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

September 30, 2021

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. 05000020/2021201

Dear Mr. Foster:

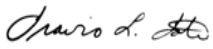
From August 9-12, 2021, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Massachusetts Institute of Technology (MIT) reactor. The enclosed report documents the inspection results which were discussed on August 12, 2021, with you and members of the MIT staff.

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 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 NRC's document system (Agencywide Documents Access and Management System (ADAMS)). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

If you have any questions concerning this inspection, please contact Mr. Phil O'Bryan at 301-415-0266, or by electronic mail at Phil.O'Bryan@nrc.gov.

Sincerely,



Signed by Tate, Travis
on 09/30/21

Travis 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: See next page

cc:

City Manager
City Hall
Cambridge, MA 02139

Department of Environmental Protection
One Winter Street
Boston, MA 02108

Mr. Jack Priest, Director
Radiation Control Program
Department of Public Health
529 Main Street
Schrafft Center, Suite 1M2A
Charlestown, MA 02129

Ms. Samantha Phillips, Director
Massachusetts Emergency Management Agency
400 Worcester Road
Framingham, MA 01702-5399

Test, Research and Training
Reactor Newsletter
Attention: Ms. Amber Johnson
Dept of Materials Science and Engineering
University of Maryland
4418 Stadium Drive
College Park, MD 20742-2115

Mr. Marshall B. Wade
Reactor Superintendent
Massachusetts Institute of Technology
Nuclear Reactor Laboratory
Research Reactor
138 Albany Street, MS NW12-116B
Cambridge, MA 02139

SUBJECT: MASSACHUSETTS INSTITUTE OF TECHNOLOGY – U.S. NUCLEAR REGULATORY COMMISSION ROUTINE INSPECTION REPORT NO. 05000020/2021201 DATED: SEPTEMBER 30, 2021

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DATE	9/3/2021	9/3/2021	9/30/2021

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

Docket No.:	50-020
License No.:	R-37
Report No.:	05000020/2021201
Licensee:	Massachusetts Institute of Technology
Facility:	Massachusetts Institute of Technology Reactor
Location:	Cambridge, Massachusetts
Dates:	August 9-12, 2021
Inspector:	Phil O'Bryan
Approved by:	Travis 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 Reactor
Inspection Report No. 05000020/2021201

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

Experiments

- The program for reviewing, authorizing, and conducting experiments satisfied technical specification (TS) and procedural 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 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."

Radiation Protection

- Surveys, postings, training, and personnel dose monitoring met regulatory requirements.

- Radiation monitoring equipment was maintained and calibrated as required by TSs.

- The radiation protection and the as low as reasonably achievable (ALARA) programs satisfied regulatory requirements.

Effluent and Environmental Monitoring

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

Transportation Activities

- The program for transportation of radioactive material (RAM) satisfied U.S. Department of Transportation (DOT) and the NRC regulations.

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 inspector observed reactor operations and portions of a reactor start up.

1. Experiments

a. Inspection Scope (IP 69005)

To verify compliance with the licensee's procedures, TS Sections 6 and 7.5, the inspector reviewed the following:

- reactor digital logbook
- PM 1.10, "Experiment Review and Approval"
- MIT annual report to the NRC for 2020

b. Observations and Findings

The inspector reviewed selected safety review forms and irradiation request forms for experiments performed in 2019 and 2020. The inspector verified that experiments were reviewed, evaluated, approved, and conducted in accordance with TS requirements.

c. Conclusion

The inspector determined that the licensee's program for reviewing, authorizing, and conducting experiments satisfied the TS and procedural requirements.

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 following documents were reviewed:

- 10 CFR 50.59 evaluations
- MIT annual reports for 2019 and 2020
- annual independent audit reports for 2019 and 2020
- MIT Research Reactor Administrative Procedure, PM 1.13, "Quality Assurance Program"
- MIT Research Reactor Administrative Procedure, PM 1.4, "Review and Approval of Plans, Procedures, and Facility Equipment and Changes Thereto"
- quality assurance documentation for facility modifications

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 was in accordance with regulatory requirements and facility procedures.

The inspector reviewed Inspector Follow-up Item (IFI) 05000020/2019202-01, which was opened to track the design change review associated with the MIT cooling tower plume catcher. The IFI was opened due to inspector questions associated with the plume catcher potentially interacting with other plant systems. During the current inspection, the inspector concluded that system interactions were adequately addressed and this design change does not represent a violation of NRC requirements because it does not represent a change that requires NRC approval to implement. This IFI is closed.

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. 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, "Standards for Protection against Radiation," the inspector reviewed selected aspects of the following:

- personnel dosimetry reports
- facility areas, equipment, operations, and postings
- MIT annual reports for 2019 and 2020
- MIT ALARA program reviews for 2019 and 2020
- MIT independent annual audits for 2019 and 2020
- instrument calibration records
- employee radiological training records
- MIT ALARA committee meeting minutes and charter
- MIT ALARA policy

- radiological survey records

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 acceptably 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.

4. Effluent and Environmental Monitoring

a. Inspection Scope (IP 69004)

To verify that the licensee complied with the requirements of 10 CFR Part 20 and TS Section 3.7, the inspector reviewed selected aspects of:

- facility records of measurements and analysis of effluent samples
- MIT annual reports for 2019 and 2020
- 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 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 are 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.

5. Transportation Activities

a. Inspection Scope (IP 86740)

The inspector reviewed the following documents to verify compliance with NRC and DOT regulations governing the transportation of 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
- training records for individuals designated as “shippers”
- annual DOT RAM shipping audits for 2019 and 2020
- MIT annual reports for the 2019 and 2020
- MIT quarterly administrative audits for 2019

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 August 12, 2021, with members of licensee management. The inspector described the areas inspected and discussed the preliminary inspection findings. The licensee acknowledged the inspection findings and did not identify any information to be withheld from public disclosure.

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

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

INSPECTION PROCEDURES USED

IP 69004	Class I Research and Test Reactor Effluent and Environmental Monitoring
IP 69005	Class I Research and Test Reactor Experiments
IP 69007	Class I Research and Test Reactor Review and Audit and Design Change Functions
IP 69012	Class I Research and Test Reactors Radiation Protection
IP 86740	Inspection of Transportation Activities

ITEMS OPENED, CLOSED, AND DISCUSSED

Open

None

Closed

IFI 05000020/2019202-01	Additional information needs to be provided for the Cooling Tower Plume Catcher Proposal (QA # 2019-19) regarding any impacts to plant operation and maintenance activities.