

August 19, 2002

Dr. John A. Bernard, Jr
Director of Reactor Operations
Massachusetts Institute of Technology
Research Reactor
MITNRL-NW12
138 Albany Street
Cambridge, MA 02139

SUBJECT: NRC ROUTINE, ANNOUNCED INSPECTION REPORT NO. 50-20/2002-202

Dear Dr. Bernard:

This letter refers to the inspection conducted on July 9-12, 2002, at your MIT Research Reactor facility. The inspection included a review of activities authorized for your facility. The enclosed report presents the results of that inspection.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress. Based on the results of this inspection, no safety concerns or noncompliances of NRC requirements were identified. No response to this letter is required.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>.

Should you have any questions concerning this inspection, please contact Mr. Thomas Dragoun at 610-337-5373.

Sincerely,

/RA/

Patrick M. Madden, Section Chief
Research and Test Reactors Section
Operating Reactor Improvements Programs
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-20
License No. R-37

Enclosure: NRC Inspection Report No. 50-20/2002-202

cc w/enclosure: See next page

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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket Nos: 50-20

License Nos.: R-37

Report No: 50-20/2002-202

Licensee: Massachusetts Institute of Technology

Facility: MIT Research Reactor

Location: 138 Albany Street
Cambridge, Massachusetts

Dates: July 9-12, 2002

Inspector: Thomas F. Dragoun

Approved by: Patrick M. Madden, Section Chief
Research and Test Reactors Section
Operating Reactor Improvements Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

Massachusetts Institute of Technology
Report No: 50-20/2002-202

The primary focus of this routine, announced inspection was the on-site review of selected aspects of the licensee's Class I non-power research reactor radiation protection and effluent monitoring programs.

Radiation Protection Program

- The elements of the licensee's radiation protection program that were reviewed during this inspection were found to be adequately implemented to protect the safety of the staff and the public.

Reactor Effluent and Environmental Monitoring

- Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and Technical Specification limits.

REPORT DETAILS

Summary of Plant Status

The licensee's five megawatt (5 MW) research reactor continues to be operated in support of student instruction and laboratory experiments, tours, reactor operator training, silicon ingot irradiation, and various types of research. The security fence at the rear of the facility was ready for restoration to its normal location after being relocated to allow installation of campus utility lines.

1. Radiation Protection

a. Inspection Scope (Inspection Procedure [IP] 83743)

The inspector reviewed selected aspects of the following procedures and program areas to ensure that the requirements in Technical Specifications (TS) Sections 7.1, 7.3, and 7.10 and 10 CFR Part 20 were met:

- the radiation protection program organization
- radiological signs and posting
- routine surveys and monitoring
- personnel dosimetry records for 2001 and 2002 to date
- maintenance and calibration of radiation monitoring equipment
- radiological control of work
- As Low As Reasonably Achievable (ALARA) program
- Procedure RRP-4006, "Ludlum Model 375 Digital Wall-Mount Area Monitor", revision 3, issued February 2000
- Procedure RRP-4007, "Ludlum Area Radiation Monitoring System - Special Calibration", revision 2, issued March 2000
- Procedure RRP-4008, "Area Radiation Monitoring System - Quarterly Calibration", revision 1, issued March 2000. Data for years 2000, 2001, and 2002 to date
- Procedure RRP-3001, "Radiological Surveys", revision 4, issued July 2001. Data for 2001 and 2002 to date
- Procedure RRP-6004, "Air Gas Samples - Tritium", revision 4, issued June 2001. Data for 2002
- Procedure RRP-6002, "Air Gas Samples - Ar41", revision 4, issued June 2001. Data for 2002
- Procedure RRP-5001, "Cooling Tower Sampling and Analysis Procedure", revision 4, issued January 2000. Data for 2000
- Procedure RRP-4802, "Calibration Procedure for the Eberline RO-2 and RO-2A Ion Chambers", revision 3, issued April 2000
- Procedure RRP-4806, "Calibration Procedure for the Bicorn RSO-5 and RSO-50 Ion Chambers" revision 3, issued April 2000. Data for 2001 and 2002
- Procedure PM 1.4, "Review and Approval of Plans, Procedures, and Facility Equipment and Changes Thereto", Safety Review No. O-79-23 dated September 19, 1979.

b. Observations and Findings

On May 30, 2002, the NRC issued Amendment No. 33 to the reactor license which approved a reorganization of the Environmental Health and Safety department. This change affected the radiation protection (RP) staff at the reactor. The change was found to be fully implemented. As part of the change, the Reactor Radiation Protection Officer (RRPO) was also designated as Deputy Director, Environmental Health and Safety. This expanded his responsibilities to become the facilitator for industrial safety and hygiene at the reactor. Action regarding Inspector Follow-up Item 50-20/2001-202-01 (submitted amendment to update TS organization) is complete and was found satisfactory. Therefore, this Inspector Follow-up Item is considered to be closed.

The Assistant Reactor Radiation Protection Officer position (ARRPO) remains unfilled in spite of recruitment efforts. This position is not required by the TS. One of the two radiation protection technicians was promoted to Project Technician which includes the authority to act for the RRPO in his absence.

The inspector observed four work coordination meetings between the reactor operations and the RP staffs. One meeting dealt with the inventory and removal of radioactive material from a storage area adjacent to the hot cells. The second dealt with relocating the chemistry sample station. The third reviewed the preparations for the routine equipment outage scheduled for the following week. The last concerned an urgent request from a nuclear power station in Arkansas to use the hot cell to evaluate a failed neutron detector. Discussions included the safety precautions, assignment of responsibilities, and were forthright and demonstrated good cooperation. The inspector commented that relocating the chemistry sampling station may require a 10 CFR 50.59 screening review.

RP signs and postings satisfied 10 CFR 20 requirements. Routine radiological surveys were conducted in accordance with the licensee's procedures. Calibration of survey meters was conducted at the required intervals. Records were kept in accordance with 10 CFR Part 20 requirements. The survey data records were changed to include the identification of the person performing the survey. This practice was recommended by ANSI Standard HPS N13.49-2001 Section 6.1.1 and was discussed with the RRPO during the last inspection of this area in June 2001. Action regarding Inspector Follow-up Item 50-20/2001-202-02 (identify person performing the radiation survey) was complete and satisfactory. This matter is closed.

A detailed inventory of the portable radiation survey meters was recently completed by the licensee. Records were purged and new identification numbers assigned to the available equipment. For survey meters and friskers left at the monitoring stations in the facility, check sources were mounted at each station to allow verification of operability of the meter prior to use. These actions constitute program improvements.

The RRPO stated that analysis of personnel doses showed that the facility total person-rem has remained constant for the past several years. Dosimetry records showed that all personnel doses were below the NRC limits. Current ALARA projects to reduce doses included relocating the chemistry sample station from the reactor auxiliary equipment room to an area with a lower dose rate area. Also, reconditioning and placing into service a box calibrator to replace the current calibration technique using an open air range, was underway.

The permanently mounted area radiation monitors (ARM) calibration and alarm setpoint verification was conducted each quarter in accordance with the requirements in TS Section 4.3. The inspector noted, and the RRPO confirmed, that satisfactory results were recorded up to the fourth quarter of 2001. Beyond then, some ranges on individual units did not meet the acceptance criteria. All twelve units were sporadically affected. TS Section 3.8.5 only requires that one of the ARM to be operable. The RRPO was evaluating the situation. This matter will be reviewed during the next inspection of this program.

As part of the post 9-11 changes to the emergency plan, the inspector was shown one of the three state-of-the-art portable radiation monitoring kits that will be provided to the off site response organizations.

c. Conclusions

The elements of the licensee's radiation protection program that were reviewed during this inspection were found to be adequately implemented to protect the safety of the staff and the public.

2. Reactor Effluent and Environmental Monitoring

a. Inspection Scope (IP 69004)

The inspector reviewed the following to ensure that the reactor was operated within the limiting conditions specified in TS Section 3.0 and periodic surveillances on safety systems were performed as stipulated in TS Section 4.0:

- Procedure RRP 5006, "Waste Storage Tank System Sampling and Analysis Procedure", revision 4, issued January 2000. Data for discharge on July 10, 2002
- Procedure PM 3.6, "Waste Tank", Safety Review SR #O-96-11, dated November 27, 1996
- Safety Review of waste water discharge filter installation, SR-O-88-11, approved by the MIT Reactor Safeguards Committee (MITRSC) on December 20, 1988
- Safety Analysis Report figure 12.1.1.2-1 dated December 1, 1988 concerning pump RM-3 (waste water discharge pump)
- Procedure RRP 4001, "Calibration and Source Check of Environmental Monitors", revision 4, issued August 2001
- Procedure RRP 4011, "Effluent and Process Radiation Monitoring System Quarterly Calibration", revision 1, issued March 2000. Data for third quarter 2001, first and second quarters 2002

- Procedure RRP 4012, "Effluent and Process Radiation Monitoring System Annual Calibration", revision 1, dated March 2000. Data for August 1, 2002, and July 19, 2001.

b. Observations and Findings

The inspector accompanied a technician during the sampling and analysis of the waste water tank contents prior to discharge. The tank had been recirculated for greater than six hours as required by procedure. The technician properly prepared the samples for counting and conducted liquid scintillation, gas flow proportional detection of beta/gamma on a boil down sample, and gamma spectroscopy. Liquid scintillation samples were also sent to the campus laboratory for confirmation. Results were provided to the RRPO for approval. This discharge to the sanitary sewer satisfied the radionuclide concentration requirements in 10 CFR 20.2003(a)(3) and 10 CFR 20 Appendix B table 3. Dilution by cooling tower blowdown was incorporated into the calculation. No other dilution was assumed. This was conservative.

However, the sample appeared murky and the inspector verified that the sample point was downstream of the in-line mechanical filter. Filtration was a method described in NRC Information Notice 94-07, "Solubility Criteria for Liquid Effluent Releases to Sanitary Sewage Under the Revised 10 CFR Part 20", dated January 28, 1994, to satisfy the requirements in 10 CFR 20.2003(a)(1). The filter's particle removal specifications were not readily available as was the flow rate of the recirculation/discharge pump. The licensee stated that this data would be obtained and reviewed. This matter will be reviewed in a future inspection (Inspector Follow up Item 50-20/2002-202-01).

Effluent monitoring equipment was maintained and calibrated acceptably. Data indicated that effluent releases were below the limits specified in 10 CFR Part 20. Records were acceptably maintained. The principles of As Low As Reasonably Achievable were acceptably implemented to minimize radioactive releases. For example, the space between the reactor vessel and the support structure was purged with carbon dioxide to reduce the generation and release of argon-41.

c. Conclusions

Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and Technical Specification limits.

3. **Exit Interview**

The inspection scope and results were summarized on July 12, 2002, with members of licensee management. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

R. Dresios, Radiation Protection Technician
E. Lau, Assistant Operations Superintendent
F. McWilliams, Reactor Radiation Protection Officer
B. Rice, Radiation Protection Project Technician
S. Tucker, Quality Assurance Supervisor

INSPECTION PROCEDURES USED

IP 69004 CLASS I NON-POWER REACTORS EFFLUENT AND ENVIRONMENTAL MONITORING
IP 83743 CLASS I NON-POWER REACTORS RADIATION PROTECTION

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-20/2002-202-01 Review specifications of waste water pump and mechanical filter.

Closed

50-20/2001-202-01 Submitted amendment to update TS organization
50-20/2001-202 -02 Identify person performing radiation survey in the records

LIST OF ACRONYMS USED

ALARA As Low As Reasonably Achievable
ARRPO Assistant Reactor Radiation Protection Officer
CFR Code of Federal Regulations
IFI Inspector Follow-up Item
IP Inspection Procedure
MITRSC MIT Reactor Safeguards Committee
NRC Nuclear Regulatory Commission
RP Radiation Protection
RRPO Reactor Radiation Protection Officer
TS Technical Specifications