U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-20/85-01

Docket No. 50-20

License No. R-37

Licensee: Massachusetts Institute of Technology
Research Reactor
138 Albany Street
Cambridge, Massachusetts 02139

Facility Name: MIT-R

Inspection At: Cambridge, Massachusetts

Inspection Conducted: February 13-15, 1985

Inspectors: _____ 3/12/85
Jean A. Cioffi, Radiation Specialist date
PWR Radiation Protection Section

_____ 3/12/85
John R. White, Senior Radiation Specialist date
PWR Radiation Protection Section

Approved by: _____ 3/18/85
M. Shanbaky, Chief date
PWR Radiation Protection Section

Inspection Summary:
Inspection on February 13-15, 1984 (Report No. 50-20/85-01).

Areas Inspected: Routine, unannounced safety inspection of the radiation protection program, including: the status of previously identified items; radiological surveys, postings, material labeling, and controls; equipment, instrumentation, and leak tests; environmental monitoring.

The inspection involved 30 hours on-site by two region-based inspectors.

Results: Of the areas inspected, one violation of transportation requirements was identified, i.e., failure to properly label a radioactive shipment with respect to radionuclide identity, physical and chemical form, and correct activity as required by 49 CFR 172.203(d), paragraph 5.0.

DETAILS

1.0 Persons Contacted

E. Karaian, Reactor Radiation Protection Officer
L. Clark, Jr., Associate Director, Nuclear Reactor Laboratory
P. Coggio, Reactor Radiation Protection Technician

2.0 Purpose

The purpose of this routine, unannounced, safety inspection was to review the licensee's radiation protection program with respect to the following elements:

- Status of Previously Identified Items
- Radiological Surveys, Posting, Material Labeling, and Controls
- Radioactive Material Identification
- Equipment, Instrumentation, and Leak Tests
- Environmental Monitoring

3.0 Status of Previously Identified Items

3.1 (Closed) Violation (83-02-01). Failure to post hot cell on reactor top as high radiation area and to control personnel access to the area. The licensee's corrective actions, as stated in Inspection Report 83-02, Section 5b, were reviewed to verify their implementation. Implementation of the corrective actions appeared to be adequate to prevent recurrence.

3.2 (Closed) Follow-up (83-02-02). Radiation protection to control use of radiation barricades and signs to avoid misuse. For other than radiological control purposes, the licensee has purchased white ropes for the researchers to use to enclose their equipment and experiments.

3.3 (Closed) Follow-up (83-02-03). Radioactive contamination control by individuals working in materials laboratory section of Engineering laboratory. The floors in front of Hoods 1 and 2 of NW12-139 are surveyed daily for contamination. Monthly surveys are performed for the entire laboratory area. Contaminated areas are cleaned immediately.

4.0 Radiological Surveys, Postings, Material Labeling, and Controls

The licensee's program for surveys, postings, labeling, and controls was reviewed against the criteria contained in 10 CFR 20.105, 20.106, 20.201, 20.203, 20.204, 20.207, and 20.401.

The licensee's performance relative to these criteria was evaluated by:

a. Examination of records of daily and monthly surveys for 1983 and 1984;
b. A tour of the facility;
c. Observation of signs and postings on equipment, in laboratories, in hallways, and on doors;
d. Direct radiological measurements of areas in the facility with a GM detector and a "Juno" ionization chamber;
e. Observations of access controls for the reactor building, and for monitoring activities within the reactor building; and
f. Discussions with licensee representatives.

The inspector noted the following:

Gamma surveys and smears are taken daily on floors and in common areas. Monthly surveys are performed in laboratories and near equipment and radioactive waste storage areas. The Radiation Protection Officer is informed daily of any contaminated areas through the use of a daily status sheet, which identifies the contaminated areas and states the corrective actions taken.

Access to the reactor building and auxiliary facilities, such as the radwaste storage areas and laboratories, is controlled with a key card. Personnel entering the reactor building are required to call the control room and notify the operator of their intent to enter. The entrance to the reactor building is observed in the control room by a closed circuit TV camera. The TV camera can also be moved to observe approximately half of the reactor floor and the top of the reactor where a hot cell is located.

There were no violations identified in review of this area.

5.0 Radioactive Material Identification

The inspector investigated two incidents, which occurred on September 4, 1984 and on September 13, 1984, in which rhenium wire samples were mistaken for other radioactive samples. On September 4, 1984, a reactor operator was directed to package and release a strontium chloride sample by an experimenter. The wrong sample was mistakenly packaged, but not shipped when it was fortuitously determined that the sample was erroneously identified.

In the incident occurring on September 13, 1984, a rhenium wire consisting of 281 millicuries of rhenium-186 and 824 millicuries of rhenium-188 was packaged, labeled, and shipped to Massachusetts General Hospital. The package was labeled and shipped as 8 millicuries of chlorine-38, in the form of calcium chloride salt. This incident constituted a violation of 49 CFR 172.203(d), which states that each package of radioactive material must be identified as to radionuclide identity, physical and chemical form, and amount of activity.

As a result of this occurrence, one Massachusetts General Hospital

employee sustained minor unplanned exposure to the wrist and whole body, of 150 millirads and 25 millirads, respectively.

The licensee determined that the cause of this occurence was misidentification of the samples on the sample storage map, located on the outer wall of the hot cell. As a result, the licensee initiated the corrective actions listed below:

a. Two internal memos were circulated emphasizing the importance of accurately marking the identity of samples on the sample map located outside the hot cell. The memos also stated that beta surveys were to be performed on all samples in addition to gamma surveys. All reactor operators initialled the memo to verify that they read it.

b. A lead container was placed in the hot cell and labeled "Rhenium Only," for the placement of the rhenium wire samples. Rhenium wire samples are now placed in this container only.

The inspector interviewed one reactor operator to evaluate the effectiveness of this corrective action. The reactor operator stated that the beta survey was not being performed. All other corrective actions were being implemented.

The inspector discussed the failure to perform the beta survey with the Radiation Protection Officer (RPO). The Radiation Protection Officer stated that he disagreed with the newly instituted requirement to perform beta survey of the samples because this practice would increase exposure to the operators which would not be consistent with good ALARA practices.

On February 21, 1985, the Radiation Protection Officer and the Associate Director, Nuclear Reactor Laboratory, telephoned the inspector to present new corrective actions. The following actions were discussed with the inspector:

a. The requirement to beta survey would be eliminated;
b. A specific procedure will be written for work in the hot cell. The identity of the sample will be specified in one or more of the following ways:

    (1) Use of the sample reference number;
    (2) Use of any distinguishable marks on the sample and the mark recorded on the work form (Part II); and
    (3) Use of any unique shape of the samples and the shape recorded on the work form (Part II).

c. The gamma dose will be verified on the work form; and
d. The importance of confirming the identity of the sample with the work form (Part II) will be reemphasized.

The effectiveness of these corrective actions will be examined in a future inspection (85-01-01).

6. Equipment, Instrumentation, and Leak Tests

The licensee maintains logs of all instrument calibrations. Survey instruments and monitors are calibrated quarterly. Effluent radiation monitors are calibrated yearly and checked on a quarterly basis for response to a radioactive source.

Argon sampling and monitoring are performed continuously using a GM detector which views a known volume of gas. A strip chart records all data. Counts are summed over one week. Additional air sampling equipment is mounted on carts and moved to various locations, such as port openings, when needed.

Leak tests are performed quarterly and semiannually, depending on the type of source. The licensee has determined that the lower level of detection for their leak tests is 1.8×10^{-6} microcuries alpha, and 9×10^{-6} microcuries beta. Accurate records are kept of leak tests with a clear description of the type of wipe (i.e., dry or wet).

Within the scope of this review, no violations were observed.

7. Environmental Monitoring

The licensee's program for environmental monitoring was reviewed against criteria contained in 10 CFR 20.106 and Appendix B, Table II.

The licensee's performance relative to these criteria was evaluated by:

a. Visual inspection of two separate environmental monitoring stations for working instrumentation, and location with reference to the reactor stack;
b. Discussions with the Reactor Health Physics technician and the Radiation Protection Officer on the calibration of the instrumentation and data collection and calculations; and
c. Review of the annual reports for 1983 and 1984.

The licensee uses GM tubes for their environmental monitoring stations. Each GM tube is connected to a count-rate meter located inside a sheltered area. The signal from the count rate meter is sent through telephone transmission lines to strip chart recorders located inside the Health Physics office at the Nuclear Reactor Laboratory. Data on the strip chart recorders is collected daily and summed monthly.

Within the scope of this review, no violations were observed.

8. Exit Interview

The inspector met with licensee management at the conclusion of the inspection of February 15, 1985 to discuss the scope and findings of the inspection as detailed in this report. At no time during this inspection effort was written material provided to the licensee by the NRC inspector.