

U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION V

Report No. 70-984/79-01
Docket No. 70-984 License No. SNM-942 Safeguards Group 5
Licensee: Pacific Northwest Laboratories
Battelle Blvd.
Richland, Washington 99352
Facility Name: Pacific Northwest Laboratories
Inspection at: Richland, Washington
Inspection conducted: May 16-18, 1979
Inspectors: W. J. Cooley, Fuel Facilities Inspector 6/18/79
Date Signed
Date Signed
Approved By: H. E. Book 6/18/79
H. E. Book, Chief, Fuel Facility and Materials
Safety Branch Date Signed

Summary:

Inspection on May 16-18, 1979 (Report No. 70-984/79-01)

Areas Inspected: Organization; modifications and changes to facilities and systems; record control and storage; internal review and audit; transportation of radioactive materials; and contamination incident at Building 303C. The inspection involved 21 manhours onsite by one NRC inspector.

Results: No items of noncompliance or deviations were identified.

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DETAILS

1. Persons Contacted

- *J. J. Fuquay, Assistant Director for Program Support
- *C. M. Unruh, Manager, Occupational and Environmental Safety Department
- *H. V. Larson, Associate Manager, Occupational and Environmental Safety Department
 - R. Cummings, Development Engineer, Personnel Dosimetry
 - R. Robinson, Senior Development Scientist, Personnel Dosimetry
 - H. W. Hunt, Supervisor, Radiation Records, Personnel Dosimetry
- *J. B. Martin, Associate Manager, Radiation Standards and Engineering (RS&E)
 - B. V. Andersen, Staff Scientist, RS&E
 - W. H. Knox, Research Scientist, RS&E
- *T. W. McClelland, Research Scientist, RS&E
 - E. P. Oscarson, Research Scientist, RS&E
 - R. C. Yoder, Research Scientist, RS&E
- *H. L. Henry, Manager, Safety and Nuclear Materials Management (SNMM)
 - C. R. Richey, Senior Research Engineer, SNMM
 - D. E. Friar, Research Scientist, SNMM
 - J. M. Taylor, Senior Development Engineer, SNMM
 - G. E. Backman, Staff Engineer, Environmental Evaluations
 - D. R. Schidke, Engineer, Facilities Engineering Section, Facilities Planning and Engineering

*Denotes those attending exit interview.

2. Organization

The Occupational and Environmental Safety Department now reports to Dr. J. J. Fuquay, Assistant Director for Program Support.

D. E. Friar has transferred from the Energy Systems Department to Occupational and Environmental Safety to assist in the preparation and review of Criticality Safety Specifications and to participate in the internal audit and review program for criticality. Ms. Friar has had about three years experience in that field while with the Energy Systems Department.

T. W. McClelland will terminate shortly and will be replaced by Mr. Wayne H. Knox. Mr. Knox will assume Mr. McClelland's responsibilities in the Radiation Safety Internal Review and Audit Program.

3. Modifications and Changes to Facilities and Systems

Several new facilities are in the early planning stages at Battelle Pacific Northwest Laboratories. There was no use being made of NRC licensed material at the time of this inspection and there did not appear to be plans for such use in the foreseeable future. The new facilities represented some of Battelle's efforts as a prime contractor for the Department of Energy.

Among the efforts in early planning stages are an Environmental and Energy Technology Facility and a Remote Fuel Fabrication Laboratory to be located in the 300 area. An additional facility is the Energy Materials Engineering Laboratory. Those new facilities are projected for operation in the early 1980s.

Consideration is being given to a corrosion study using a commercial power reactor steam generator. That work may be performed at Battelle facilities starting in about one year.

The Battelle facility Modification Permit Procedure requires distribution and sign-off by Environmental and Operational Safety Department Management for changes in facilities whether they are planned for use under Department of Energy contract or for use under the subject NRC license. This arrangement has permitted the Occupational and Environmental Safety Department an opportunity for early participation in Project Review Committee meetings and continues to permit early input by Occupational and Environmental Safety in planning.

4. Records Control and Storage

Personnel dosimetry and bioassay records are maintained within the Personnel Dosimetry Section of the Occupational and Environmental Safety Department. This inspection included a review of that record system.

A master record is maintained giving the name, address, exposure dates, worker classification, social security number, location of work, in-vivo count frequency, bioassay frequency, badge exchange frequency, employee training history, date of respirator fitting test, and date of last respirator training session. Special forms are used to provide basic information on new employees and to provide for change in status of an employee to a radiation worker. The above information is kept current and printed out once per month.

A computerized record of external radiation exposure of employees is maintained indicating penetrating, non-penetrating, skin, extremity, slow neutron, and fast neutron exposures. Personnel

dosimeters are exchanged monthly, quarterly and annually. Corresponding printouts for each of those categories are provided for the employees' Section Manager and for information of Health Physics Monitors assigned to the employees' working area. Those printouts include accumulation of monthly dosimeter results, year to date and lifetime accumulations, and an extrapolation to the calendar year exposure accumulation.

Provision is made and forms provided for forgotten and lost dosimetry badges which are distributed to the Radiation Records Unit and which information is followed up by that unit.

An annual report of whole body penetrating exposure and whole body total exposure is provided to each employee.

Additionally a monthly report of the exposure of all monitored visitors is printed out. That record includes the name, social security number, wearing period, name of employer, and employer address. Any indication of an exposure in excess of 50 millirem is reported to both the employer and to the visitor.

A major printout is made giving the calendar year exposure summary for all persons monitored by personnel dosimetry. It includes the monitored persons name, social security number, birth date, exposure period, (skin, whole body, extremity, penetrating, non-penetrating, fast neutron, slow neutron) exposures, whether exposure occurred onsite or offsite, total lifetime exposure including all previous employers, and the exposure accumulated with the current employer.

The licensee can provide additional 15 major printout options along with specially requested options.

Similar master printouts provide internal dosimetry data including in-vivo counts and bioassay schedules and results. They include a monthly bioassay report, a weekly report of in-vivo count data and a personal report to employees regarding in-vivo count results.

An annual report of graded whole body dosimetry results is provided to the Department of Energy by Battelle.

All the above forms of personnel dosimetry data are maintained in individual, personal data files by Battelle. It is held in that form for approximately two years and then microfilmed for more permanent storage. Records of that nature appeared to be complete from the present to 1944. An inspection of those records indicated they include all bioassay data, employee training, dosimetry data, occurrence (incident) reports, change in status forms, investigation reports involving the employee, personal survey records, and exposure history. The Radiation Records Unit also maintains descriptions of the methods of measurements which were used over the years to facilitate interpretation of the existing data in any future review.

5. License Renewal Application

The subject license, SNM-942, bears the expiration date of June 30, 1979. The licensee completed publication of the "Application for Renewal of Special Nuclear Materials License SNM-942" on May 1, 1979. That application is identified as PNL-MA-527, Revision 5. That timely application was submitted to the Commission by Registered Mail about May 10, 1979.

The application consists of two parts. Part one consists of license conditions and technical specifications. Part two serves as a descriptive supplement and demonstration of the licensee's capabilities.

6. Preventive Maintenance

Preventive maintenance procedures are prepared by persons in the Craft and Operations Services Department. That group schedules the maintenance work, sends the preventive maintenance schedules to appropriate foremen to have it accomplished, reviews preventive maintenance procedures to see that they are current and that they have been completed as scheduled, and prepares a monthly report of maintenance accomplished.

The Facilities Engineering Section of the Facilities Planning and Engineering Department coordinates and monitors the preventive maintenance program. The program and procedures are reviewed by that organization to determine if maintenance standards are appropriate and to make recommendations for adequate scheduling frequencies. The Facilities Engineering Section also reviews Facility Modification Permits to see if new preventive maintenance procedures and standards should be placed on the master list of the preventive maintenance program. Facilities Engineering Section becomes involved in new and changed equipment for the most part after the work (equipment installation or removal) has been completed.

A review of some preventive maintenance procedures indicated they include measurement of hoods flow rates, criticality alarm system checks, checks of exhaust and intake fans and motors, and maintenance on emergency generators.

The preventive maintenance master list is maintained by building number and includes a listing of all items, item descriptions, and the preventive maintenance procedure for each item. A review of the preventive maintenance procedure for chemical hoods indicated a checkoff list type of approach. The procedure called for hood flow rate measurements, gave the location of each hood, presented the listing of all hoods in the entire building, and provided space for logging the flow rates before and after adjustments. Space was also provided for any comments and indication of corrective action taken. The procedure included a space for the approval of the craft foreman and the signature of the employee doing the work.

Similar procedures were available for emergency generators. In that case the procedure was appended with a generator parts list and a parts replacement order sheet to provide for stock replacement when repairs were needed. The procedure for motors provided for trend analysis of the motor condition by requiring the recording of bearing temperatures and field insulation resistance. Diagrams were included in the procedures, as needed. The frequencies of various checks made on typical motors correspond to different preventive maintenance procedures. That is, the procedure corresponding to quarterly checks may be less complicated than that corresponding to semiannual and annual checks on that motor. A schedule for checking criticality alarm systems and instructions for repair and calibration by the Radiation Standards and Engineering Section of the Occupational and Environmental Safety Department were also available. Typically the preventive maintenance procedure called for the presence of a Health Physics Monitor and/or the issuance of a Radiation Work Permit, as required.

A further review of the preventive maintenance master list indicated procedures existed for emergency lighting circuits, fire alarm systems, and high efficiency particulate air filters.

7. Transportation

The licensee published a manual for shipping radioactive materials about January, 1977. That document was identified as BNWL-MA-81. The manual was issued by the Occupational and Environmental Safety Department and approved by its management. Some minor revisions have occurred from time to time. At the time of this inspection the manual had just gone through its first major revision to bring it up to date and to include the participation of the Quality Assurance Department in aspects of the transportation program. The licensee made a timely submittal of his Quality Assurance Program for shipping packages of radioactive material to the Transportation Branch, Office of Nuclear Materials Safety and Safeguards, NRC. A licensee representative stated that the Battelle Quality Assurance Manual has been revised to make it consistent with the Quality Assurance Program for 10 CFR 71 requirements and the Radioactive Material Shipping Manual.

The Radioactive Material Shipping Manual presents the responsibilities of the various groups participating in the shipment of radioactive materials. They include those of the Operating Group making the shipment, Safety and Nuclear Materials Management, Radiation Monitoring, Radiation Standards and Engineering, and Quality Assurance. The manual requires that department managers designate a shipping representative(s) to coordinate radioactive materials shipments. That coordination includes liaison with Radiation Monitoring, Safety and Nuclear Materials Management, and Quality Assurance. Those responsibilities include providing approved shipping containers, cooperation with the other groups in performing periodic inspections and maintenance of containers as well as in

performing physical tests that might be required to qualify shipping containers. It includes the maintenance of documents relating to the procurement of new containers and inspection and testing of new and old containers.

Safety and Nuclear Materials Management is responsible for establishing shipping procedures as they appear in the licensee's Radioactive Materials Shipping Manual, maintaining current knowledge of all regulations, administrative requirements and standards of good practice, maintaining a complete file of Department of Energy Certificates of Compliance and Safety Analysis Reports for Shipping Containers, obtaining technical guidance from Criticality Analysis when required, and the maintenance of various records of offsite shipments.

Radiation Monitoring is responsible for establishing dose rates and contamination levels associated with shipments and the maintenance of certain Health Physics type records.

Radiation Standards and Engineering is responsible for performing annual packaging and shipping appraisals of Operating Groups.

Quality Assurance is responsible for reviewing purchase orders for all new containers, providing inspection activities pertaining to vendor's services, and witnessing tests of containers when requested.

The above information is abstracted from Section 2, Responsibilities, Radioactive Materials Shipping Manual, Document BNWL-MA-81.

Detailed procedures for packaging are presented in Section 5 of the Radioactive Materials Shipping Manual. Additional loading and unloading procedures have been prepared by Operating Groups and have been reviewed by Safety and Nuclear Materials Management Group. This inspection included a brief review of some of those procedures including the waste cask handling procedure for using 6M type containers; the procedure for shipping containers for handling irradiations at Oregon State and Washington State Universities; the packaging of certain radioactive liquids; and the packaging of promethium oxide. Those procedures have been approved by signature of Operations personnel, Facilities Management, Radiation Monitoring, and Industrial Safety for type B quantity shipments.

Procedures for receiving and monitoring incoming packages are contained both in the licensee's Radioactive Materials Shipping Manual and in his Radiation Protection Procedures, Document BNWL-MA-6, Procedure No. 6.

The licensee does not own large special purpose casks but uses primarily Department of Transportation specification containers for shipments of both Department of Energy prime contract materials and Nuclear Regulatory Commission materials. Those containers most

frequently used are listed in the licensee's Radioactive Materials Shipping Manual and include the Department of Transportation specification containers 17H, 198, 55, 12B, 7A, 6M, 6L, 2030-1 (USA/5332/BLF), (USA/5791/BLF), and 60 (USA/6387/BF).

This inspection included the review of records of all shipments of radioactive material which were non-contract material shipments. Many shipments were material used under the Agreement State of Washington Radioactive Materials License. All shipments made in the year 1979 were of non-fissile material and most of those shipments were low specific activity material.

8. Radioactive Materials Incident in Building 303C

About March 13, 1979 a release of plutonium oxide occurred in Building 303C. That release was from a hermetically sealed metal container as it was being handled by Battelle Northwest employees. The three employees involved were significantly contaminated and subsequently decontaminated. Fecal and urine analyses as well as in-vivo chest counts indicated no inhalation or ingestion of plutonium.

The material being handled was acquired and used under a prime contract with the Department of Energy in the Waste Vitrification Program. The incident, therefore, was not reportable to the Nuclear Regulatory Commission although decontamination of Building 303C will require its temporary shutdown and considerable expense.

At the time of this inspection the licensee had investigated the incident and had available a draft report prepared for the Department of Energy. Not as an NRC jurisdictional matter but rather as a matter of technical interest, portions of that report were reviewed by the NRC inspector during the presently reported inspection.

A review of the investigation summary and recommendations and discussion with licensee representatives, one more interesting aspect of the incident which may have generic application to the shipment of plutonium oxide was noted.

It appears that the hermetically sealed can of plutonium oxide ruptured under pressure due to the presence of moisture and the presence of self-heating plutonium 238. The can contained approximately one kilogram plutonium, about one and one-half percent of which was plutonium 238. The moisture content was about 0.43 weight percent. Heat transfer calculations made by Battelle Northwest Laboratories subsequent to the incident indicate that the hermetically sealed can would not have ruptured had it not been placed in a thermally insulated DOT specification 17C (5791) container for storage and subsequent transfer within the 300 area of the reservation. A recommendation of the report is that there is a need for a technical data base for shipping plutonium and a complete study of storage and transfer of self-heating material. That recommendation does not imply a question as to the integrity of the

seal provided by the shipping container against the loss of contents in transit. Rather, it raises the question as to the integrity of any sealed inner container under pressurization. That is, the inner container could rupture in transit without loss of material from the shipping container. The inner container could rupture (as it did in the case of this incident) as it is being removed from the shipping container. The fact that self-heating material is considered and pressure limitations placed on shipping containers with respect to their seal integrity in shipping container evaluations is not being questioned.

9. Management Interview

The scope and the results of this inspection were discussed with licensee representatives at the conclusion of the inspection on May 18, 1979. Those persons were informed that no items of non-compliance were observed within the scope of the inspection.