

U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos.: 50-20/94-01 and 70-938/94-01

Docket Nos.: 50-20 and 70-938

License Nos.: R-37 and SNM-986

Licensee: Massachusetts Institute of Technology (MIT)
138 Albany Street
Cambridge, Massachusetts

Facility Name: MIT Research Reactor

Inspection At: Cambridge, Massachusetts

Inspection Conducted: January 26-28, 1994

Inspector:

Thomas Dragoun

Thomas Dragoun, Project Scientist
Effluents Radiation Protection Section (ERPS)
Facilities Radiological Safety and Safeguards Branch (FRSSB)

2/23/94
Date

Approved By:

Judith A. Joustra

Judith Joustra, Chief, ERPS, FRSSB
Division of Radiation Safety and Safeguards

2/18/94
Date

Areas Inspected: Status of previously identified items, corrective actions for a failed low-range amplifier, and implementation of the emergency preparedness program.

Results: No safety concerns or violations of regulatory requirements were observed. The emergency preparedness program was implemented in a manner that protects the public health and safety.

DETAILS

1.0 Individuals Contacted

- * J. Bernard, Director of Reactor Operations
 - D. Carlson, Assistant to the Chief, Campus Police
 - * E. Lau, Assistant Operations Superintendent
 - F. Massé, Campus Radiation Protection Officer
 - * F. McWilliams, Reactor Radiation Protection Officer
 - * T. Newton, Assistant Operations Superintendent
 - D. O'Connor, Director, Emergency Management, City of Cambridge
 - R. Suduiko, Assistant to the President, MIT
- * Personnel present at the Exit Interview on January 21, 1994. Additional personnel were contacted or interviewed during the course of the inspection.

2.0 Status of Previously Identified Items

(Closed) Violation (70-938/87-01-03) Waste manifest did not specify the total quantity of hydrogen 3 (H-3), carbon 14 (C-14), technetium 99 (Tc-99), and iodine 129 (I-129) in reactor resin packages. The licensee contracted an outside vendor (Controls for Environmental Pollution) to perform a waste stream analysis. This report, dated March 1992, provided the data used to develop dose-to-curie conversion factors for the radionuclides in the waste resin shipments, including C-14, Tc-99, and I-129. The H-3 content for each shipment is scaled from liquid scintillation analysis of reactor water. Corrective actions described in licensee letters dated October 16, 1987, March 14, 1991, and April 12, 1991, are complete and satisfactory.

3.0 Special Nuclear Materials

The inspector discussed the organizational structure and scope of the Special Nuclear Materials Program with the Campus Radiation Protection Officer and the Reactor Radiation Protection Officer. No safety concerns or violations of regulatory requirements were identified.

4.0 Nuclear Instrumentation Failure

On December 8, 1993, the licensee informed the NRC that on December 7, 1993, one of the two low range reactor power channels failed to indicate properly during operations in low power mode (<100Kw, natural circulation cooling). The reactor scrambled during diagnostic testing of the electronic module circuitry. Defective components were found, including a relay that aligns the channel for low power operation and enables a front panel test connection. The modules are multipurpose and may be used either in the low range or high range power channels.

Corrective actions included repair of the defective module, evaluation of equipment repair data for other modules to assess evidence of common-mode failure, procedure changes to require verification of low/high range selection, and use of the detector input connection for startup tests in lieu of the front panel test connection. In a December 28, 1993 letter, the licensee stated that two modules would be permanently modified for low range use, thereby eliminating the need for some of the corrective actions already taken. The inspector interviewed the instrument technician who designed the changes, reviewed the safety evaluation of the changes, and visually inspected the modified modules. The inspector witnessed an operational test of a module installed in the reactor console that validated the hard-wired features. Within the scope of this review, no safety concerns were identified. Licensee corrective action for Reportable Occurrence 50-20/1993-1 (NRC Event No. 26479) was complete and satisfactory.

5.0 Emergency Preparedness

5.1 Emergency Plan Changes

The licensee has nearly completed revisions to sections of the NRC-approved Emergency Plan (EPlan) and emergency procedures. The changes were made to implement the revised 10 CFR 20 requirements that were effective on January 1, 1994 and to reflect changes in EPA "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents". Each change was accompanied by a documented review relative to requirements in 10 CFR 50.59, 10 CFR 50.54(i), 10 CFR 50.54(p), and 10 CFR 50.54(q). There were no unreviewed safety questions or relaxation of requirements. The MIT Reactor Safeguards Committee (RSC) reviewed and approved the changes to the EPlan on December 21, 1993. The inspector discussed with the licensee the notifications that would be made to the NRC during emergencies. The licensee stated that facility management expects the operators on duty during an accident to carefully evaluate the situation, take the necessary initial action to protect the staff, the public, and vital safety equipment, and then notify off-site agencies, including the NRC. Notification to the NRC will generally be made by the acting Emergency Director within 15 minutes after an event has been identified and categorized. The inspector concluded that this was reasonable. Within the scope of this review, no safety concerns were identified.

5.2 Emergency Facilities and Equipment

The inspector toured the facilities that would be used to coordinate emergency response which includes the control room and the emergency support centers located in the Reactor Operations Office and the Environmental and Medical Services Office. In the control room the inspector noted that each alarm on the display panel was labeled with a Abnormal Operating Procedure (AOP) number. On receipt of an alarm, the operators are trained to retrieve and follow the

instructions in the AOP. If certain plant conditions exist, the AOP notifies the operator to an Emergency Operating Procedure thereby initiating the emergency plan. In addition, a chart of Emergency Action Levels (EALs) is posted near the instruments used to determine the EAL. Emergency and staff home phone numbers are conspicuously posted. The use of these operator aids is a good initiative. The inspector quizzed several operators and determined that they were aware of their emergency response duties.

The emergency support center, located in the Reactor Operations Office, is equipped with a remotely controlled video camera that can be focused on any instrument on the reactor control panel. It can also be used to check levels of smoke or flooding in the control room if personnel are evacuated. One of the telephones in the support center is connected to an alternate telephone company to provide backup communications on loss of power. Other data available in the support center includes readout of wind speed, wind direction, and radiation levels in several areas of the reactor building.

The Environmental and Medical Services Office, the alternate emergency response center, was well equipped with telephones and portable radiation survey equipment. Battery operated air sampling equipment and walkie-talkie radios were also available.

Within the scope of this review, no deficiencies were noted. Emergency response facilities were well equipped and could perform their function.

5.3 Drills and Training

The EPlan requires four annual drills, one each in the areas of communications, radiological event, building evacuation, and medical injury. Records indicated that drills were conducted as required. Responsibility for conduct of the drills was assigned to one of the Assistant Operations Superintendents. The radiological and medical drills involved extensive preparation and coordination. Drill scenarios, findings, and corrective actions were reported to the MIT RSC for review. The inspector noted that the drill scenarios were challenging.

One element of the requalification program for reactor operators is annual refresher of emergency response duties. Operators are required to read the EPlan and emergency procedures and take a written exam. The exam was prepared by the Senior Review Board. One of the Shift Superintendents is responsible for ensuring completion of this training. A review of training and exam records indicated that the requirements were met.

Annual training is also required for support groups such as the campus police and City of Cambridge firefighters. Completion of this training for campus police

was verified through a review records and discussions with a campus police lieutenant. Recent training of firefighters could not be verified and is discussed further in Section 5.4 of this report.

5.4 Emergency Support

The licensee has extensive in-house resources available for emergency response including medical facilities and the campus police. According to the EPlan requirements, the campus police are responsible for conducting radiation surveys in areas external to the reactor building and contacting various personnel and agencies by telephone or radio. The inspector visited the campus police headquarters and interviewed the assistant to the chief. The inspector concluded that the campus police could perform the emergency response tasks on all shifts and any day of the week. The inspector noted that reactor emergency drills normally do not exercise off-site support. The assistant to the chief stated that a Local Emergency Planning Committee (LEPC) had been recently formed. The LEPC conducted a HAZMAT drill on campus in December 1993 that involved participation by off-site groups. This was a good licensee initiative.

The licensee has written agreements with the City of Cambridge Emergency Management Department, Fire Department, and Police Department and the Massachusetts General Hospital to provide emergency assistance as specified in the EPlan. The current agreements were signed in 1992 with renewal anticipated to occur in 1994. Records indicate that the licensee has conducted periodic tours and briefings for these personnel. However, section PM 4.3 of the EPlan requires these tours annually for firefighters. Although completed in the past, participation by firefighters has decreased lately. The failure to meet the commitments documented in the EPlan is an unresolved item, a matter about which the NRC requires additional information to determine whether it is an acceptable issue, a deviation from a written commitment, or a violation. This matter will be reviewed in a future inspection. (Unresolved Item 50-20/94-01-01)

In an effort to resolve this matter, the inspector met with the Director of the Cambridge Emergency Management Department (Director), the Assistant to the President (MIT), and the facility staff to discuss this matter. The Director stated that the scope of training requirements for firefighters had been increased dramatically by other agencies. This reduced the amount of time available for training at the research reactor. The fire department had organized a special "Rescue Team" that was specifically trained and equipped to respond to radiation emergencies. The Rescue Team was located five minutes from the research reactor. The City also purchased a radiation training package, standardized for nationwide use, which will be given to all firefighters. The Director also delivered a verbal message from the City Manager stating that he was fully satisfied with the current level of coordination and cooperation between the

reactor facility and the city departments. The licensee stated that negotiations with the city government will continue in an attempt to revive participation in the orientations. In addition, the standardized training for the firefighters will be reviewed by the licensee, pending permission by the city. Pending the outcome of these efforts, the need for a change to the EPlan will be assessed by the licensee.

6.0 Exit Interview

The inspector met with the licensee representatives indicated in Section 1.0 of this report on January 28, 1994, and summarized the scope and findings of this inspection. The licensee acknowledged the inspection findings. Subsequent to the inspection, the unresolved item in Section 5.4 was identified. This matter was discussed with a licensee representative by telephone on February 23, 1994.