumped from the main box and adsorbed on the molecular sieves in a separate enclosure. The dry air is then returned to the main box. Thus, by capturing vapors within a closed system and by continuously recirculating the box air through the absorbers, a reasonably dry atmosphere is maintained at all times within the chemistry enclosure, and corrosive action is effectively reduced.

266 WAPD-PWR-CP-3052
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
DECONTAMINABILITY OF STRUCTURAL MATERIALS AND SURFACE COATINGS FOR USE IN NUCLEAR INSTALLATIONS. R. Lloyd. May 28, 1957. 18p. $4.80(ph OTS); $2.70(mf OTS).

A standard procedure for washing under rigorously reproducible conditions was used to clean radioactive contamination from a variety of surface coatings and structural materials. Specific data on the clean-up properties of these materials are tabulated.

267 WASH-275
Division of Reactor Development, AEC.
SANITARY ENGINEERING CONFERENCE, BALTIMORE, MARYLAND, APRIL 15–16, 1954. Aug. 1955. 332p.

Twenty-six papers on various phases of sanitary engineering are included in this report. The results of radioactive waste-disposal operating and research activities at various AEC and contractor installations are presented and reviewed.

268 Y-659
Oak Ridge National Lab., Y-12 Area, Tenn.
FACILITIES FOR PROCESSING ALPHA–ACTIVE ISOTOPES. F. N. Case. Sept. 1, 1950. Decl. Jan. 30, 1956. 24p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

Laboratory equipment and procedures developed for processing alpha-active isotopes safely and with very low contamination and dispersal of materials have been tested with excellent results. Applied to the concentration of U^{234}, these facilities have made it possible to recycle 36 grams of U for four passes through the electromagnetic separation equipment with 99.6% recovery per cycle. A wide margin of safety in the exposure of personnel was maintained.

269
PLANNING THE RADIOACTIVITY LABORATORY. John M. Ruddy (Brookhaven National Lab., Upton, N. Y.). Plant Eng. 10, No. 8, 83-6, 174-5(1956) Aug.

270
WISSENSCHAFTLICHE REFERATE UND BERICHTE DER 2. TAGUNG DER ARBEITSGEMEINSCHAFT DER STRAHLENSCHUTZARZTE DES DEUTSCHEN ROTEN KREUZES BONN, 28.-30. NOVEMBER 1956. (Scientific Reviews and Reports of the Second Meeting of the Study of the German Red Cross from November 28 to 30, 1956, in Bonn). Siegfried Balke. No. 1 of "Schriftenreihe des Bundesministers fur Atomkernenergie und Wasserwirtschaft. Strahlenschutz." Brunswick, Gersbach and Sohn Verlag GmbH, 1957. 184p. DM 4.

The papers and reviews given at the second working conference of German Red Cross radiologists are presented. The topics discussed include radiation effects on gene constitution, radiation damage of human genes, pathological and anatomical study of radiation genetics and radiation damage of fetus, gynecological consequences and embryonic damage in radiation burdens, arrangement of isotopic laboratories, incorporation of radioactive materials, evaluation of radiation protection precautions, ultrasonic resistance of leukocytes in acute radiation syndrome in rats, procedures in catastrophic incidents, first-aid in radiation injury, and contamination of soil, water, and air with radioactive particles. Brief reviews were also presented on the work of various conferences, congresses, and commissions.

271
HOT LABORATORY OPERATION AND EQUIPMENT. VOLUME III. John R. Dunning and Bruce R. Prentice, eds. New York, Pergamon Press, 1957. 306p.

Papers presented at the Conference on Hot Laboratories and Equipment are given. This volume is broken down into six sections, including hot laboratory facilities, hot laboratory operations and administration, equipment for hot chemical and physical operations, equipment for hot mechanical and metallurgical operation, hot cell installations, and specialized hot operations.

272
NEW DOUNREAY LABORATORIES EXEMPLIFY CURRENT BRITISH PRACTICE. Nuclear Power 2, 317(1957) Aug.

273
GENERAL CHARACTERISTICS AND EQUIPMENT OF A RADIOCHEMICAL LABORATORY. F. Gadda and A. Scaroni. Energia nucleare (Milan) 4, 379-90(1957) Oct. (In Italian)

The basic rules connected with the construction and the operation of a low level radiochemical laboratory are given together with the approximate prices for the installation of special equipment.

274
DESIGN, INSTALLATIONS, AND EQUIPMENT FOR A RADIOISOTOPE LABORATORY. George G. Manov (Atomic Energy Commission, Washington) and Eduardo Schalscha B. (Universidad de Chile, Santiago). Bol. centro Investigaciones Nucleares Universidad Chile 1, 3-20(1957) Nov. (In Spanish)

In the design of a radioisotope laboratory there must be a balance between the work program, number of personnel, necessary equipment, and cost. A review is presented of the equipment and installations necessary for laboratories handling either low- or high-level activities. Approximate cost figures are given.

275
THE ATOMIC RESEARCH CENTER-KARLSRUHE. Laboratory for Isotope Distribution. K. Hogrebe. Atomwirtschaft 2, 432-3(1957) Dec. (In German)

276
ANALYTICAL CHEMISTRY INSTALLATION FOR RADIOACTIVE PRODUCTS. M. Douis, A. Guillon, H. Laurent, R. Sauvagnac (Centre d'Études Nucléaires, Saclay, France). Compt. rend. congr. intern. chim. ind., 31^{e}, Liège, Belg., 1958 1, 687-92. (In French)
A sealed, shielded enclosure is described which permits manipulation and analytical control of radioactive products. Some of the techniques that are adapted for remote operation are pipetting, weighing, centrifugation, drying, volumetry, pH measurement, potentiometry, colorimetry, and polarography. Other apparatus can be quickly installed. Protected by 5 cm of lead and well ventilated, it gives complete security in manipulation up to a level of 400 millicuries of long-lived fission products.

277
THE ARGONNE HIGH LEVEL GAMMA IRRADIATION FACILITY: DESCRIPTION AND OPERATING PROCEDURES. H. Gladys Swop (Argonne National Lab., Lemont, Ill.). Atompraxis 4, 249-54(1958).
The facility is a canal in which spent fuel rods from the Materials Testing Reactor are contained in specially constructed racks, the latter being at the bottom of the canal. The canal is 28 feet long, 14 feet wide, and 24 feet deep. The water level varies from 16 to 20 feet. The water is used as a coolant and shield for the spent fuel rods. The water is demineralized and is continuously recirculated through a mixed bed ion-exchange unit at the rate of 800 gallons per hour. The average temperature of the water is 76°F. There are three underwater irradiation racks in the gamma canal. In the main rack there are twelve fuel rods arranged in the form of a honeycomb, so that there are six sample ports surrounded by four fuel rods and six sample ports adjacent to two fuel rods. Where four fuel rods surround a sample, the sample being four inches in diameter, intensities as high as 3.5×10^6 rads/hr have been obtained. Another rack is a cylindrical one in which a sample as large as 20 inches in diameter and 30 inches high may be irradiated. There are eight fuel rods surrounding this sample cylinder. Due to its large diameter and the fact that the fuel rods in this rack are at least 150 days old, the gamma intensity in the center of this rack may be only 15,000 rads/hr. In the third rack, which is a rectangular one, still older fuel rods are used but the sample cylinders are the same as those used in the main rack, namely $4\frac{1}{8}'' \times 28''$ and when four fuel rods surround a sample the intensity is about 200,000 rads/hr. In this rack the samples do not rotate while in the other two racks they do. Dosimetry is measured by ferrous sulfate solution 0.8 N sulfuric acid.

278
DESIGN AND VARIOUS ASPECTS IN PLANNING RADIOISOTOPE LABORATORY. D. Vödrös. Energia es Atomtech. 11, 135-7(1958). (In Hungarian)
Descriptions are given of the practical design, floor plans, and various technical and safety aspects in the construction of radioisotope laboratory. The description includes laboratories for handling the upper, medium, and lower levels of radioactivity. The necessary remote-control equipment and decontamination and personnel protection measures as well as construction costs are included.

279
THE DEVELOPMENT OF RADIOCHEMICAL FACILITIES AT LUCAS HEIGHTS. G. L. Miles and D. P. Sangster (Australian Atomic Energy Commission Research Establishment, Lucas Heights, New South Wales). p.731-8 of "Australian Atomic Energy Symposium, 1958."
A description is given of the radiochemical laboratories at Lucas Heights. Design problems, experimental facilities, and initial operating experience are discussed.

280
RADIATION HAZARDS AND PROTECTION. D. E. Barnes and Denis Taylor. London, George Newnes Limited, 1958. 185p.
Information is presented on the following topics: nature and properties of radiation; units of radiation and radioactivity; radioactivity; effects of radiation of the human system; naturally occurring radiations; the standard man; permissible doses; radiation output; measurement of radiation; fundamentals of instrumentation; building and laboratory design; shielding design; instruments for the measurement of radiation dose-rate; personal protection; instruments for measuring radiation dose; surface contamination; contamination monitors; air sampling; biological monitoring; apparatus and methods of radioassay; waste disposal; transport of radioactive material and other legal aspects; and radiation from nuclear weapons.

281
RADIOISOTOPE LABORATORY TECHNIQUES. R. A. Faires and B. H. Parks. London, George Newnes Limited, 1958. 252p.
A practical guide to the laboratory use of radioisotopes is presented. The terminology may be easily understood by workers having only basic scientific knowledge. The theory of nuclear physics is reviewed briefly. Design features and equipment for radiation laboratories are discussed. Electronic techniques are discussed and radiation detection equipment and techniques are described. Applications of isotopes are reviewed.

282
HARWELL'S NEW "HOT" FACILITY. Atomics and Nuclear Energy 9, 60-1(1958) Feb.
The design, equipment, procedures, and safety precautions used in this facility are described.

283
A NEW LABORATORY FOR BERYLLIUM RESEARCH. John D. Abbatt, F. L. Griffiths, and P. J. Phennah. G.E.C. Atomic Energy Rev. 1, 154-9(1958) Mar.
After a brief summary of the precautions necessary when working with beryllium, a full description is given of a laboratory specially constructed for such work by the G.E.C. at Erith. Details, including illustrations, are given of the air-conditioning arrangements and of operating procedures. A brief description of the method used for monitoring beryllium concentrations is included.

284

SIXTH HOT LABORATORIES AND EQUIPMENT CONFERENCE, MARCH 19-21, 1958, INTERNATIONAL AMPHITHEATRE, CHICAGO, ILLINOIS. [New York, American Institute of Chemical Engineers, 1958]. 375p. $10.00.

Radiochemical cells and process facilities in the United States and at a number of European establishments are described. Irradiation facilities and associated equipment in the United States are described. Hot laboratory practices and equipment, operation, and safety are discussed.

285

WORKING TECHNIQUES IN RADIOISOTOPE LABORATORIES. Daniel Vödrös. Energia és Atomtech. 11, 310-12(1958) Apr.-May. (In Hungarian)

Personnel safety, remote control instruments, and shielding in laboratories preparing and handling radioisotopes are discussed. The problems of storage and transportation of radioactive materials are also analyzed.

286

ACTIVITY LEVELS IN RELATION TO LABORATORY DESIGN AND PRACTICE. A. R. W. Wilson (Australian Atomic Energy Commission Research Establishment, Lucas Heights, New South Wales). p.147-51 of "Radiation Biology. Proceedings of the Second Australasian Conference on Radiation Biology held at the University, Melbourne, 15-18 December 1958, by the Australian Radiation Society." J. H. Martin, ed. New York, Academic Press Inc. and London, Butterworths Scientific Publications, 1959.

In planning an experiment involving radioactive material, proper consideration must be given to the measures, appropriate to the amount and toxicity of the nucleide involved, which should be adopted as protection against the hazards of ingestion and inhalation. Particular consideration must be given to the type and finish of the laboratory building and the requisite degree of containment of the experiment. It is not possible to formulate rigid rules concerning laboratory design since a number of parameters, which determine the degree of hazard, cannot be evaluated except as a result of experience and then only as lying within a relatively broad range. The activity levels calculated for application at Lucas Heights are presented. It is emphasized that these figures were developed only as a guide to assist in the initial operation of an establishment. They must necessarily be amended in the light of experience and may well prove to be far removed from the limits determined by practice.

287

ARRANGEMENT OF SANITARY LOOPS IN LABORATORIES AND SHOPS DEALING WITH RADIOACTIVE MATERIALS. Miloš Panýr (Chemoprojekt, Prague). Jaderná energie 5, 161-4(1959). (In Czech.)

The paper gives information about sanitary loops in laboratories and shops dealing with radioactive materials. After the principal data have been given, the classification of loops by categories is described. Suggestions about their extent and also some examples of their arrangements are given.

288

PRACTICAL ASPECTS OF PROTECTION AGAINST RADIATION IN LABORATORIES USING RADIOELEMENTS. Jacques Pradel (Commissariat a l'Énergie Atomique, Paris). Énergie nucléaire 1, 77-84(1959) May-June. (In French)

The manipulation of radioelements presents danger both from external irradiation and from contamination. Against the former, shields of various compositions and thicknesses are used depending on the nature and activity of the radioactive source. Protection against contamination poses more complex problems. The principal protective equipment used is described: ventilated hoods, glove boxes, boxes with grips, and telemanipulators. The basic principles of the idea and of the management of the protective structure and of containment of the manipulation are pointed out. The rules to be observed in manipulating radioelements are reviewed as well as the means of controlling irradiation and contaminations.

289

EQUIPMENT FOR HANDLING MILLICURIE AMOUNTS OF RADIOISOTOPES. W. J. Blaedel and Eugene D. Olsen (Univ. of Wisconsin, Madison). Anal. Chem. 31, 1608(1959) Sept.

A description of laboratory equipment for the handling of millicurie amounts of radioisotopes is given.

290 THE HIGH-ALPHA-RADIATION ANALYTICAL FACILITY OF THE OAK RIDGE NATIONAL LABORATORY. J. H. Cooper (Oak Ridge National Lab., Tenn.). Talanta, 6: 154-8(1960).

Originally concentrated plutonium and U^{233} solutions were assayed in the High-Alpha-Radiation Analytical Laboratory and the control analyses associated with the ion-exchange isolation of these solutions were also carried out in this facility. However, during the past few years, the high-alpha-laboratory was also used to provide analytical services for all development programs concerned with the processing of α-emitting materials, such as Np^{237} and Am^{241}. A brief description of the methods of analysis and techniques is presented. Mention is made of some of the special problems that have arisen concerning the handling of α-emitting materials. Future plans for a transplutonic analytical facility are also discussed.

291

MATERIALS FOR ISOTOPE LABORATORIES. L. Von Erichsen (Universität, Bonn). Atomwirtschaft 2, 72-4 (1960) Feb. (In German)

Isotope laboratories are more fastidious than conventional chemical laboratories with respect to the choice of suitable working materials. There are, however, materials with outstanding properties available. Numerous materials such as wood, steel, tiles, plastics (PVC, polyethylene, polypropylene, PTFE) and many others are compared with respect to their existing properties as construction materials; in particular with respect to important properties such as ease of working and shaping, corrosion resistance against acids and alkalies, solvent resistance, surface finish, heat resistance, ease of renovation, adhesive bonding, and price.

292

RESEARCH ON THE SUITABILITY OF INDUSTRIAL MATERIALS FOR CONSTRUCTION AND EQUIPPING OF ISOTOPE LABORATORIES. H. Koch (Institut für angewandte Radioaktivität, Leipzig). Kernenergie 3, 109-16(1960) Feb. (In German)

In the equipment of isotopes laboratories for different degrees of danger and various needs one must give particular attention to ventilation, waste, radiation protection, and contamination considerations. It is very important in this connection to know the mechanical and chemical behavior of individual construction materials as well as of the different radioisotopes. When construction of the Institute for Applied Radioactivity building began in 1956, there was only very little experience in this field. It was necessary to test covering materials for floors, walls, tables, and hoods, as well as protective covers for furniture and apparatus for their behavior with respect to the acids, alkalies, solvents, and radioisotopes to be used. For the latter tests, aqueous solutions of chemical compounds of Co^{60} and P^{32} were used.

293
TYPICAL DESIGNS OF BUILDINGS FOR THE ORGANIZATION OF RADIOLOGICAL DEPARTMENTS FOR DIVERSE PURPOSES. S. L. Kanevskiĭ. Med. Radiol. 5, No. 8, 46-52(1960) Aug. (In Russian)

The characteristics of typical designs for radiological departments with presentation of design solutions, equipment, and technico-economical indexes are discussed.

294 EVALUATION AND STORAGE OF ACTIVE AND DOUBTFUL WASTES AT THE INTERIOR OF LABORATORIES. F. Dubois. Bull inform. sci. et tech. (Paris), No. 44, 38-44(Oct. 1960). (In French)

A hot laboratory has a disposal system for doubtful wastes and one for active wastes. The active and doubtful systems are described briefly by giving some indications on the selection of materials and linings. The active waste system is comprised of the reject points, the evacuation system, the storage, and the pumping system. Each part is described.

295 THE DESIGNING OF LABORATORIES AND RADIATION SAFETY. V. P. Granilshchikov and G. M. Parkhomenko. Med. Radiol., 5: No. 12, 47-56(Dec. 1960). (In Russian)

Data are given as pertinent to the importance of designing of laboratories for work with radioactive substances in the problem of securing radiation safety for research workers. Examples are given of zonal designing in accordance with the sanitary requirements.

296 ZASHCHITNOE OBORUDOVANIE I PRISPOSOBLENIYA DLYA RABOTY S RADIOACTIVNYMI VESHCHESTVAMI. (Radiation Shielding and Instruments in Handling Radioactive Materials). G. N. Lokhanin, V. I. Sinitsyn, and A. S. Shtan. Moscow, Gosatomizdat, 1961. 130p.

Practical data are given on protective measures and rules in handling radioactive materials in a laboratory. The laboratory equipment and furniture, shielding chambers, hood exhausts, shielding blocks and screens, and remote-control devices and instruments are discussed. Transportation containers and waste disposal measures are also discussed. Detailed descriptions are given of clothing, boots, and gloves for the personnel handling radioactive materials and waste.

297 NUCLEAR FACILITIES DESIGN METHODS BASED ON RADIATION SHIELDING. Masaaki Sakuta (Taisei Construction Co.). Proc. Japan Conf. Radioisotopes, 4th, 666-9(1961). (In Japanese)

Considering the design of nuclear industry facilities, it is necessary to add two design factors for safety—protection of radiation and protection from contamination—onto the other design factors of common facilities (buildings and equipments). Fundamental design techniques of nuclear industry facilities, including buildings and equipments, based on the techniques of protection of radiation are studied.

298 ON THE HOT LABORATORY OF RIKKYO UNIVERSITY ATOMIC INSTITUTE. Tetsuo Takaishi and Tatsuo Matsuura (Rikkyo Univ. Atomic Inst.). Proc. Japan Conf. Radioisotopes, 4th, 677-82(1961). (In Japanese)

The outline of the laboratory of Rikkyo University Reactor is reported, as well as the results of tests of shielding, ventilating system, etc.

299 DESIGN AND OPERATION OF THE RADIOCHEMISTRY LABORATORY. PART II. G. R. Hall (Imperial Coll., London). Nuclear Energy, 111-13(Mar. 1961).

The problems of providing adequate ventilation and effluent control in radiochemical laboratories are discussed. The calculation of air changes for a particular laboratory setup and fumehood design are considered. Extraction filtration must be used for the air from class A and B laboratories, and the air should be released to the atmosphere at or above roof level. For effluent control in a class A laboratory, all drainage is usually fed to delay tanks which can be monitored prior to disposal or treatment. The disposal of radioactive solid wastes and the more highly radioactive liquid wastes is also discussed. The storage of active sources and materials is briefly considered; rooms for such storage should be ventilated. Various laboratory materials are discussed, e.g., floor covering, walls, sinks, furniture, and fumehoods. Finally, the problems of laboratory management are discussed, and some safety precautions and a possible procedure for use in case of accidents involving radioactive materials are given. It is strongly recommended that the designer and scientist meet at the earliest possible stage in the design of the radiochemical laboratory.

300 LABORATORY SPECIALIZED IN THE PRODUCTION OF RADIOELEMENTS. C. Fisher. Bull. inform. sci. et tech. (Paris), No. 51, 17-21(May 1961). (In French)

France is second only to Great Britain in the production of artificial radioisotopes in Europe. In 1959 construction was started on a hot laboratory for the production of radioisotopes. The laboratory is described and sketched. The interior equipment of the hot laboratory is indicated.

301 TRANSURANIUM DEVELOPMENT FACILITY. B. B. Klima (Oak Ridge National Lab., Tenn.). p.27-34 of "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Illinois, November 7-9, 1961." Chicago, American Nuclear Society, 1961.

An alpha-tight transuranium development facility was designed and is being installed in a cell with the immediate objective of studying the chemistry of the recovery of americium and curium from rare earths and fission products by ion exchange techniques. In addition, it is to provide a facility in which may be tested design concepts and equipment for use in a larger Transuranium Laboratory and Facility, now in the preliminary stages of design.

302 RADIOACTIVE MATERIALS LABORATORY UNION CARBIDE NUCLEAR COMPANY. C. F. Vandenbulck (Union Carbide Nuclear Co., Tuxedo, N. Y.). p.35-43 of "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Illinois, November 7-9, 1961." Chicago, American Nuclear Society, 1961.

The Radioactive Materials Laboratory (hot lab) at the nuclear research center of Union Carbide Corporation is described. Features of this facility include: transfer of radioactive material from the reactor pool directly to the hot cells via a canal; a large canal gamma facility utilizing spent fuel elements; an unique, inexpensive intercell conveyor; and an integrated plant for treating radioactive waste liquids. A 4,000 curie Co^{60} source, utilized for radiation chemistry studies, is in one cell.

303 NEW DECONTAMINATION CHAMBER. M. E. McMahan (General Electric Co., Richland, Wash.). p.195-200 of "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Illinois, November 7-9, 1961." Chicago, American Nuclear Society, 1961.

The installation of the decontamination chamber in the Hanford Radiometallurgy Laboratory greatly reduced the radiation exposure, air-borne contamination, cleaning time, and increased the efficiency. This stainless steel chamber uses plant steam, water and decontamination solutions through two solenoid controlled spray nozzles.

304 LABORATORY FOR PLUTONIUM FUEL ELEMENT FABRICATION AT CADARACHE. Y. Duvaux, R. Mas, A. Junca, and H. Dick (Commissariat a l'Energie Atomique, [Paris]). p.307-14 of "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Illinois, November 7-9, 1961." Chicago, American Nuclear Society, 1961.

The first hot laboratory that is going to be operating at the new Nuclear Research Center of Cadarache is described. This is the Laboratory for Plutonium Fuel Element Fabrication mainly designed for the fabrication of the plutonium fuel elements for the Rapsodie reactor. The general design of the building, with its emergency approaches in case of accident, and the safety systems by telealarm in case of incident or accident, are emphasized.

305 PROCEEDINGS OF THE NINTH CONFERENCE ON HOT LABORATORIES AND EQUIPMENT, CHICAGO, ILLINOIS, NOVEMBER 7-9, 1961. Paul R. Fields, ed. (American Nuclear Society, Chicago). 399p. $10.00(ASN)

306 ON THE HOT METALLURGY LABORATORY IN JAERI. I. STUDY FOR FUEL DEVELOPMENT, (8). Kiyoaki Taketani (Japan Atomic Energy Research Inst., Tokyo). Nippon Genshiryoku Gakkaishi, 3: 929-35(Dec. 1961). (In Japanese)

The design, construction, and operation of the hot metallurgy laboratory in the Japan Atomic Energy Research Inst. are described. The facility is mainly used for post-irradiation test of irradiated fissile materials and fuel elements from reactors. It has five unit cells, operation room, changing room, decontamination room, and so on. The shielding of these cells is composed of heavy concrete and lead glass windows withstanding 10,000 curie activity. The area of the unit cell is 8 ft by 8 ft and each cell has its own M-8 type manipulator and power manipulator traveling between all cells. Ventilation, monitoring, lighting, emergency power supply, and utilities in the laboratory are discussed.

307 FOUR YEARS OPERATING EXPERIENCE AT THE SACLAY LABORATORY FOR RESEARCH ON IRRADIATED FUELS (LECI). C. E. Brebant and F. L. Mathern (Commissariat à l'Energie Atomique, Fontenay-aux-Roses, France). Proc. Hot Lab. Equip. Conf., 10th, Washington, D. C., 1962: 69-82(1962).

Operating experience at the Saclay Laboratory after 4 years is described. The laboratory consists of four machining caves and one storage cave in a line with protection for 10^4 C, and six analysis caves with protection for 100 C. Operating experience with the original equipment in the machining cave indicated the need for complete redesign. The redesign increased the remote repairability and reduced the decontamination and removal time of the equipment. Other changes improved the accuracy and efficiency with which the equipment can be operated. The laboratory building was modified to increase the size of a hot change room and a new cold change room was added.

308 SANITATION RULES IN HANDLING RADIOACTIVE MATERIALS AND IONIZING RADIATION SOURCES. p.79-143 of "Sbornik Vazhneishikh Ofitsial'nykh Materialov po Voprosam Gigieny Truda i Proizvodstvennoi Sanitarii." Moscow, Medgiz, 1962.

Sanitation rules and standards are given for all laboratories and establishments handling or transporting radioactive materials. The regulations cover the general conditions and location of laboratories and installations, storage and transportation rules, dosimetric devices, ventilation, heating, plumbing, emergency measures, waste disposal, and personal hygiene and sanitation. Permissible doses for various radioisotopes and symptoms of radiation injuries are enumerated. Invoices and official forms are included.

309 VOPROSY BEZOPASNOSTI V URANOVYKH RUDNIKAKH. (Safety in Uranium Mines). V. I. Baranov and L. V. Gorbushina. Moscow, Publishing House of Literature on Nuclear Science and Technology, 1962. 186p.

A survey is given on radiation effects on human organisms and on permissible levels of γ and beta radiations. Dosimetric characteristics of various types of radiation and calculation methods for determining radiation doses from emitters with various configurations are discussed. Safety techniques, dosimetric equipment, and installations for laboratories handling radioactive materials are described. Radiometric sampling, waste disposal, and safety factors in uranium and radon mining are discussed as well as measuring devices for determining air contamination by radioactive aerosols.

310 PRIMARY PHASE IN THE DEVELOPMENT OF THE NUCLEAR CENTER OF MOL. J. Goens and M. d'Hont (Centre d'Etude de l'Energie Nucléaire, Brussels). p.187-96 of "Programming and Utilization of Research Reactors. Vol. 1." London, Academic Press, 1962. (In French)

The activities of the laboratories at Mol comprise: applied research dealing with fuel cycles, reactors, and radioisotope production; basic research in physics, chemistry, and biology; personnel and environs radiation-monitoring duties; studies of reactor exploitation and applied mathematics; and machine and instrumentation shops. These activities, as well as the research, maintenance, administration, and protection of personnel are outlined.

311 AN ENGINEERING-SCALE HIGH-ALPHA FACILITY FOR PLUTONIUM FLUORIDE VOLATILITY PROCESS STUDIES. G. J. Vogel, E. L. Carls, W. J. Mecham, and A. A. Jonke (Argonne National Lab., Ill.). Proc. Hot Lab. Equip. Conf., 10th, Washington, D. C., 1962: 287-92(1962).

An outline of the Fluoride Volatility Process is presented along with descriptions of the alpha containment boxes and equipment and discussion on the ventilation air and process off-gas handling schemes, critical path method for planning and scheduling construction jobs, and purchase cost data for various sizes of Chemical Engineering Hood, Alpha Modular (CENHAM) boxes. In the process the separation of fuel element components (uranium, plutonium, and fission products) is based on the chemical and physical properties of the fluorides formed by fluorinating a dejacketed element at 500°C in a fluidized bed reactor.

312 A RADIOISOTOPE PRODUCTION FACILITY UTILIZING THE INCHAS 2 MW RESEARCH REACTOR. H. Mahmoud, M. A. El-Guebeily, and E. Hallaba (Atomic Energy Establishment, Cairo). p.395-403 of "Programming and Utilization of Research Reactors. Vol. 3." London, Academic Press, 1962. (In English)

The isotope production laboratory and its ventilation, waste disposal, radiation monitoring, and internal communication systems are described.

313 IMPROVEMENTS IN OR RELATING TO EQUIPMENT FOR HANDLING DANGEROUS SUBSTANCES. Kenneth Winfield Bagnall and Daniel Stewart Robertson (to United Kingdom Atomic Energy Authority). British Patent 887,367. Jan. 17, 1962.

An apparatus for carrying out operations on toxic or radioactive substances comprises a circular gastight chamber with a turntable situated within. A window is provided in the wall of the chamber, and glove ports are provided in both the table and the base plate of the chamber. The table may be rotated to register the gloveports for transport of objects into or from the chamber.

314 EQUIPMENT FOR HANDLING DANGEROUS SUBSTANCES. Kenneth Winfield Bagnall and Daniel Stewart Robertson (to United Kingdom Atomic Energy Authority). U. S. Patent 3,038,787. June 12, 1962.

A gas-tight chamber is designed for carrying out operations or treatments on radioactive or toxic materials. The chamber has a window with glove ports, and a turntable is located within the chamber. Ports are provided for rotating the table, and a horizontal passageway beneath the chamber may be used to transfer materials or equipment to another chamber.

315 METALS DEVELOPMENT PROCESS INTEGRATED WITH AIR CONDITIONING AT AEC'S AMES LAB Robert W. Flanagan. Heating, Piping Air Conditioning, 34: 97-102(July 1962).

High air requirements, varying loads, controlled interior pressure relationships, and limitations imposed by building design were the complicating factors in providing air conditioning for the Atomic Energy Commission's new metals development lab at Ames, Iowa. A split air and water system was the answer. An interesting feature of this system is that by using the absorption machine as a condenser in the lab's distilled water process as well as to provide air conditioning, equipment and operating costs were minimized. A detailed description of the design and control of this installation is presented.

316 DANGER OF CONTAMINATION OF ISOTOPE LABORATORIES. S. Simon and R. Constant (Université, Brussells and Centre d'Étude de l'Énergie Nucléaire, Mol, Belgium). J. Belge Radiol., 46: 306-18(1963). (In French)

Radioactive materials may be used as external emitters, as internal sources, or as tracers. According to their use in medical services or in biological research laboratories, the risks are different. In medical services, radioactive materials may be used in the form of either sealed or non-sealed sources. The sealed sources in general present but a risk of external irradiation. The sealed sources in general contain β or β-γ emitters with generally no risk of long-lasting residual radioactivity in organisms. The risks at manipulation level are equal to the radiotoxicity of mean or short-lived β and γ emitters. In the biological research laboratories, the risk may arise from the accumulation of many different substances. The need is stressed for constant surveillance to avoid contamination of laboratories.

317 ON JAERI'S HOT LABORATORY BASED ON ITS OPERATING EXPERIENCE. NO. I. M. Murakami, Y. Sumiya, Y. Sasaki, T. Otuka, H. Hagiya, and A. Sirasaki (Japan Atomic Energy Research Inst.). Proc. Japan Conf. Radioisotopes, 5th, No. 3, 7-9(1963). (In Japanese)

The High Activity Handling Building is a general purpose handling facility and has been in operation since September 1961. The facility is concerned with a wide variety of metallurgical study, such as capsule disassembling, mechanical tests of irradiated materials, metallography, and any other high-activity handling requirements that may arise. The experience gained in the operation of these facilities from September 1961 to January 1963 is described. The equipment, operational difficulties, and decontamination are discussed in relation to safe handling of high-activity materials.

318 ON JAERI'S HOT LABORATORY BASED ON ITS OPERATING EXPERIENCE. NO. II. Masatoshi Murakami, Tokutaro Matumoto, Hisanori Ito, and Kyoichi Abe (Japan Atomic Energy Research Inst.). Proc. Japan Conf. Radioisotopes, 5th, No. 3, 10-12(1963). (In Japanese)

The following aspects of the dissolving of irradiated UO_2 and the separation of Pu from the solution are described: method and installation of experiment, system of work, circumstance of contamination and method of decontamination, and handling of high-level radioactive waste.

319 LABORATORII DLYA RABOT S RADIOAKTIVNYMI VESHCHESTVAMI. (Laboratory for Working with Radioactive Materials). I. A. Reformatskii. Moscow, Gosatomizdat, 1963. 128p.

A general review is given of the rules and requirements for operating a laboratory handling radioactive materials. Descriptions are given of standard, special, and remote-control equipment used in hot laboratory cells. Means of protection, shielding, sanitation, and hygiene are discussed.

320 A RI LAB. OF NTT AND THE EXAMINED RESULTS OF EXHAUST AND LIQUID WASTE DISPOSAL FACILITIES. IBARAKI ANNEX OF ECL. Shozo Hagai, Soichiro Okishio, and Tatsuo Murakami (Ibaraki Annex, Electrical Communication Lab.). Proc. Japan Conf. Radioisotopes, 5th, No. 3, 19-21(1963). (In Japanese)

In 1962 a radioisotope laboratory was constructed at Ibaraki Annex by the Electrical Communication Laboratory, Nippon Telegraph and Telephone Public Corporation. The main building is of steel concrete and occupies 993 m^2. Radioisotope hoods for radiochemical and radiometallurgical work and storage for radioactive materials are provided. The ventilation system and liquid waste disposal facilities are described briefly. Tests showed that the elimination coefficient of I^{128} in exhaust line A was 99.9% and the collection coefficient of Mn^{56} in liquid waste disposal line A was 91.4%.

321 A DECONTAMINATION APPARATUS FOR RADIOISOTOPE LABORATORIES. I. Szantai and Cornelia Gherman. Rev. Chim. (Bucharest), 14: 161-3(Mar. 1963).

A decontamination apparatus built to avoid the accidental contamination of handlers by accidental direct contact or through atmospheric aerosols is described. The decontaminator is made entirely of plexiglass plates, can be applied to laboratory sinks as fully closed systems, and offers absolute protection against beta radiations. A lead screen may be added when gamma radiation is present.

322 A LARGE WORKING CHAMBER FOR THE USE OF β-EMITTERS. U. O. Schanze. Atompraxis, 9: 197-8 (May 1963). (In German)

A special designed experimental chamber for the use of beta emitting radioisotopes is described, which is completely constructed of rigid plastics. All manipulations with pure beta emitters even such of high activity and energy can be done. The "Beta Cave" is designed as a double chamber and fitted with all necessary installations.

323 RECENT TOPICS ON THE BUILDINGS FOR HANDLING RADIOISOTOPES. Shoichi Fujii. Radioisotopes (Tokyo), 12: 120-32(May 1963). (In Japanese)

324 HANFORD PLUTONIUM FUEL DEVELOPMENT LABORATORY. L. G. Merker and I. D. Thomas (General Electric Co., Richland, Wash.). Trans. Am. Nucl. Soc., 6: 160-1(June 1963).

325 IMPROVEMENTS IN OR RELATING TO GAS-TIGHT CHAMBERS FOR HANDLING TOXIC SUBSTANCES. Ernest Robert Landon (to United Kingdom Atomic Energy Authority). British Patent 928,849. June 19, 1963. Filed Aug. 18, 1960.

A gas-tight chamber including a posting port, a window, and glove ports in the window, is designed so that it can be rotated about a central vertical axis. The chamber is mounted on a fixed hollow spindle which is provided with a door for communication into the interior of the chamber.

326 COORDINATED DESIGN OF RADIOISOTOPE LABORATORIES. Chih H. Wang (Oregon State Univ., Corvallis), R. A. Adams, and Wyman K. Bear. Atomlight, No. 30, 1-10(July 1963).

The design of a laboratory especially for the applications of radioisotopes is described. Floor arrangement, ventilation and heating, electrical utilities, sewage disposal, radioactive waste disposal, laboratory fixtures, and radiochemical hoods are discussed.

327 LABORATORY PLANNING AND EQUIPMENT—TECHNICAL RADIATION PROTECTION IN OPERATOR'S ROOMS. G. Siewert. Kernenergie, 6: 428-36(Aug. 1963). (In German)

A review of the development and state of laboratory construction in the German Democratic Republic for the equipment of laboratories for work with radioactive materials is given.

328 THE CONSTRUCTION OF THE HOT AND ISOTOPE LABORATORY. P. Graf (EIR, Wurenlingen, Ger.), K. Metzger, and R. Stoehr. Neue Tech., 5: 490-7(Sept. 1963). (In German)

The basic principles to be followed in the construction of a hot laboratory are briefly indicated, and then the concepts used in the building of the Wurenlingen laboratory are given. The lay-out of the inactive, radiochemical, and hot cell sections are described.

329 PREPARATION OF THE PROTECTION NORM FOR A "HOT OPERATION LABORATORY." C. Cortissone (CNEN, Rome). Minerva Nucl., 7: 353-62(Sept. 1963). (In Italian)

The manual on radioactivity for the hot operations laboratory of the Center for Nuclear Studies of the CNEN at Casaccia (Rome) is presented. The presentation of the manual offers the opportunity for a complete description of the laboratory and the operations that can be carried out in it. An extract from the manual is given in an appendix.

330 RADIATION PROTECTION AND DECONTAMINATION IN ISOTOPE LABORATORIES. Ulrich O. Schanze. Acta Radiol. (N.S.), 1: 484-96(Dec. 1963). (In German)

An accident trolley is described that contains everything needed if an accident with radioactive materials occurs. Instructions for decontamination are given and measures to be taken after mishaps with open isotopes are recommended. Cleansing and treatment of laundry that is contaminated with radioactive materials are discussed and an active laundry is described.

331
INTERMEDIATE LEVEL RADIOCHEMISTRY HOT CELL. Philip F. Moore (Los Alamos Scientific Lab., N. Mex.). p.81-6 in "Proceedings of the Seventh Hot Laboratories and Equipment Conference."

The general design and systems layout of a radiochemistry hot cell is described. Design criteria included an unusually high degree of flexibility and versatility in operations with minimum set-up times and a control layout such that no special operators need be used. Rigid contamination control was also required as well as adherence to a modest construction budget.

VENTILATION AND FILTER SYSTEMS

332 AERE-E/M-70
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
IMPROVED LOW PRESSURE AIR EJECTOR AS A DRY BOX SUCTION UNIT. R. A. G. Welsher. June 30, 1953. 10p.

An investigation to obtain and improve the low-pressure suction flow of an air ejector used for dry box evacuation and to reduce the cost of such ejectors made from copper alloy pipe fittings is described in the Appendix of AERE C/M 152. A filter unit was added to prevent the transfer of contamination from the dry box to the main exhaust ducting. Optimum design figures are recommended.

333 BNL-27
Brookhaven National Lab., Upton, N. Y.
HOT LABORATORY TECHNICAL REPORT. I. VENTILATION STUDIES ON A RADIOCHEMICAL "SEMIHOT" CELL. John J. Keyes. Sept. 1, 1949. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 24p. \$4.80(ph OTS); \$2.70(mf OTS).

Observation of smoke patterns together with velocity explorations made possible an appraisal of the exhaust system of a Brookhaven type semihot bench for some anticipated operating conditions. It is concluded that 1400 cfm of air will adequately ventilate the bench and maintain 100 linear feet per minute through all openings.

334 CEA-656
France. Commissariat à l'Énergie Atomique, Paris. VENTILATION DES ENCEINTES RADIOACTIVES. (Ventilation of Radioactive Enclosures). F. Caminade and H. Laurent. May 1957. 19p.

This study deals with the individual equipment of small installations: glove boxes, manipulation boxes with outside control and, if necessary, production chambers (maximum useful volume: 5 m^3). The performance of three types of "ventilators", and the modifications provided by the addition of filters, are measured and compared.

335 (HW-53004(Del.)) AN EFFICIENT METHOD FOR RADIATION AND VENTILATION CONTROL OF CONTAMINATION ENCLOSURES. Process Technology Information Report. H. A. Moulthrop (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). Oct. 9, 1957. 14p.

An efficient method for shielding and ventilation of contamination enclosures containing process equipment for radioactive materials is described. A spacious, low-density, easily accessible, unshielded contamination enclosure is used for this method because it permits improved flexibility not only for process control and changes, but also for maintenance since it is adaptable for either unit replacement or in-line repair. By using this type of localized shielding around the individual process equipment units, a secondary internal ventilation control system can be used which provides control of radioactive particles which would otherwise escape from the unsealed equipment shields. A typical structure (hood) employing this long-range concept of radiation exposure control is shown in perspective along with a method for changing the filters in the ventilation system. This localized shielding is adaptable to the use of disposable liners.

336 (JPRS-12637) RADIOACTIVE WASTES IN THE ATMOSPHERE. THE PLANNING OF FACILITIES FOR REMOVING WASTES FROM AEROSOLS AND GASES. S. A. Prechistenskii (Prechistenskiy). Translated from p.1-14; 155-70 of "Radioaktivnye Vybrosy V Atmosferu. Proektirovanie Ustanovok Dlya Ochistki Vybrosov ot Aerozolei i Gazov" (a Publication of the State Publishing House for Literature in the Field of Atomic Science and Technology, Moscow, 1961). 67p.

General features of aerosols are reviewed, and the use of models in the design optimization of a facility for removal of radioactive dust and toxic gases from air is outlined. Methods are described for removal of these materials from air, utilizing filtration, absorption, adsorption, centrifuging, or combined methods. Precautions necessary for the prevention of the formation and spread of aerosols are discussed. Tabulations are given of maximum permissible concentrations of toxic gases, vapors, dusts, aerosols, and radioactive substances in the air in working areas, zones under sanitation protection, and populated areas. Parameters are tabulated for operation of a foam-bed facility for contaminant removal from air.

337 **Little, Arthur D., Inc.**
DEVELOPMENT OF A HIGH TEMPERATURE—HIGH EFFICIENCY AIR FILTER: SUMMARY REPORT. Issued Aug. 18, 1953. 48p. (NYO-4527)

A high-efficiency air filter made of noncombustible materials, suitable for use at temperatures of 500°F or higher and resistant to corrosive gases and fumes, has been developed. The filter medium (or paper) is a felt-like material similar in form and appearance to the low-temperature media now in use. It is composed of all-mineral fibers bonded together with a small amount of synthetic resin. Glass fibers of about 3 μ diam. provide 80% or more by weight of the fiber composition. Either asbestos fibers or very fine glass fibers are used with the coarser fiber. Two formulations are recommended, the choice being governed by economics and availability of materials. For low-temperature use the binder does no harm in the filter, and there is not enough present to be a fire hazard. When the filter is used at high temperature the binder decomposes harmlessly. Practical manufacture of the filter media on commercial equipment has been demonstrated by full-scale paper mill runs, and this report contains recommended mill procedures. A steel-frame filter unit design, using mineral fiber medium and a high-temperature cement, gives a finished product fulfilling the requirements to be met. Filter manufacturers have demonstrated that the unit is a practical production item. The new filter has the same high-efficiency performance and low air-flow resistance as the present low-temperature filters, performance is as good or better at 500°F, it will stand frequent wetting and drying, and it is resistant to many chemicals. Cost will be somewhat higher than for present filters.

338 (ORNL-3086) CALCULATED TRANSIENT PRESSURES DUE TO IMPULSE AND RAMP PERTURBATIONS TO VENTILATING SYSTEMS IN BUILDINGS 3019, 3026, 3508, AND 4507. J. J. Perona, W. E. Dunn, and H. F. Johnson (Oak Ridge National Lab., Tenn.). Aug. 15, 1961. Contract W-7405-eng-26. 63p.

As part of a general hazard review survey conducted by the Chemical Technology Division of its facilities, transient pressures due to impulse and ramp perturbations to the cell ventilating systems of buildings 3019, 3026, and 4607 and the closed glove box system of 3508 were calculated. From the portions of the pressure curves above atmospheric pressure, volumes of gas outleakage were estimated; thus the amount of activity released can be calculated if an estimate of the activity concentration is available. The volumes of outleakage for all four ventilating systems were small for reasonable sizes of perturbations. For an impulse perturbation causing an instantaneous rise of +8.0 in. H_2O, the length of time above atmospheric pressure and estimated outleakages for PRFP cells in 3019 are 1.5 sec and 3.1 ft^3, respectively; for volatility cell 1 in 3019, 0.33 sec and 0.45 ft^3; for cell A in 3026, 2.1 sec and 3.0 ft^3; for a glove box in 3508, 0.066 sec and 0.04 ft^3; and a cell in 4507, 0.26 sec and 0.03 ft^3.

339 (RFP-253) RADIOACTIVE FILTER BANK FIRE DETECTION SYSTEMS. R. W. Walker (Dow Chemical Co. Rocky Flats Plant, Denver). Dec. 27, 1961. Contract AT(29-1)-1106. 14p.

The detection of radioactive air filter fires is discussed. Criteria requirements for a suitable fire detection system were established. The applicability of aircraft-type fire detection systems for this use was evaluated. The operation of a discrete eutectic salt type continuous fire detection tubing system is outlined.

340 (TID-7023) INSPECTION, STORAGE, HANDLING, AND INSTALLATION OF HIGH-EFFICIENCY PARTICULATE AIR FILTER UNITS. Humphrey Gilbert

(Atomic Energy Commission, Washington, D. C.) and James H. Palmer (General Electric Co. Hanford Atomic Products Operation, Richland, Wash.). Aug. 1961. 34p.

A guide for the inspection, storage, handling, and installation of high-efficiency particulate air filter units is presented. Precautions and recommendations are given.

341 TID-7551(p.5-8)
Argonne National Lab., Lemont, Ill.
AIR CLEANING ACTIVITIES AT ANL. D. P. O'Neil. p.5-8 [of] FIFTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT THE HARVARD AIR CLEANING LABORATORY, JUNE 24-27, 1957. 4p.

The present status and future plans for air cleaning systems of the fuel fabrication facility, the senior cave, and the inert gas cave at Argonne National Laboratory are discussed. Investigation of the efficiency of hood prefilters is described.

342 (TID-7677(p.56-72)) SAFETY ASPECTS OF THE DESIGN OF FILTERED VENTILATION SYSTEMS. S. E. Smith, F. J. Hall, and W. E. Holmes (United Kingdom Atomic Energy Authority. Weapons Group. Atomic Weapons Research Establishment, Aldermaston, Berks, England).

A number of safety aspects of the design of filtered ventilation systems for radioactive and toxic buildings were considered. These include theoretical and experimental assessments of the heat release from fires of various kinds in workrooms, fume cupboards, glove boxes, and extract systems, the use of spark and flame arrestors, the ignitability of dust deposits in extract systems and filters, and the cooling of hot gases in exhaust ducts. As a result of this work, it was possible to formulate principles which should be followed in the layout and design of such systems, in the future; existing systems were found not to require any serious modification apart from installation of glass paper filters.

343 (TID-7677(p.86-101)) CONTAINMENT AND VENTILATION SYSTEMS IN THE TRANSURANIUM PROCESSING PLANT. B. F. Bottenfield, J. P. Nichols, W. D. Burch, O. O. Yarbro, and W. E. Unger (Oak Ridge National Lab., Tenn.).

The unique features of the ventilation and containment systems incorporated into the Transuranium Processing Plant, under construction at the Oak Ridge National Laboratory, are described. This facility is designed to recover from irradiated target rods by solvent extraction and ion exchange techniques gram quantities of many of the heavy actinide elements for research. Containment of process solutions is insured by surrounding the equipment with multiple negative-pressure systems, including final containment by maintaining the entire building at a −0.3 in. pressure. The effects of operational and accidental activity releases from the facility are discussed.

344 UCRL-3635
California. Univ., Berkeley. Radiation Lab.
OFF-GAS TREATMENT IN BERKELEY ENCLOSURES. M. D. Thaxter, H. P. Cantelow, and C. Burk. Jan. 7, 1957. 16p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

Developments at UCRL in off-gas treatment are reviewed. A multiple-purpose gas scrubber and a total capture system for slug-dissolver off gas are described.

345
VENTILATION FOR RADIOACTIVE WORK. BALANCING. OPERATION. MAINTENANCE. W. W. McIntosh. Heating, Piping, Air Conditioning 25, No. 7, 98-102(1953) July.

The basic problems to be considered in the design, operation, and maintenance of an efficient ventilation system for buildings wherein radioactive materials are handled or processed are outlined.

346
VENTILATING RADIOLOGICAL LABORATORIES. Melville G. Kershaw (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.). Chem. Eng. Progr. 52, Symposium Ser. No. 19, 15-24(1956).

Basic concepts and a description of successful solution to ventilating problems encountered in radiological laboratories are given. Radioactive contaminants, solid or gaseous, must be confined, controlled, collected, removed or diluted to prevent recirculation or contamination of surrounding areas. The control of radioactive contamination requires proper partitions, enclosures, hoods, etc. Air must flow from clean areas toward and into the more contaminated areas.

347
MEASUREMENT OF RADIOACTIVITY IN AIR FILTERS. E. J. Story and A. W. Waltnr (North Carolina State College, Raleigh). Health Phys. 2, 49-52(1959) July.

Measurements of the fall-out fission product activity that accumulates in the air filters employed in ventilation systems are described. A general method for determining the γ activity of pelletized filter samples using a NaI well-type crystal spectrometer is discussed. The photofraction of a well-type crystal was measured and data are presented for γ-ray energies from 0.12 to 1.12 Mev. It is suggested that building air filters be employed in monitoring programs connected with laboratories, reactors, and studies on fall-out.

348
A VENTURI SCRUBBER INSTALLATION FOR THE REMOVAL OF FISSION PRODUCTS FROM AIR. H. S. Jordan and C. G. Welty (Los Alamos Scientific Lab., N. Mex.). Am. Ind. Hyg. Assoc. J. 20, 332-6(1959) Aug.

A local exhaust collection system and a venturi scrubber installation for the cleaning of exhaust air contaminated with acid mists and mixed fission products are described in detail. It was determined that 20 cfm exhausted by a local slot exhaust hood would control the maximum evolution of gases from a 1500 ml beaker. Features of the exhaust system that were designed to offset the hazard of perchloric acid condensation in the system included welded stainless steel construction, sloping horizontal runs, regulating valves only on vertical sections, and adaptability to cleaning by simple washdown. The feasibility of a venturi scrubber with a caustic solution as the scrubbing medium for low loadings of iodine vapors (2.4×10^{-4} to 7.3×10^{-3} $\mu g/m^3$) was indicated by an average removal efficiency of 95 per cent. Air-cleaning efficiencies for acid mists were dependent on the type of acid suspended in the air stream. Removal efficiencies of 90 per cent and 95 per cent were obtained with nitric acid and oxides of nitrogen loadings of 2 grams/m^3, and with perchloric acid loadings of 3 grams/m^3, respectively. Total fission product loadings ranging from 0.01 to 0.4 mc/m^3 were removed from the contaminated air with an average efficiency of 94 per cent.

349 EVOLUTION OF THE VENTILATION CHARACTERISTICS OF HIGH ACTIVITY LABORATORIES.

R. Sallé. Bull. inform. sci. et tech. (Paris), No. 44, 59-65(Oct. 1960). (In French)

The ventilation system of hot laboratories has the task of limiting the concentration of active materials in the atmosphere, of confining any eventual contamination, and of retaining dangerous dusts before disposal to the air. The evolution of the general characteristics of the system is briefly reviewed. The improvements made are described in some detail, and the filters used in the system are discussed.

350 VENTILATION PROBLEMS IN RADIOCHEMISTRY. Hellmut Schmidt. Wiss. Z. Hochsch. Maschinenbau Karl-Marx-Stadt, 3: 69-74(1961).

Several methods for separating extremely fine particles (usually the carriers of activity) from the air employ precipitation chambers, centrifuges, dry and wet filtering devices, and electrostatic condensers. The construction and operation of these devices, which are controlled continuously by radiation monitors, are described. Experiences with most of the installations were quite satisfactory. They are based not only on principles of radiochemistry and health physics but comply also with laws and regulations concerning handling of radioactive preparations.

351 AIR CONDITIONING IN ISOTOPE LABORATORIES. F. Zimmermann. Tech. Gemeinsch., 9: 266-8 (July 1961).

The ventilating systems are classified into heating, air conditioning, and climatic systems. Heating systems, using radiators, should be avoided because they are subject to corrosion and promote the deposition of dust which is readily activated. The official standards and directions are discussed for admitting fresh air, changing used air, constructing laboratory hoods and gloveboxes, climatizing and decontaminating the air, and general protective measures for emergencies. Particular emphasis is placed on the materials used for ventilating systems, the proper construction of the laboratories, and the economy of adequate ventilation.

352 HOOD VENTILATION IN ARGONNE'S PLUTONIUM FUEL FABRICATION FACILITY. R. M. Mayfield and H. Bairiot (Argonne National Lab., Ill.). Heating, Piping Air Conditioning, 33: No. 9, 124-9(Sept. 1961).

An evaluation is given of the hood ventilation system in Argonne's plutonium fuel fabrication facility. Operational difficulties, revisions made to the system, and the proper operation of the interrelated ventilation systems are discussed. The hood ventilation system employs either air or helium, the choice being largely a function of the state of the material and the operations being performed. The system controls the air in such a manner that the atmosphere within the laboratory and the surrounding community is safe for breathing.

353 FIRE DETECTION IN RADIOACTIVE FILTER BANKS. R. W. Walker (Dow Chemical Co., Denver). Nucleonics, 21: No. 5, 98(May 1963).

A continuous fire detection system that gives warning and activates protective equipment within seconds is described for use in radioactive filter banks.

354 THE VENTILATION INSTALLATION OF THE HOT AND ISOTOPE LABORATORY. P. Graf (EIR, Wurenlingen, Ger.), W. Griner, F. Meier, Schaerer, and H. Studer. Neue Tech., 5: 509-20(Sept. 1963). (In German)

The functions of the ventilation and air conditioning systems are briefly tabulated, and their characteristics are given. The exhaust and input installations of the system are then described in detail for each of the three sections of the laboratory. The electropneumatic control and monitoring are described. A brief review of the special problems connected with the installation is given in conclusion.

MISCELLANEOUS REFERENCES

355 ANL-6021
Argonne National Lab., Lemont, Ill.
COMMENTS OF THE HANDLING OF PLUTONIUM.
M. J. Steindler. June 1959. 27p. Contract W-31-109-eng-38. $0.75(OTS).

Many of the features of plutonium facilities have been covered, and a number of them have been omitted. A great variety of safety equipment is available, together with trained personnel to operate it. All of these devices, however, do not assure a contamination-free operation. Basically, the careful design of enclosures, experimental equipment, and procedures when handled by trained personnel represents the only approach to the problem of plutonium handling.

356 (ASD-TR-62-7-665) TOXICITY OF BERYLLIUM. Final Technical Engineering Report. J. Cholak, Robert A. Kehoe, Lee H. Miller, Frank Princi, and L. J. Schafer (Cincinnati. Univ. Kettering Lab.). Apr. 1962. Contract AF33(600)37211. 76p.

A review is given on the effects of the absorption of beryllium and specific measures designed to prevent illness and maintain health among persons who work with beryllium. The history of beryllium disease, hygenic standards, environmental control procedures, sampling and analytical procedures, housekeeping, personal hygiene and plant sanitation, are discussed and a medical program is outlined. Illustrations of ventilation controls are included.

357 CF-60-6-24
Oak Ridge National Lab., Tenn.
FUEL ELEMENT CATASTROPHE STUDIES: HAZARDS OF FISSION PRODUCT RELEASE FROM IRRADIATED URANIUM. G. W. Parker, G. E. Creek, W. J. Martin, and C. J. Barton. June 30, 1960. 87p. Contract [W-7405-eng-26]. OTS.

The rate of reaction of highly irradiated U with air, CO_2, and steam was studied in an investigation of the fission product release potential in a loss-of-coolant type accident postulated for Pu-producing reactors. Highly irradiated U was found to be more reactive, probably because of the defects in the oxide coating formed by the inclusion of fission products. Complete oxidation or melting was found to release rare gases, I, and Te semi-quantitatively in most atmospheres. Other fission products (Ru, Cs, and Sr) were released to a lesser extent and apparently in proportion to the amount of self-heating induced. In order of their relative tendency to release fission products, the atmospheric conditions investigated were rated in the order: air > CO_2 > steam.

358 DP-188
Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.
A CONTINUOUS MONITOR FOR AIRBORNE PLUTONIUM.
Dowdey C. Collins. Nov. 1956. 16p. Contract AT(07-2)-1. $0.20(OTS).

A continuous monitor has been developed that can detect one MPC (maximum permissible concentration) of Pu in

air within ten minutes. Application details are described to assist other groups in adapting the equipment to their needs.

359 GAT-DR-226
Goodyear Atomic Corp., Portsmouth, Ohio.
MULTICOMPONENT GASEOUS DIFFUSION SEPARATION.
R. H. Newell. Apr. 29, 1957. 6p. Contract AT(33-2)-1.
$1.80(ph OTS); $1.80(mf OTS).

An algebraic method is presented for the solution of a 4- component gaseous diffusion cascade. At present the development is restricted to a single enricher, theoretical separation factor and the assumption of no losses. No insurmountable obstacles are foreseen in the extension of this work.

360 K-1380
Oak Ridge Gaseous Diffusion Plant, Tenn.
STUDIES IN NUCLEAR SAFETY. Lectures Presented at the Nuclear Safety Training School Conducted by Union Carbide Nuclear Company, June 3-14, 1957. Aug. 14, 1958. 162p. Contract W-7405-eng-26. $3.00(OTS).

A compilation of the material presented at the first Nuclear Safety Training School is given. No attempt is made to present new information, but a review and summary of information applicable to nuclear safety in industry. A bibliography of publications in the field is included (51 references). Separate abstracts have been prepared for each paper.

361 (LAMS-2660) PLUTONIUM FACILITY OPERATING PROCEDURES IN CMF-5. W. N. Miner and F. W. Schonfeld, comps. (Los Alamos Scientific Lab., N. Mex.). Nov. 1, 1961. Contract W-7405-Eng-36. 175p.

Safety regulations and operating procedures related to the various types of equipment used in the Plutonium Physical Metallurgy Group at the Los Alamos Scientific Laboratory are described in detail. Consideration of the hazards involved in working with plutonium is emphasized. A brief description of the group's activities and facilities is also included.

362 (NDA-2162-5) CARBIDE FUEL DEVELOPMENT. Phase III Report, September 15, 1960—September 15, 1961. W. Sheridan and A. Strasser (United Nuclear Corp. Development Div., White Plains, N. Y.) and J. Anderson and K. Taylor (Carborundum Co., Niagara Falls, N. Y.). Sept. 30, 1961. Contract AT(30-1)-2303(IV). 64p.

UC—PuC solid solution powders containing only minor amounts of impurities were obtained by reacting a mixture of UO_2 and PuO_2 with carbon or by heating together a mixture of UC, Pu_2C_3, and U. UC—PuC pellets with the desired high densities of 95% of theoretical were obtained by cold pressing and sintering, using 0.1 wt % nickel as a sintering aid. Without nickel, the densities were much lower for the same sintering conditions. Prior to experiments with solid solution carbides, essentially stoichiometric UC powder was prepared in the plutonium facility by the carbon reduction of UO_2 in a helium atmosphere. Attempts to prepare stoichiometric PuC by the carbon reduction of PuO_2 failed, the product consisting of a mixture of plutonium carbides and oxides. Pu_2C_3 was readily obtained by reacting stoichiometric amounts of PuO_2 and carbon. Additional evaluation of test samples, using x-ray diffraction and a microprobe analyzer, confirmed that type 304 stainless steel, 2¼ Cr-1 Mo steel, and niobium are satisfactory UC cladding materials at 820°C, for 4000 hr, while Inconel-X, Zircaloy-2, and beryllium are not satisfactory. The irradiation of two clad UC specimens was completed. The UC pellets were made by cold pressing and sintering UC powder, which in turn was made by reacting UO_2 with carbon. Irradiation conditions were 18,500 Mwd/tonne average burnup, 760°C average central fuel temperature, and 315 w/cm average heat generation rate. In-pile measurements of the combined fuel plus helium gap conductivity gave an average value of 0.02 g-cal/sec-cm^2-°C/cm. The UC conductivity was similar to out-of-pile values for arc cast UC, if reasonable helium gap conductances were assumed. A glove box for high temperature property measurements was designed and is being assembled. A conceptual design of the facility for examining irradiated plutonium was made.

363 (NP-11504) LIST OF PUBLICATIONS AVAILABLE TO THE PUBLIC. Cumulation No. 6, January—December, 1961. (United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England). Mar. 1962. 112p.

A listing of 1300 unclassified reports, translations, periodical articles, and books announced during 1961, together with patent applications filed by the UKAEA is given. The references are listed under the following subject headings: general; biology, medicine, and agriculture; general chemistry; radiochemistry; analytical chemistry; chemical engineering; engineering; instrumentation; geology and mineralogy; health and safety; industrial applications of isotopes and radiations; isotope separation; mathematics and computers; metallurgy and materials; radiation effects on materials; general and solid state physics; nuclear and theoretical physics; plasma physics and controlled thermonuclear devices; particle accelerators; reactor physics; reactor technology; waste disposal; patents; and reports which have appeared in the published literature. Author and report number indexes are included.

364 (NP-12961) FUNDAMENTALS OF PROTECTIVE DESIGN. Engineer Manual for War Department Construction. (Corps of Engineers). 1946. 190p.

This manual was prepared as a guide for engineers in the planning and design of protective structures, fortifications, gun batteries, and components of military installations. The fundamental phenomena of various military weapons and their structural effects are discussed and examples in application of the data to specific design problems are given. Sufficient information is included to determine the requirements and design procedure for protection against explosives, fire attack, and war gases.

365 NUMEC-P-30
Nuclear Materials and Equipment Corp., Apollo, Penna.
DEVELOPMENT OF PLUTONIUM BEARING FUEL MATERIALS. Progress Report for Period April 1 through June 30, 1960. July 18, 1960. 36p. Contract AT(30-1)-2389. OTS.

Major effort was directed toward assembly of glove boxes and installation and checking out of equipment. Fourteen glove boxes have been installed and connected to the ventilation system. Preparatory to working with plutonium, significant studies were carried out on the preparation and characterization of UO_2. Testing of the ventilation system demonstrated a need for further work on the plant absolute-filter housing to achieve absolute tightness. Details were worked out for "closing" the glove boxes after installation of equipment. The acceptance criterion of 0.01%/hr pressure loss at a box vacuum of 2 in. of water is easily achieved. Fabrication and evaluation of fuel shapes,

fuel reprocessing, and reactor physics and engineering parametric studies are discussed briefly.

366 (NUMEC-P-104) DEVELOPMENT OF PLUTONIUM-BEARING FUEL MATERIALS. Progress Report, January 1 through March 31, 1963. (Nuclear Materials and Equipment Corp., Apollo, Penna.). Contract AT(30-1)-2389. 50p.

Three batches of PuO_2 were prepared via the plutonium peroxide route. Except for the high tap density, it was found that the powder characteristics of PuO_2 prepared in this manner are similar to the characteristics of PuO_2 prepared by the oxalate route. Modifications were made to equipment for preparation of mixed oxides to achieve better reproducibility and minimize operator time. A study was initiated to assess the feasibility of using gamma spectrometry for rapid in-process determination of plutonium in solutions that also contain uranium. It was found that plutonium can be determined to within 1% provided that the uranium concentration is known to better than 2 mg/ml. Plutonium separation studies using TTA extraction were continued and the determination of cesium and strontium fission products by flame photometry was investigated. The effect of carbon content on the weight loss of PuO_2 during sintering was determined. Metallographic examination of sintered UO_2-35 wt % PuO_2 pellets indicated that the low densities obtained may be due to grain growth and broadening of grain boundaries. Green spheres of PuO_2 were formed in a small mill jar and the particle size distributions of both the formable and non-formable powder fractions were determined by centrifugal sedimentation size analysis. Preparation of duplex pellets for determining the reaction between PuO_2-UO_2 and possible cladding and diluent metals was continued. Pellets of pure PuO_2 and six compositions of coprecipitated PuO_2-UO_2 were fabricated for corrosion testing in water and steam. Preliminary tests in steam at 750°F and 2200 psi for 10 hr showed no visual evidence of corrosion. The NUSURP code was modified to allow calculation of undermoderated systems. Equipment is being installed in alpha boxes.

367 (ORNL-TM-346) HAZARDS ANALYSIS OF FUEL HANDLING FACILITIES. E. D. Arnold and J. P. Nichols (Oak Ridge National Lab., Tenn.). Aug. 24, 1962. Contract [W-7405-Eng-26]. 30p.

Accidental releases of radioactive material at the Oak Ridge National Laboratory resulted in the establishment of building and ventilation design criteria and the requirement for a hazards evaluation for those facilities which contain or handle radioactive materials of physiological hazard greater than that equivalent to one gram of Pu-239. A quantitative method for estimating the hazards associated with the maximum credible accident in a radiochemical facility were developed. The maximum credible accidents are chemical or nuclear explosions which disperse radioactive aerosol and gases into ventilation streams which exhaust to the atmosphere. Approximate physical properties of these aerosols and gases were combined with the efficiency of ventilation cleanup devices and meteorological correlations to evaluate the hazard to the environment.

368 TID-5221
Mound Lab., Miamisburg, Ohio.
POLONIUM. Harvey V. Moyer, ed. 1955. Decl. Oct. 12, 1955. 402p. $1.75(OTS).

A survey was made of γ, α, and x radiations associated with the decay of Po^{210}. The nuclear, physical and chemical properties of Po are analyzed. Chemical separation methods and separation by distillation are studied for extraction of Po from irradiated Bi. Polonium from Pb residues and neutron and alpha sources are described. Biological research related to Po and health physics concerning with personnel protection and waste disposal are discussed.

369 (TID-7599) PROCEEDINGS OF THE EIGHTH CONFERENCE ON HOT LABORATORIES AND EQUIPMENT, SAN FRANCISCO, CALIFORNIA, DECEMBER 13-15, 1960. (American Nuclear Society, Chicago). 556p. OTS.

Fifty-two papers presented at the Eighth Conference on Hot Laboratories and Equipment held at San Francisco, California, December 13 to 15, 1960, are given. The papers are grouped under the following headings: hot laboratory facilities and hot cells; general purpose manipulators and viewing; shielding and experiments; and glovebox design and specialized equipment. Fifty-one of these papers are covered by separate abstracts. One paper was previously abstracted for NSA.

370 TID-8206(Rev.)
Office of Health and Safety, AEC.
A COMPENDIUM OF INFORMATION FOR USE IN CONTROLLING RADIATION EMERGENCIES INCLUDING LECTURE NOTES FROM A TRAINING SESSION AT IDAHO FALLS, IDAHO, FEBRUARY 12-14, 1958. Allan Brodsky and G. Victor Beard, comps. and eds. Sept. 1960. 105p. OTS.

A training course was held to familiarize members of radiological assistance teams from various parts of the U. S. with the origin and nature of situations that might, by the event of an unusual accident, release radioactive materials to a populated environment. The course consisted of a series of lectures and a tour of some of the radiation monitoring, source handling, and transportation facilities at NRTS. A summary of the lecture material is presented.

371 (TID-17697) A STUDY OF THE GENETIC AND BIOCHEMICAL EFFECTS OF RADIATION ON BACTERIA. Final Report, July 1, 1953-September 30, 1962. (Texas. Univ., Austin). Contract AT(40-1)-1649. 10p.

Progress is reported in studies of the genetic and biochemical effects of radiation on bacteria. Topics discussed include the effects of radiation on adaptation, pattern studies on the induced enzymes nitratase and β galactosidase in a number of strains of irradiated E. coli, the contribution of various cell components to radiation injury, the effect of pigment and spore formation on radiosensitivity, and factors affecting radioresistance in Escherichia coli. Preliminary studies were made on the effects of radiation on biological processes in the soil.

372 UCRL-4556
California. Univ., Livermore. Radiation Lab.
A CONTINUOUS ALPHA AIR MONITOR COMPENSATING FOR THE NATURAL ATMOSPHERIC RADIOACTIVITY. David R. Sawle. Aug. 24, 1955. 26p. Contract W-7405-eng-48.

An instrument has been built and tested which, when placed in a room containing α activity, will under most conditions give a positive indication that activity is present by the time the operator has received one half the maximum permissible daily dose of uranium or, if the activity stems from Pu, five times the maximum daily dose. Under

many conditions it will give a positive indication sooner. It operates on the principle that when air is drawn through a filter paper, the Rn daughters reach equilibrium after a short time, and upon reaching equilibrium, 94% of the α emitted are 7.68 Mev. By discriminating electronically between these and the lower-energy, longer-lived activity, it is possible to build a continuous α air monitor with a fast response and good sensitivity.

373 WADC-TN-57-247
Michigan. Univ., Ann Arbor. Engineering Research Inst. CRYSTALLOGRAPHIC STRUCTURE AND ORIENTATION OF THE γ' PHASE IN FOUR COMMERCIAL NICKEL-BASE ALLOYS. J. A. Amy and W. C. Bigelow. July 1957. 17p. Project 7021. Contract AF-33(616)-3250. (AD-130834).

Selected area electron diffraction patterns have been obtained from matrix precipitate particles isolated by the extraction-replica technique from aged specimens of four commercial nickel-base alloys, Inconcel-X, Waspalloy, M-252, and Udimet, which contain titanium and aluminum as hardening agents. From these patterns the matrix particles have been conclusively identified as the γ' phase. It has also been shown that the ordered, or superlattice, structure reported for this phase in simpler alloy systems occurs also in these complex alloys, and that the particles develop with a high degree of preferred crystallographic orientation relative to the matrix lattice. Variations in the size, shape, and distribution of the particles in specimens of the four alloys aged 100 hours at 1400°F are also evident, and appear to be related to the titanium and aluminum content of the alloys.

374
Carbide and Carbon Chemicals Co. (Y-12)
DECONTAMINATION: A LITERATURE SEARCH. Rosalie L. Curtis. May 19, 1953. 32p. (Y-964)

A compilation of 70 abstracts of unclassified reports on the removal of radioactive contaminants from various materials is presented.

375 IMPROVEMENTS IN OR RELATING TO DEVICES FOR THE DETERMINATION OF CHANGES IN THE COMPOSITION OF GASES. Ernst Meili, Heinrich Derfler, and Thomas Lampart (to Cerberus GmbH). British Patent 855,111. Nov 30, 1960.

An improved fire alarm system is designed which uses two ionization chambers. One chamber has perforations while the other is not accessible to air, and both are series-connected with the end terminals connected to a voltage source. The chambers are dimensioned so that the cold cathode tube in the circuit ignites to operate a fire alarm only when the air composition is altered, e.g., by smoke particles.

376 METHOD AND APPARATUS FOR DETECTING MINUTE CONCENTRATIONS OF GASES AND VAPORS. (to Mine Safety Appliances Co.). British Patent 860,576. Feb. 8, 1961.

An apparatus is designed for detecting a trace constituent in a gaseous mixture with an ionization chamber. In the apparatus, the mixture is exposed to a reagent as it enters the chamber, whereby nascent particulate matter forms from the constituent-reagent reaction; the effect of the particulate matter on the ionization current enables the concentration of the constituent to be measured. The following compounds may be determined in this way: hydrogen halides, NO, SO_2, halogenated hydrocarbons, and HCN. NH_3 is the reagent for all except HCN, for which HCl is the reagent, while the halogenated hydrocarbons must be pyrolyzed beforehand to yield a hydrogen halide which will react with NH_3. The ionization chamber is described at length in Patent No. 860,577.

377 IMPROVEMENTS IN OR RELATING TO AIR-TIGHT DISMOUNTABLE ENCLOSURES. Paul Cogez and Jacques Humbert (to Commissariat à l'Energie Atomique). British Patent 926,226. May 15, 1963. Priority date Dec. 10, 1959.

The design of an airtight enclosure for the manipulation of radioactive products or for permitting work to be done in vacuum or controlled atmospheres is patented. The enclosure is dismountable and is built up of a plurality of rectangular frames, which can be closed to form panels. The edges of the frames can be joined to ensure airtight assembly of two adjacent frames, either in the same plane or at right angles. Special sealing strips and clamping devices are included in the design. The enclosure has the advantages of flexibility in volume, small bulk for storage in the dismantled state, and ease of cleaning and decontamination.

378 INERT ATMOSPHERES IN NUCLEAR ENERGY. P. A. F. White and S. E. Smith (Atomic Weapons Research Establishment, [Aldermaston, Eng.]). Nuclear Eng., 7: 284-8(July 1962).

Some of the situations in nuclear technology in which inert atmospheres are desirable or necessary are outlined. An account is given of the principles involved in the creation of inert atmosphere conditions. General solutions are indicated to some of the problems raised by the use of such atmospheres. Particular attention is given to inert-gas purification and impurity detection, as well as the problem of supplying inert gas to the workspaces.

379 ONE SHOP'S EXPERIENCE IN MACHINING BERYLLIUM. Don Titus. Machinery (N. Y.), 69: No. 8, 109-12(Apr. 1963).

Details of machining, milling, and lapping methods for producing surface finishes to 2 microinches on Be components are given. Due to the toxicity of the material extreme precautions are taken with ventilating equipment and protective clothing. Descriptions and photographs of the ventilation equipment are included. (Rev. Metal Lit., 20: No. 7, July 1963)

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14409	46	Dep.; \$1.10(fs), \$0.80(mf)OTS
IGO-TM/CA		
015	47	Dep.(mc)
JAERI		
5009	239	
JPRS		
453-D	240	\$0.50(OTS)
2737	241	\$0.75(OTS)
12637	336	OTS

REPORT NUMBER
AND AVAILABILITY INDEX

Report No.	Reference	Availability
WADC-TN		
57-247	373	$0.50(OTS) as PB-131518
WAPD-PWR-CP		
3052	266	Dep.(mc); $4.80(ph), $2.70(mf)OTS
WASH		
170(Del.)		Dep.(mc); $59.40(ph), $11.10(mf)OTS
170(Del.)(p.170-84)	78	
170(Del.)(p.218-21)	79	
275	267	Dep.; $37.80(ph), $11.10(mf)OTS
Y		
659	268	Dep.(mc); $4.80(ph), $2.70(mf)OTS
811(Suppl.)	142	Dep.; $0.75(OTS)
964	374	Dep.; $6.30(ph), $3.00(mf)OTS