UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 12, 2024

Mr. John P. Foster
Director of Reactor Operations
Nuclear Reactor Laboratory
Massachusetts Institute of Technology
138 Albany Street, MS NW12-116A
Cambridge, MA 02139

SUBJECT: MASSACHUSETTS INSTITUTE OF TECHNOLOGY – U.S. NUCLEAR REGULATORY COMMISSION ROUTINE INSPECTION REPORT NO. 05000020/2024201

Dear Mr. Foster:

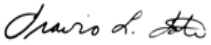
From July 8-11, 2024, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Massachusetts Institute of Technology (MIT) reactor. The enclosed report presents the results of that inspection, which were discussed on July 11, 2024, with you and members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspector reviewed selected procedures and records, observed various activities, and interviewed personnel. Based on the results of this inspection, no findings of significance were identified. No response to this letter is required.

In accordance with Title 10 of the *Code of Federal Regulations* Section 2.390, "Public inspections, exemptions, requests for withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of the NRC's document system (Agencywide Documents Access and Management System (ADAMS)). ADAMS is accessible from the NRC website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

If you have any questions concerning this inspection, please contact Brian Lin at (301) 415-2923, or by email at Brian.Lin@nrc.gov.

Sincerely,


Signed by Tate, Travis
on 09/12/24

Travis L. Tate, Chief
Non-Power Production and Utilization Facility
Oversight Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Docket No. 50-020
License No. R-37

Enclosure:
As stated

cc w/enclosure: GovDelivery Subscribers

SUBJECT: MASSACHUSETTS INSTITUTE OF TECHNOLOGY – U.S. NUCLEAR REGULATORY COMMISSION ROUTINE INSPECTION REPORT NO. 05000020/2024201 DATED: SEPTEMBER 12, 2024

DISTRIBUTION:
PUBLIC
TTate, NRR
HCruz, NRR
NParker, NRR
XYin, NRR
PBoyle, NRR
BLin, NRR
MWentzel, NRR
DTifft, R-I
RidsNrrDanuUnpo Resource

ADAMS Accession No.: ML24248A113 **NRC-002**

OFFICE	NRR/DANU/UNPO	NRR/DANU/UNPO/LA	NRR/DANU/UNPO/BC
NAME	BLin	NParker	TTate
DATE	09/05/2024	09/06/2024	09/12/2024

OFFICIAL RECORD COPY

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

Docket No.:	50-020
License No.:	R-37
Report No:	05000020/2024201
Licensee:	Massachusetts Institute of Technology
Facility:	Massachusetts Institute of Technology Reactor
Location:	Cambridge, Massachusetts
Dates:	July 8-11, 2024
Inspector:	Brian Lin
Approved by:	Travis L. Tate, Chief Non-Power Production and Utilization Facility Oversight Branch Division of Advanced Reactors and Non-Power Production and Utilization Facilities Office of Nuclear Reactor Regulation

Enclosure

EXECUTIVE SUMMARY

Massachusetts Institute of Technology
Massachusetts Institute of Technology Reactor
Inspection Report No. 05000020/2024201

The primary focus of this routine announced inspection was the onsite review of selected aspects of the Massachusetts Institute of Technology (MIT, the licensee) research reactor safety program, including: (1) effluent and environmental monitoring; (2) review and audit and design change functions; (3) emergency preparedness; (4) radiation protection; and (5) transportation activities. The U.S. Nuclear Regulatory Commission (NRC) staff determined that the licensee's program was acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

Effluent and Environmental Monitoring

- The inspector determined that effluent and environmental monitoring was conducted in accordance with technical specifications (TSs) and regulatory requirements.

Review and Audit and Design Change Functions

- The MIT Reactor Safeguards Committee (RSC) met as required and reviewed the topics outlined in the TS.

- Annual audits of facility programs were conducted as required by the TS.

- Changes to the facility were evaluated using the criteria specified in Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59, "Changes, tests and experiments."

Emergency Preparedness

- The inspector determined that the licensee's emergency preparedness program was conducted in accordance with the licensee's emergency plan (E-Plan), TS, procedural, and regulatory requirements.

Radiation Protection

- The inspector determined that the licensee's radiation protection program was conducted in accordance with TS, procedural, and regulatory requirements.

Transportation Activities

- The inspector determined that the licensee's radioactive material transportation program was in accordance with procedural and regulatory requirements.

REPORT DETAILS

Summary of Facility Status

The MIT Nuclear Reactor Laboratory 6-megawatt research reactor is routinely operated in support of training, experiments, and maintenance. During this inspection, the reactor was not operated due to maintenance activities.

1. Effluent and Environmental Monitoring

a. Inspection Scope (Inspection Procedure [IP] 69004)

To verify that the licensee complied with the requirements of 10 CFR Part 20, "Standards for Protection against Radiation," and TS section 3.7, the inspector examined a sample of gas and particulate radiation monitors, observed a water waste tank sample taken, observed multiple air samples taken, and reviewed selected aspects of:

- facility records of measurements and analysis of effluent samples
- "MIT Research Reactor Nuclear Reactor Laboratory Massachusetts Institute of Technology Annual Report to United States Nuclear Regulatory Commission for the period January 1, 2023 - December 31, 2023," dated March 29, 2024
- environmental release records
- secondary water tritium sample records
- effluent monitoring instrumentation maintenance records

b. Observations and Findings

The inspector found that environmental radiation monitoring was accomplished by use of thermoluminescent dosimeters placed within a quarter mile of the reactor, and that doses were within regulatory limits. The inspector also found that at least one real-time environmental monitor was at the site and one within approximately one-fourth of a mile of the site was used to verify compliance with environmental dose limits. The inspector noted that gaseous releases from the containment exhaust stack are monitored, and release amounts are calculated and documented in the annual reports; and that the airborne concentrations of the gaseous releases were within the concentrations stipulated in 10 CFR Part 20, Appendix B, Table 2.

The inspector found that the combined sources of all liquid effluent releases were within the monthly average concentration limits established in 10 CFR Part 20, Appendix B, Table 3.

c. Conclusion

The inspector found that effluent release measurements, liquid and gas sampling analysis, and environmental monitoring measurements, demonstrated compliance with regulatory and TS limits.

2. Review and Audit and Design Change Functions

a. Inspection Scope (IP 69007)

To verify compliance with TS sections 7.2.1, 7.2.2, 7.2.3, and 10 CFR 50.59, the inspector reviewed the following documents:

- "MIT Research Reactor Nuclear Reactor Laboratory Massachusetts Institute of Technology Annual Report to United States Nuclear Regulatory Commission for the period January 1, 2023 - December 31, 2023," dated March 29, 2024
- 10 CFR 50.59 evaluations from 2023 - present
- "MIT Reactor (MITR) Annual Independent Audit Report for CY 2023," dated May 22,2024
- response to independent audit for calendar year 2022 dated July 14, 2023
- draft of, "Minutes of the One Hundred Sixteenth Meeting of the MIT Reactor Safeguards Committee (MITRSC)," dated January 8, 2024
- "Minutes of the One Hundred Fifteenth Meeting of the MIT Reactor Safeguards Committee (MITRSC)," dated January 25, 2023
- 115th MITRSC meeting package 1/25/2023
- "Review and Approval of Plans, Procedures, and Facility Equipment and Changes Thereto," dated February 20, 2013
- MP-6/6A Core Tank Stub-Ends Replacement quality assurance report #2023-09

b. Observations and Findings

(1) Review and Audit Functions

The inspector found that the MIT RSC meeting frequency and committee membership satisfied TS section 7.2.1, and that safety reviews and audits were completed at the required frequency for the functional areas specified by TS sections 7.2.2 and 7.2.3. The inspector reviewed the results of the audits and determined that the audit findings and licensee actions taken in response to the findings were appropriate.

(2) Design Change Functions

The inspector found that screening and safety review of changes, tests, and experiments were in accordance with regulatory requirements and facility procedures.

c. Conclusion

The inspector found that the MIT review, audit and design change programs were implemented in accordance with the TS requirements and NRC regulations.

3. Emergency Preparedness

a. Inspection Scope (IP 69011)

The inspector inventoried an emergency locker, observed a daily and weekly security test, and reviewed selected aspects of the following to verify compliance with the licensee's E-Plan and associated procedures:

- 2023 – 2024 annual drill record
- select emergency implementing procedures
- select emergency locker inventory forms, dated 2023-present
- preventive maintenance (PM) 4.0, "MITR Emergency Plan and Procedures," dated October 7, 2019
- Letter of agreement (LOA) with Massachusetts General Hospital, dated April 11, 2016
- LOA with Mount Auburn Hospital, dated December 1, 2013
- LOA with City of Cambridge Fire Department, dated August 6, 2018
- LOA with City of Cambridge Police Department, dated February 12, 2016
- LOA with Professional Ambulance company, dated February 10, 2019
- NW12 MIT Police training records
- PM 6.6.2.4, "Inventory of Emergency Supplies and Equipment," dated April 6, 2022
- PM 6.6.2.1.2, "Fire Extinguisher Semi-Annual Inspection," dated August 12, 2016
- PM 6.6.1.4, "Communication Links Test," dated April 15, 2023
- PM 3.7.1, "Weekly Security," from 2023 – present
- "2022 Radiological Emergency Exercise (In-House Only)," dated November 22, 2022
- "2023 Medical Emergency Exercise (In-House Only)," dated December 7, 2023

b. Observations and Findings

The inspector verified, through discussions with the licensee, that no changes to the E-Plan were made since the last inspection in accordance with 10 CFR 50.54(q), "Emergency Plans." The inspector found that the emergency plan trainings were conducted, drills were performed, and emergency response call lists were maintained and readily available. The inspector also found that the implementing procedures were consistent with emergency plans requirements.

c. Conclusion

The inspector found that the licensee maintained its emergency preparedness program in accordance with its E-Plan requirements.

4. Radiation Protection

a. Inspection Scope (IP 69012)

To verify that the licensee followed the requirements of TS section 7.3, 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations," and 10 CFR Part 20 the inspector observed a daily radiological survey, and reviewed selected aspects of the following:

- 2023 annual operating report
- ludlum area monitors calibration records from 2023 – present
- personnel dosimetry reports
- facility areas, equipment, operations, and postings
- “MIT Research Reactor Nuclear Reactor Laboratory Massachusetts Institute of Technology Annual Report to United States Nuclear Regulatory Commission for the period January 1, 2023 - December 31, 2023,” dated March 29, 2024
- “MITR Effluent and Process Radiation Monitoring System Quarterly Calibration,” from 2023 – present
- “Effluent and Process Radiation Monitoring System Calibration - Annual Pulse and Voltage Checks,” from 2023 – present
- employee radiological training records
- MIT as low as is reasonably achievable (ALARA) policy
- radiological survey records
- radiological contamination records
- D2O activity samples from 2023 – present
- annual continuous air monitor calibrations from 2023 – present
- select primary gross activity samples from 2023 – present
- select secondary gross activity samples from 2023 – present
- environmental dosimeters from 2023 – present
- Radiological Survey, RRP 3001, Revision 8
- Radiological Controls Notification, RRP 0050, Revision 5
- PM 1.12, “Radiological Training and Dosimetry Classification,” dated November 9, 2004

b. Observations and Findings

(1) Surveys

The inspector found that periodic contamination and radiation surveys were completed in accordance with radiation protection procedures, and that survey results were documented and posted so that facility personnel would be knowledgeable of the radiological conditions that existed in the controlled areas of the facility.

(2) Postings and Notices

The inspector observed that NRC Form 3, “Notice to Employees,” was prominently posted as required by 10 CFR 19.11, “Posting of notices to workers,” and that radiological signs were also posted as required by 10 CFR 20.1902, “Posting requirements.”

(3) Dosimetry

The inspector observed that dosimetry use was in accordance with facility procedures and dose limits to workers and the public were within 10 CFR Part 20 limits.

(4) Radiation Monitoring Equipment

The inspector found that installed and portable radiation monitoring equipment was calibrated in accordance with TS and facility procedures.

(5) Radiation Protection Training

The inspector reviewed the general employee radiation protection training given to MIT staff members, to those authorized to use the experimental facilities of the reactor, to students, and to visitors, and that training was in accordance with facility procedures and regulatory requirements.

c. Conclusion

The inspector determined that: (1) surveys were completed and documented in accordance with radiation protection procedures to permit evaluation of the radiation hazards present, (2) postings and notices met regulatory requirements, (3) personnel dosimetry was worn as required by facility procedures and recorded doses were within the NRC's regulatory limits, (4) radiation survey and monitoring equipment was maintained and calibrated as required by TS and facility procedures, (5) the radiation safety training program was implemented in accordance with procedures, and (6) the radiation protection and ALARA programs satisfied regulatory requirements.

5. Transportation Activities

a. Inspection Scope (IP 86740)

The inspector reviewed the following documents to verify compliance with NRC and Department of Transportation (DOT) regulations governing the transportation of radioactive material (RAM) as specified in 10 CFR Part 20 and 10 CFR Part 71, "Packaging and Transportation of Radioactive Material," and in 49 CFR Parts 171-178:

- RAM shipping papers and related records from 4th quarter of 2023 – present
- training records for individuals
- annual DOT RAM shipping audits for 2023
- annual SNM license audit for 2023
- "MIT Research Reactor Nuclear Reactor Laboratory Massachusetts Institute of Technology Annual Report to United States Nuclear Regulatory Commission for the period January 1, 2023 - December 31, 2023," dated March 29, 2024
- various radioactive waste preparation and shipping procedures

b. Observations and Findings

The inspector found that the licensee shipped various types of RAM since the last inspection of this area. The inspector noted that shipping records were complete, and the shipping containers were labeled correctly.

The inspector verified that the licensee maintained copies of consignees' RAM possession licenses, and that training for staff members involved in the shipment of RAM was performed.

c. Conclusion

The inspector found that the program for transportation of RAM satisfied the DOT and NRC regulations.

6. Exit Interview

The inspection scope and results were summarized on July 11, 2024, with members of licensee management and staff. The inspector described the areas inspected and discussed the inspection results. The licensee acknowledged the results of the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

T. Bork	Reactor Utilization Manager
J. Foster	Director, Reactor Operations
E. Lau	Associate Director, Reactor Operations
W. McCarthy	Deputy Director, Environment, Health, and Safety
S. Tucker	Quality Assurance Supervisor
F. Warmsley	Superintendent of Operations

INSPECTION PROCEDURES USED

IP 69004	Class I Research and Test Reactor Effluent and Environmental Monitoring
IP 69007	Class I Research and Test Reactor Review and Audit and Design Change Functions
IP 69011	Class I Research and Test Reactor Emergency Preparedness
IP 69012	Class I Research and Test Reactors Radiation Protection
IP 86740	Inspection of Transportation Activities

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened:

None

Closed:

None