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Licensee: Battelle Memorial Institute - Columbus Division

Location: 1. 505 King Avenue, Columbus, Ohio
2. West Jefferson, Ohio

Dates: January 6-10, 1997

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EXECUTIVE SUMMARY

BATTELLE MEMORIAL INSTITUTE COLUMBUS DIVISION NRC Inspection Report No. 070-00008/97001(DNMS)

This was a routine, unannounced safety inspection to evaluate the licensee's oversight of health physics controls, decontamination surveys and analytical procedures, and remediation activities. The inspection focused on the licensee's ongoing decontamination/decommissioning (D&D) and research/development (R&D) activities and the related radiation safety program to determine if these activities were adversely impacting the safety of employees or the public and to determine compliance with the Commission's rules, regulations, and License Conditions. The inspection included visits to R&D laboratories, buildings undergoing D&D at the King Avenue site, and the JN-1 facility in West Jefferson site.

Overall, licensed activities were conducted safely and in accordance with established requirements. Staff were well trained and qualified, and control of licensed activities and materials were effective in maintaining radiation exposures and effluent releases well below established limits.

A concern was identified (Section 2.0) relating to management changes, vacancies and reassignments, such that the Battelle Management Team is no longer constituted or functioning as described in the Decommissioning Plan. In addition, isolated examples were noted involving document discrepancies (Section 3.6), indicating room for improvement in self-auditing. A concern relating to security equipment functionality was promptly addressed when identified (Section 3.7), and actions were planned to address instances of incomplete access control to areas/facilities containing licensed material (Section 7.0). Finally, there was a lack of formality and documentation of verbal management approval involving the reclassification of a significant contaminated area (Section 6.0).

DETAILS

1.0 Background

In 1943, Battelle Memorial Institute (BMI) performed atomic energy research and development while under contract with the Manhattan Engineer District. These programs continued under the Atomic Energy Commission (AEC) and the Department of Energy (DOE). Other nuclear programs were operated under Nuclear Regulatory Commission (NRC) Special Nuclear Materials License No. SNM-7. Work conducted under SNM-7 included: evaluations of power and research reactor fuels; post-irradiation examination of fissile material, control rods, and structural components; operation of a critical assembly laboratory; and, operation of a research reactor.

In 1986, BMI discontinued its nuclear fuel research and began remediation of its facilities such that they would be available for unrestricted use. The decommissioning and decontamination operations were being conducted at the King Avenue and West Jefferson facilities. The Decontamination Plan was approved via letter dated December 6, 1993.

In addition to its decommissioning activities, the licensee also has authority to perform agricultural, animal and laboratory research utilizing byproduct material. These programs are conducted in buildings and associated grounds located at the King Avenue Site in Columbus, Ohio, and the West Jefferson Site in West Jefferson, Ohio.

2.0 Management Oversight

2.1 Scope (87104)

The inspectors interviewed Battelle managers, supervisors, and decommissioning staff regarding their involvement and understanding of Battelle's radiation safety program. The inspectors reviewed a number of program management documents, and assessed Battelle management's understanding of previous commitments made in letters and license amendments to the NRC.

2.2 Observations and Findings

The NRC inspectors interviewed most of the managers and supervisors responsible for the oversight of Battelle's radiological program (positions described in Battelle's Decommissioning Plan, approved by the NRC on December 8, 1993). These individuals were interviewed to determine availability, involvement and knowledge of Battelle's decommissioning program.

The inspectors determined that since Battelle's Decommissioning Plan had been approved in 1993, a number of individuals identified as members of Battelle's seven-member Management Team are no longer employed at Battelle. This included the designated incumbents for the positions of Manager of Decontamination Operations, Quality Manager, and Manager for

Decommissioning Engineering. The inspectors also were informed that due to funding cuts, some positions (specifically, the quality oversight function) may no longer be organizationally a part of the Battelle Decommissioning Project. It was uncertain how these functions would be carried out in the future. The inspectors determined that Battelle had not notified the NRC licensing authority that the decommissioning management team described in Battelle's Decommissioning Plan had changed.

The inspectors also reviewed management control documents (e.g., Annual Program Review, ALARA Reports, Radiological Awareness Reports, Quality Assurance Monthly Surveillance Reports) which were required either by regulation, licensee commitment or Battelle procedures. Based on this review, the inspectors determined the licensee had implemented adequate assessment and audit tools to properly oversee routine daily decommissioning activities.

2.3 Conclusions

The inspectors determined that Battelle had a sufficient number of qualified and trained managers and supervisors, such that they were able to effectively control the radiological safety aspects of their decommissioning program. In general, the program management and documentation of program management commitments were satisfactory. However, Battelle's lack of a mechanism to keep the NRC informed of changes in their management organizational structure was a concern, as was the potential uncertainty of the Battelle quality assurance management group responsible for program auditing and oversight.

3.0 Radiation Protection Program

3.1 Radiation Training Program

3.1.1 Scope (87104)

The inspectors reviewed the training program for radiation workers and health physics technicians against the training requirements as described in the licensee's Decommissioning Plan and applicable procedures. The review included interviews of licensee personnel functioning as health physics, characterization and remediation technicians.

3.1.2 Observations and Findings

The resumes of various technicians were reviewed and compared to the requirements established in the applicable licensee procedures: Indoctrination, Training and Qualifications (TD-AP-2.0), Health Physics Technician Training (TD-AP-4.0) and Radiation Protection Training (TD-AP-5.0). The licensee's program provided standards for training, experience and/or testing, as appropriate, to achieve technician certification. Success on the National Registry of Radiation Protection Technologists (NRRPT) certification examination, for which the

candidates appeared to be properly qualified, was at a high level. Qualifications and minimal training requirements were properly addressed in all cases.

3.1.3 Conclusions

In general, technicians were highly experienced. The licensee's training program was found to be adequate and met regulatory requirements.

3.2 Contamination Control and Disposal of Soil

3.2.1 Scope (87104)

The inspectors reviewed the licensee's procedures and processes for identifying and limiting the creation and spread of radioactive contamination, and the disposal of soil removed during decommissioning activities. The review included tours of affected buildings in various stages of decommissioning and decontamination, examination of procedures used and their implementation, and interviews of licensee and contractor personnel.

3.2.2 Observations and Findings

The inspectors toured Buildings A, 2, 3, 5, 6, and 7 at the King Avenue site. Each of those buildings were either in the process of being decontaminated (Buildings 2, 6 and 7) or decontamination activities had been completed and the licensee was awaiting independent verification of final survey results (Buildings A, 6 and 7). In addition, Buildings 3 and 5 had been decommissioned and verified free of contamination and the licensee was in the process of rebuilding the usable spaces within each building.

The inspectors observed that the licensee had posted all areas that were radioactively contaminated and had further demarcated and posted a buffer zone or controlled area around each radioactively posted area. The controlled areas were used to limit the likelihood of spreading contamination to known clean areas. The inspectors reviewed licensee procedures HP-OP-011, Rev. 3, "Release of Materials from Controlled Areas," and HP-OP-014, Rev.1, "Control of Radioactive Material," and discussed their implementation with radiation protection and contractor personnel. The inspectors determined that all objects that were to be removed from a posted contaminated area were either: (1) surveyed and verified free of detectable contamination, or (2) bagged, prior to entry into the controlled area. Objects that were bagged, typically for continued use in other contaminated areas, were surveyed to verify that the exterior of the bag was free of detectable contamination. Prior to release from the controlled areas, the objects, whether bagged or not,

were resurveyed in order to verify that the object or bag exterior was free of detectable contamination. All release surveys were conducted by health physics technicians. Inspector observation of work in progress in contaminated areas determined that workers observed posted area restrictions and demonstrated good contamination control techniques.

The inspectors reviewed the process for collecting, evaluating and disposing of potentially contaminated and confirmed contaminated soil removed during decommissioning activities. The inspectors observed that samples were taken from suspected and known contaminated soil strata and analyzed for radioactivity. Soil identified as contaminated was packaged for disposal at a licensed radioactive burial site. Soil that was determined to be free of radioactive contamination above the licensee's release limit was packaged for disposal at a licensed municipal waste landfill, in accordance with licensee procedure HP-OP-106, Rev. 0, "Volumetric Release Permitting Requirements." The general steps used to complete a volumetric release were as follows:

- (1) determine the release limit for the material to be analyzed;
- (2) determine the radioactivity levels of the suspect material;
- (3) determine whether the suspect material's radioactivity content is within background values;
- (4) determine whether the suspect material's radioactivity content is within volumetric release criteria;
- (5) determine route and method of disposal; and (6) complete, approve, and retain the release package. Once a release package had been completed, including the laboratory analysis, it was forwarded to the Manager, Safety, Health and Environmental Support, and the Environmental Manager, for approval. The approval included an expiration date, usually 30 days. If the disposal was not completed prior to the expiration date, the entire package was prepared again and resubmitted for approval.

The inspectors selected two release permits for review. Both permits were for soils removed from Building A decommissioning and decontamination that were eventually released as free of radioactive contamination. The permits contained all of the required laboratory analyses and the approvals of both Managers. The disposals were completed within two days of the Managers' approvals.

3.2.3 Conclusions

The inspectors determined that the licensee effectively identified and controlled radioactive contamination at the King Avenue site. Workers appeared to effectively observe and implement contamination control procedures. The licensee's procedures and processes for soil analysis and disposal were adequately implemented.

3.3 Personnel Monitoring

3.3.1 Scope (87104)

The inspectors reviewed the licensee's program for monitoring radiation dose from both external and internal sources.

3.3.2 Observations and Findings

Thermoluminescent dosimeters were exchanged once every three months. A National Voluntary Laboratory Accreditation Program (NVLAP) approved supplier provided dosimetry badges to Battelle. The dosimetry exposure data was reviewed for the years 1995 and 1996. The records showed that workers at the West Jefferson location received the greater dose. There were no unusual exposures and the exposures were well below the 10 CFR Part 20 limits and the licensee's administrative limits of 500 mRem per quarter.

Urine bioassay data for 1995 and 1996 was reviewed and determined to be well below the 10 CFR Part 20 limits; there were no positive bioassay results. The licensee used a subcontractor to analyze urine samples semiannually. The NRC inspector reviewed the subcontractor's procedures. This review included minimum detectable concentrations, adequacy of quality assurance procedures, and sample turn around time.

3.3.3 Conclusions

The licensee's personnel monitoring program was found to be adequate and met regulatory requirements.

3.4 Air Monitoring (87104)

3.4.1 Scope

The inspectors reviewed the licensee's program for air monitoring in the work place. The review included the evaluation of analytical and sampling procedures, and interviews of licensee personnel.

3.4.2 Observations and Findings

The inspectors reviewed the DAC*Hour exposures for workers in the JN-1 Building during 1996 D&D activities and determined that the internal exposures based on air sampling were also well below the 10 CFR Part 20 limits and the licensee's ALARA administrative limits. Additional details are given in Section 5.0.

3.4.3 Conclusions

The licensee's air monitoring program was determined to be adequate, meeting NRC regulatory requirements.

3.5 Effluent Release

3.5.1 Scope

The inspectors reviewed the licensee's program for monitoring the stack release from hot cells in the JN-1 Building. The review included evaluation of analytical counting methods and air sampling procedures, and interviews of licensee personnel.

3.5.2 Observations and Findings

Stack releases from hot cells in JN-1 Building during 1996 were below the 10 CFR Part 20 limits and the licensee's administrative limits.

3.5.3 Conclusions

The licensee's monitoring program and controls for stack releases were found to be adequate and met regulatory requirements.

3.6 Posting

3.6.1 Scope (87104)

The inspectors toured several Battelle buildings undergoing decommissioning, at both the King Avenue, Columbus, OH site and the West Jefferson, West Jefferson, OH site. During these tours the inspectors checked for posting of standard NRC informational and radiological caution signs. Areas were checked for posting of Radiation Work Permits (RWP), and other postings required by internal procedures.

3.6.2 Observations and Findings

During the tours of the buildings the inspectors checked for required postings at each point of access to a controlled or restricted area. Additionally, the inspectors checked for the posting of RWPs and RWP Sign-in Sheets. A few isolated examples were noted where decommissioning staff did not record their time out and final dosimeter value at the end of the day as specified in procedure HP-AP 1.0. The inspectors determined that these records are audited weekly by Battelle's health physics staff. Typically, omissions were corrected during the weekly audits. The one instance noted at the JN-1 Building was corrected prior to the inspectors departure from the building.

During a review of records, the inspectors identified a few additional instances where RWP Sign-in Sheets had not been completely filled out. The number was not significant when compared to the volume of records which had been appropriately completed during the two year period reviewed (1995 and 1996). Further, as noted in Section 3.3, a check of personnel monitoring records did not identify any individuals who exceeded either the NRC regulatory limits, or Battelle's internal ALARA radiological exposure limits.

3.6.3 Conclusions

The inspectors determined that the licensee had an adequate program for posting of procedural guidance documents (including data entry/sign-in logs) and informational and radiological caution signs. In light of the omissions noted above, the licensee's auditing and control process has room for improvement. The inspectors discussed with Battelle staff the need for emphasis on insuring staff complete all required sign-in sheets properly and completely.

3.7 Security

3.7.1 Scope (87104)

The NRC inspectors reviewed the licensee's practices and procedures for insuring security of and controlling access to licensed radioactive materials. The review included checking of security alarms, checking security doors, and interviewing Battelle decommissioning and security personnel.

3.7.2 Observations and Findings

The inspectors toured several buildings at both the King Avenue and West Jefferson sites. During the tours of these buildings the security and access points to restricted areas which were checked, appeared to be adequate. The inspectors identified two security concerns at the West Jefferson JN-1 Building.

The first concern regarded a security computer software problem. After opening an alarmed door in the JN-1 Building, the inspectors contacted Battelle's Security Office to discuss the alarm function. During these discussions, it was determined that a potential problem with the security software program existed which could have led to the security force missing an alarm. The Battelle Security Personnel informed the NRC inspectors the next day that the software problem had been corrected.

The second concern regarded security at the main door to the JN-1 Building, which was not being locked at the end of the day. The inspectors were informed that the building was locked later in the evening by a member of the Security force who toured the site on a periodic basis. Battelle personnel considered the security fence and surveillance camera to be sufficient to insure adequate access control and security. The inspectors discussed their concern regarding the limitations of camera surveillance systems, and the fact that there were other buildings and personnel on the site (inside the fence) whose work was not related to the decommissioning project. These personnel were not issued dosimetry, but could access radiologically controlled areas in the JN-1 Building via the unsecured main door. The NRC was informed by Battelle's Assistant Radiation Safety Officer, during a January 24, 1997 telephone call, that Battelle had decided to improve access control for the JN-1 Building by adding a security card reading device at the main entrance.

3.7.3 Conclusions

The licensee's practices and procedures for security of and access to licensed materials was determined to be adequate. The licensee's security force was professional and appeared well trained. Battelle was receptive to NRC identification of areas for improvement and took prompt actions to address them.

4.0 Survey Instrument Calibration and Contamination Surveys

4.1 Scope (87104)

The inspectors reviewed the licensee's characterization and final status survey, and ORISE's confirmatory survey of the KA-5 Building. The review included evaluation of instrument calibration and contamination survey procedures, and interviews of licensee personnel.

4.2 Observations and Findings

The calibrations for all survey instruments were completed by the health physics technicians group. Gas proportional counters were used for the contamination surveys.

The survey instruments were calibrated at the alpha plateau and at the alpha plus beta plateau. The alpha plus beta plateau setting was used to determine levels of contamination during the characterization surveys. Due to surface attenuation, most of the particles detected were expected to be high energy beta; only a very small percentage of the alpha was expected to be detected. It was appropriate to determine the levels of contamination (thorium/depleted uranium) based on the beta measurement.

4.3 Conclusions

The licensee's instrument calibration and contamination survey program for unrestricted release were found to be adequate and met regulatory requirements. The residual surface activity levels of the KA-5 Building were below the NRC's unrestricted release guidelines.

5.0 Removal of Spent Fuel Pool Water

5.1 Scope (87104)

The inspectors reviewed the licensee's program for removal of spent fuel pool water. This included the review of radiation work permits, work instructions, and ALARA considerations, a tour of the spent fuel pool facilities, and interviews of licensee personnel.

5.2 Observations and Findings

The licensee currently uses a pool water processing system for the water removal into a holding tank through a filter system incorporating both mechanical filters and resin. The water in the holding tank is analyzed and completely steam evaporated through the evaporator. No liquid effluent is discharged.

The inspectors reviewed the data from water sampling of the pool and the holding tank, and determined that the steam release concentrations were within 10 CFR Part 20 limits.

The inspectors reviewed air sampling results of breathing zone, zone 11, high bay general area, and inside pool cavity area. On July 27, 1995, while removing objects from the pool, the air sampling results indicated 163% DAC in the breathing zone area, and 652% DAC inside the pool cavity area. The D&D activities were terminated until the licensee instituted an engineering control system. The system consisted of ventilation/exhaust system. When the D&D activities were started again on August 9, 1995, the engineering control system reduced the breathing zone air concentrations to less than 10 % DAC.

5.3 Conclusion

The licensee's program for processing of spent fuel pool water was determined to be adequate and met regulatory requirements.

6.0 Hot Cell Activities

6.1 Scope (87104)

The inspectors reviewed the licensee's program for hot cell entry and decontamination. The review included the review of radiation work permits (RWP), work instructions, and ALARA considerations, a tour of hot cell facilities, and interviews of licensee personnel.

6.2 Observations and Findings

Prior to the initial hot cell entry on September 11, 1996, extensive remote surveying activities were conducted. At the time of the entry, the licensee reevaluated its hot cell entry procedure (HP-AP-17.0) and downgraded the entry requirements based on in-cell radiological conditions. This decision was apparently communicated only verbally. Subsequently, workers were allowed to enter the hot cell only in the area where the radiological conditions had been characterized through remote surveys. The activities were controlled by the RWP and by continuous direct supervision.

The modifications of entry requirements were evaluated by the inspectors and determined to be based on sound health physics principles. However, the licensee's basis was not formally documented.

The inspectors reviewed in-cell exposures based on pocket dosimeters, DAC*hours and thermoluminescent dosimeters, and determined that the exposures were within the licensee's administrative limits.

6.3 Conclusions

The licensee's program for entry and decontamination of hot cells was found to be adequate and met regulatory requirements. However, there was a lack of formality surrounding downgrading hot cell entry requirements.

7.0 Routine Materials Program

7.1 Scope (87100)

The inspectors reviewed the licensee's implementation of its radiation safety program for routine operations conducted under an active byproduct materials license of broad scope. The review included an examination of use authorizations, radioactive material procurement, laboratory surveys, sealed source inventory and leak testing, and self-assessments. The inspectors conducted tours of laboratory activities, performed confirmatory surveys in high-activity use areas, and interviewed licensee and contractor personnel.

7.2 Observations and Findings

During tours of laboratory areas in Building 5, the inspectors observed that laboratories were secured against unauthorized entrance. In addition, all cabinets and refrigerators used to store stock and in-process materials were padlocked. The licensee had identified a few examples in the last twelve months when laboratory personnel had left the doors to laboratory areas and refrigerators unlocked. At the time of each occurrence, the licensee immediately secured the area and counselled laboratory personnel on security requirements. Incremental increases in the level of security and oversight on laboratory activities were also implemented. At the time of this inspection, the licensee was again considering increased security measures, based on the cumulative number and nature of security lapses in the past. None of the previous security lapses resulted in the loss of licensed material or unnecessary exposures to workers or visitors. Visitors must be escorted at all times on licensee property and access by unauthorized individuals to otherwise restricted areas was unlikely.

The inspectors conducted removable contamination surveys in one high use laboratory, where millicurie quantities of powdered carbon-14 compounds are used. The surveys did not identify any contamination significantly different from background levels. The licensee had not experienced any significant contamination incidents in this area. All other laboratory areas used primarily microcurie quantities, or less, of carbon-14. At the time of the inspection, no other isotopes in unsealed form were actively in use.

The inspectors examined the licensee's process for maintaining the inventory of sealed sources and conducting leak tests of those sources requiring testing. All sealed sources were actively tracked through a software database which indicated when sources were due for leak testing at least one month before the required testing date.

7.3 Conclusions

The licensee had effectively implemented its radiation safety program for routine activities conducted under its broad scope research and development license. The licensee had identified several examples of

security lapses in some laboratory areas, but none had resulted in the loss of licensed material or unnecessary exposures. Other security measures in place, facility-wide, provided an additional margin of security such that the identified examples would not likely have resulted in the unauthorized access to otherwise restricted areas.

8.0 Exit Meeting

The inspectors conducted a meeting to discuss preliminary inspection results with members of licensee management and staff at the conclusion of the inspection on January 10, 1997. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

Partial List of Persons Contacted

Licensee

F. Hood, Vice President, Environment, Safety and Health
S. Layendecker, Manager, Safety, Health and Environmental Support/RSO
J. Poliziani, Characterization Manager
C. Jensen, Radiological Technical Support Manager
G. Henderson, Assistant Radiological Field Operations Manager
J. Hallgren, Radiological Field Operation Manager

State

F. Talbot, Health Physicist, Ohio Department of Health
J. Webb, Health Physicist, Ohio Department of Health

List of Procedures and Documents Reviewed

Annual Radiation Program Review
RC-AP 3.0, Rev. 0, Event Reporting
HP-AP-21.0 Rev 0, Rad Awareness Report
HP-OP-17.0, Health Physics Routine Surveillance
HP-OP-19.0, Radiation and Contamination Survey Techniques
HP-AP-7.0, Rev 1, Requirements for Reporting Information to the NRC
HP-AP-1.0, Rev 4, Issue and Use of Radiation Work Permits
HP-AP-29.0, Rev 3, Control of Measuring and Test Equipment and Instruments
HP-AP-17.0, Rev 1, Human Entry into Hot Cells
TD-AP-2.0, Indoctrination, Training and Qualifications
TD-AP-4.0, Health Physics Technician Training
TD-AP-5.0, Radiation Protection Training
DD-CP-004, Rev 6, Radioactive Contamination Monitoring Requirements
DD-CP-002, Rev 3, Facility Post-Decontamination Final Status Survey
Characterization and Final Status Survey, Building KA-5
ORISE Confirmatory Survey, Building KA-5
Radiation Work Permit, 96-JN1-013
Health Physics Survey Reports, J-10995, 10590, 10948, 10676
Release Permits HPS #K-22132 and HPS #K-22577
RWP Sign-in Sheet, 1995 & 1996
Air Sampling Results (1995), Stack Releases from Hot Cells
Air Sampling Results (1995), Spent Fuel Pool Areas
NRC Form 5, Personnel Dosimetry Record, 1995 & 1996
Survey Forms, DDO-384, 1996
Bioassay Reports, 1995 & 1996
HP-OP-011, Rev. 3, Release of Materials from Controlled Areas
HP-OP-014, Rev.1, Control of Radioactive Material