U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 70-008/89002(DRSS); 50-006/89002(DRSS)

Docket Nos. 07-008; 50-006 Licenses No. SNM-7; R-A

Licensee: Battelle Columbus Division
505 King Avenue
Columbus, OH 43201-2693

Inspection At: West Jefferson and King Avenue Facilities

Inspection Conducted: June 27-30, 1989

George M France, III

Inspector: George M. France, III 9-13-89
Date

Approved By: D. J. Sreniawski, Chief DJ Sreniawski 9/13/89
Nuclear Materials Safety Date
Section 1

Inspection Summary

Inspection on June 27-30, 1989 (Reports No. 70-008/89002(DRSS); No. 50-008/89002(DRSS))
Areas Inspected: Routine, unannounced health and safety inspection, including: management and organization controls (IP 88005); transportatior activities (IP 86740); radiation protection (IP 83822); criticality safety (IP 88015); operations review (IP 88020); environmental protection (IP 88045); and maintenance surveillance (IP 88025).
Results: The licensee was found to be in compliance with NRC requirements within the areas examined. The inspector examined the licensee's program for investigating unusual occurrences. The licensee's corrective action was adequate to restore conditions to the usual operative mode.

DETAILS

1. Persons Contacted

T. Emswiler, Transportation Specialist (Part-time Employee)
M. Failey, Research Scientist
R. Hyatt, Operations Engineer
*G. Kirsch, Supervisor, Health Physics
*V. Pasupathi, Manager, Nuclear Technical Section
D. Stitcher, Industrial Hygienist
E. Swindall, Master Technician
*H. Toy, Manager, Nuclear Services

Interviews were also conducted with other members of the licensee's staff.

*Denotes those present at the exit meeting on June 30, 1989.

2. General

This inspection of onsite licensee activities, which began at 1:00 p.m. on June 27, 1989, was conducted to examine activities at the West Jefferson site and King Avenue site under Materials License No. SNM-7 and Reactor License No. R-4. The inspector toured the location designated for radiographic operations and the location where controlled field studies involving carbon-14 were being conducted.

3. Management Organization and Controls (IP 88005)

The inspector reviewed the licensee's management organization and controls for radiation protection and operations, including changes in the organizational structure.

a. Organization

The licensee noted that the Supervisor, Quality Assurance (Earl Fromm) has retired and is now a member of the retired staff. A former QA Supervisor (Donald Lozier) at BCD replaced Mr. Fromm. QA audit results are reported directly to the Vice President, Nuclear Operations. There were no other changes in staff assignments that affected radiological health and safety concerns.

b. Audits

The RSO completed an annual report that summarized factors pertinent to the radiological status of the retired Battelle Research Reactor facility for calendar year 1988. The report was submitted to NMSS as required by Materials License No. SNM-7. The report indicated that all smear and exposure data collected for 1988 operations were within acceptable limits. The radiological status of the facility

is audited by the Radioactive Materials Subcommittee (RSC-1) of the BCD Radiological Safety Committee.

No violations or deviations were identified.

4. Radiation Protection (IP 83822)

The inspector reviewed the licensee's internal and external exposure control programs including the required records, reports, and notifications.

a. Internal Exposure Control

The inspector interviewed the Health Physics Operational Supervisor and the Master Technician (health physics activities) concerning bioassay records for the January through June 1989 operating period. The records disclosed urinalysis results for workers exposed to plutonium, uranium and mixed fission products and workers exposed to chemical compounds labelled with phosphorus-32 or carbon-14. Few of the urinalysis results exceeded the level of detection above background. Consequently, the 40 MPC-hour intake limit for uranium and plutonium was not exceeded.

It was apparent that there had been no significant internal exposure to workers from soluble forms of radioactive materials.

Whole-body count results were reviewed during a previous inspection. (See Inspection Report No. 70-008/89001.)

b. External Exposure

The inspector reviewed the licensee's summary of whole-body radiation exposures from external penetrating radiation for the January through June 1989 operating period. The highest exposure received among workers assigned to the hot lab was less than 500 mrem/hour. Apparently, most exposures occurred while workers were conducting radiological surveys of equipment scheduled for decontamination. The highest quarterly total for workers wearing ring badges were reported as 1.5 rems which is less than 10% of the standard specified in 10 CFR 20.101. According to the licensee's summary for external exposure no results exceeded 10 CFR Part 20 limits.

c. Retired Reactor Facility

The licensee summarized data concerned with the radiological status of the retired Battelle Research Reactor (BRR) facility.

These records indicated that the technical specifications of Amendment 13, BRR License No. R-4 were satisfactorily met for the January through June 1989 operating period. Exposure levels

around the reactor's six beam tube and sump pump covers were less than 3 mR/hr. Smears were evaluated for alpha and beta activity at 80 locations. All smear and exposure data measured during the operating period were within acceptable limits.

d. Radiological Surveys and Contamination Control (West Jefferson Site)

Records of radiological surveys conducted for the January through June 1989 operating period disclosed no significant contamination or exposure problems. The licensee performs surveys in accordance with written Procedure No. NS-NS-18 Smear Surveys-Collection, Counting and Documentation.

e. Unusual Occurrence Report

The inspector reviewed the licensee's file on incidents that involved the release of radioactive materials. Details of the unusual events were covered during the onsite inspection and a follow-up review was conducted by telephone on August 9, 1989.

Several gallons of liquid waste contaminated with cesium-137 spilled onto the asphalt driveway near the truck loading dock and onto the basement floor of building JN-1. The liquid waste was being transferred from an underground holding tank to an evaporator tank in building JN-1. A technician mistakenly shut off a light switch instead of the breaker switch that controlled the liquid waste transfer pump. This caused the evaporator tank to overflow.

The contamination level was less than 1000 dpm/100cm^2 after cleanup. The concentration of cesium-137 in the liquid waste was less than the quantities required for notification under 10 CFR 20.403 or 405.

In order to prevent a similar or recurring incident the licensee reviewed the operating procedure and made the following changes:

- The operator should not leave the evaporator tank unattended during a liquid waste transfer.

- The circuit breaker that deactivates the transfer pump was identified/marked with a number.

An unusual occurrence report was also filed when a glass cylinder containing fission gas krypton-85 in the presence of non-radiological gases was inadvertently broken during an inspection of the glass container. The inspector interviewed the research scientist involved in the incident. A summary of the interview is discussed below:

- The first of 100 glass cylinders of fission gas krypton-85 and non-radiological gases was being inspected for signs of

deterioration and integrity of holding a partial vacuum. The cylinder in question was actually brittle and inadvertently cracked during the inspection. There was no apparent rush of air which indicated that the vacuum was probably lost during storage.

- Damage to the cylinder may have been caused by storage in a gamma-ray radiation field and/or from internal beta particle bombardment from decay of krypton-85.

- The cylinder originally contained a maximum of 5 mCi, but there was no apparent spread of contamination. The cylinder was allowed to remain in the hood for two days. The inspection process is handled in an examining hood that was measured for adequate air flow. The radiological air monitors (room monitors) did not detect an increase in airborne radioactivity that enunciated an action alarm. The licensee indicated that the procedure for disposing of the glass cylinders requires the vacuum transfer of gas to a container stored in a steel drum. According to the licensed waste depositary, each waste tank capacity is limited to either occurrence of 1.5 atmospheres of pressure or 100 curies of contained fission gas. The inspector will review the licensee's operations for disposing of the glass cylinders during a future inspection.

No violations or deviations were identified.

f. Airborne Releases

Records of air sampling data were reviewed for the January through June 1989 operating period. Included in this review were stack sampling composites for gross alpha and beta (24-hour samples) and weekly samples collected from constant air monitors. This data gave no indication of a radioactive airborne release that exceeded the action level of the licensee's reference or limiting isotopes plutonium-239 and strontium-90.

The inspector concluded that there was no apparent incident that resulted in an excessive dose or intake to workers at either the West Jefferson or King Avenue facility.

No violations or deviations were identified.

5. Nuclear Criticality Safety (IP 88015)

The quantitative levels of plutonium and enriched uranium located in plant materials are considered contaminated residues. It is highly unlikely that fissile quantities of plutonium and enriched uranium are contained in any of the contaminated materials.

No violations or deviations were identified.

6. Operations Review (IP 88020)

The Department of Energy (DOE) has phased out nuclear research performed for DOE at Battelle Columbus Division (BCD). As a result, some 15 buildings, or portions thereof, will require decontamination and decommissioning (D and D) in order to remediate the facilities and qualify the buildings for unrestricted use. Only about 6% of the total work performed in some of the buildings was accomplished under a NRC license. Coinciding with the D and D effort is the current NRC license (Materials License SNM-7) which was amended to allow BCD to use carbon-14 in controlled field studies. The license was also amended to authorize the possession and use of iridium-192 for radiography associated with research and development.

The inspector toured all portions of the 15 buildings designated for D and D. The inspector observed that radiological surveys had been performed on equipment left over from DOE/NRC projects. Also, the extent of contamination in laboratory drains was being determined by radiologically characterizing materials removed from the drains.

a Radiography Room (King Avenue Facility)

BCD is authorized by license amendment to increase its radiographic capability by procuring a 150 curie iridium-192 source. The inspector observed that shielding of the radiograph room was upgraded by adding lead panels to the ceiling and the access door. The basic structure of the room consists of heavily shielded concrete walls. The operations engineer demonstrated the use of interlocking procedures, operating restrictions and instructions applicable to the operation of the iridium source and the security of the radiography room. The inspector determined that these components comply with the license amendment application.

b. Carbon-14 Field Studies (West Jefferson Facility)

The inspector reviewed records concerning health and safety audits and interviewed the industrial hygienist associated with the carbon-14 field studies. The records indicated that all personnel associated with the carbon-14 project received basic orientation in radiation protection. According to the standard operating procedure audits of the facility are performed and an inspection "walk through" to identify potential hazards is also required. The inspector toured the facility and observed that appropriate engineering controls (plastic sheeting and light wooden framed tents) for ventilation were present in areas were experiments involving carbon-14 were conducted. The control of contaminated liquid and solid waste was managed with 55 gallon waste drums.

The inspector concluded that the radiological health and safety controls were properly engineered to isolate experiments in a manner

that would protect personnel and the environment from unplanned aerosol releases.

No violations or deviations were identified.

7. Environmental Protection (IP 88045)

a. Site Characterization

As previously reported (see Inspection Report No. 70-008/89001) the licensee is investigating the extent of residual soil contamination which accumulated from past projects. Hence, soil samples were collected from the area between the effluent outfall and Darby Creek and sediment samples were collected from Battelle Lake. Recent data indicated that contaminated levels in soil collected 200 feet downstream of the outfall are less than 20 pCi cesium-137/g of soil. Less than 1 pCi cesium-137/g and no americium-241 was detected in samples of lake sediment. The investigation of soil contamination is still ongoing for consideration of remediation. The inspector observed while the licensee prepared borehole samples extracted from the site for a non-destructive analysis. These sample data will be helpful to the licensee in determining the extent of onsite residual contamination.

b. Annual Environmental Report

In accordance with Materials License No. SNM-7, Item No. 19, the licensee is required to submit on annual environmental report.

Groundwater samples are collected from three wells. The 1987 environmental report disclosed that the concentration of radioactivity found in well water samples was indistinguishable from background contributions. The report also indicated that liquid effluent released from the site to Darby Creek, as disclosed in upstream and downstream control samples, did not alter the concentration of radioactivity in the creek to greater than background levels. In addition, the licensee verifies compliance with applicable water quality standards for radioactivity in drinking water. An analysis of the non-community drinking water indicated that the average concentrations of gross alpha and gross beta radioactivity were less than EPA's drinking water standard.

Data presented in the 1986 environmental monitoring report disclosed similar results. Although the 1988 report has not been issued, the data is currently being reviewed by DOE.

No violations or deviations were identified.

8. Maintenance Surveillance (IP 88005)

A review of the licensee's surveillance tests was conducted to determine specifically whether the Hot Cell Laboratory pool water was being maintained within the limits prescribed by the license application.

The upper limits of radioactivity in the fuel storage pool water during routine operations shall not exceed 1E-03 μCi/ml beta gamma and 1E-04 μCi/ml alpha. For non-routine operations the upper limits of the radioactivity in the pool water shall not exceed 5E-03 μCi/ml beta gamma and 5E-03 μCi/ml alpha.

The pool water analyses indicated that the radioactivity concentration in eight samples collected in May and June 1989 ranged from 7.8E-08 μCi/ml to 7E-06 μCi/ml.

In compliance with the technical specifications as described in the license application and License Condition No. 21, the licensee determined that the pool water quality met surveillance requirements for radioactivity concentration.

9. Transportation Activities (IP 86740)

The inspector reviewed the licensee's program for shipment of radioactive materials.

Records indicated that three shipments containing radioactive materials were made during the March through June 1989 operating period. The shipments consisted of milling equipment, metallurgical tools and shielded drums of boron carbide control rods. The milling equipment was shipped as a limited quantity. The external surface contamination on this package was less than the DOT limit of 22 dpm/cm^2, while the radiation level on the external surface of the package did not exceed 0.5 mR/hr.

The inspector determined that the package shipped as a limited quantity met the limits specified in 49 CFR 173.421 and 173.443.

The inspector concluded that the licensee made an appropriate determination in order to ship the material as a limited quantity.

No violations or deviations were identified.

10. Exit Meeting

The scope and findings of the inspection were discussed with licensee representatives (Section 1) at the close of the onsite inspection on June 30, 1989. The inspector stated that licensee programs in the areas of exposure control, criticality safety, surveillance, operations, and transportation met regulatory requirements.

During the course of the inspection and the exit meeting, the licensee did not identify any documents or inspector statements and references to specific process as proprietary.