



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

November 8, 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. 05000020/2021203

Dear Mr. Foster:

From September 13-15, 2021, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Massachusetts Institute of Technology research reactor. The enclosed report documents the inspection results which were discussed on September 15, 2021, with you, members of your staff, and Dr. Gordon Kohse, Managing Director for Operations at the Nuclear Reactor Laboratory.

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.

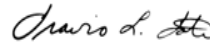
In accordance with Title 10 of the *Code of Federal Regulations*, Section 2.390, "Public inspections, exemptions, requests for withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from 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).

J. Foster

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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](mailto:Phil.O'Bryan@nrc.gov).

Sincerely,



Signed by Tate, Travis  
on 11/08/21

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: See next page

Massachusetts Institute of Technology

Docket No. 50-020

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. 0500020/2021203 DATED: NOVEMBER 8, 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.: 05000020/2021203

Licensee: Massachusetts Institute of Technology

Facility: Massachusetts Institute of Technology Reactor

Location: Cambridge, Massachusetts

Dates: September 13-15, 2021

Inspector: Phil O'Bryan

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

## EXECUTIVE SUMMARY

Massachusetts Institute of Technology  
Massachusetts Institute of Technology Reactor  
Inspection Report No. 05000020/2021203

The primary focus of this routine, announced inspection was the onsite review of selected elements of the Massachusetts Institute of Technology (MIT, licensee) research reactor safety program, including: (1) operator licenses, requalification, and medical examinations, (2) organization and operations and maintenance activities, (3) procedures, (4) fuel movement, (5) surveillance, and (6) emergency preparedness. The inspector found that the licensee's program complied with the U.S. Nuclear Regulatory Commission (NRC) requirements.

### Operator Licenses, Requalification, and Medical Examinations

- Licensed operator licenses, requalification and medical examinations met technical specification (TS), administrative, and regulatory requirements.

### Organization and Operations and Maintenance

- Organizational structure and staffing were consistent with TS requirements.
- Operational and Maintenance activities were consistent with applicable TS and procedural requirements.

### Procedures

- The licensee's procedural review, revision, and implementation program satisfied the requirements of TS.

### Fuel Movement

- Fuel movements and inspections were conducted in accordance with TS and procedural requirements.

### Surveillance

- The surveillance program was conducted in accordance with TS and licensee procedural requirements.

### Emergency Preparedness

- The emergency preparedness program was conducted in accordance with the Emergency Plan (E-Plan), including response equipment maintenance, emergency drills, and E-Plan training.

## 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.

#### 1. Operator Licenses, Requalification, and Medical Examinations

##### a. Inspection Scope (Inspection Procedure (IP) 69003)

To verify that the licensee complied with the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55, "Operators' Licenses," and TS Section 7.1.5, the inspector reviewed selected aspects of the following:

- current status of operator licenses
- reactor digital logbook
- annual written examinations
- medical examination records for selected operators
- procedure manual (PM) 1.16.2, "Requalification Program"
- safety analysis report Section 12.10, "Operator Training and Requalification (2 year cycle)"

##### b. Observations and Findings

The inspector found that training was conducted in accordance with the licensee's NRC-approved requalification and training program and was documented, and that requalification records were maintained. The inspector also found medical examinations for licensed operators were completed and documented as required by the regulations.

##### c. Conclusion

The inspector found that operator requalification was conducted as required by the requalification program and licensed operators met regulatory requirements.

#### 2. Organization and Operations and Maintenance Activities

##### a. Inspection Scope (IP 69006)

To verify that the licensee complied with the requirements for organization, operations, and maintenance activities, as specified in TS Sections 2, 3, 7.1, and licensee procedural requirements, the inspector reviewed selected aspects of the following:

- MIT nuclear reactor laboratory organization chart
- reactor digital logbook
- reactor job workbook
- reactor digital daily operations schedule

- reactor annual report to the NRC for 2020

b. Observations and Findings

The inspector found that the MIT reactor organization and shift staffing was consistent with that specified in the TS. The inspector also found that operations and maintenance activities were consistent with administrative procedures and TS, and equipment malfunctions were documented, and actions were taken in accordance with TS.

c. Conclusion

The inspector determined that the licensee's organization and staffing complied with the requirements specified in TS Section 7.1, and that operational and maintenance activities were also consistent with applicable TS and procedural requirements.

**3. Procedures**

a. Inspection Scope (IP 69008)

To verify that the licensee met the requirements of TS Section 7.4, the inspector reviewed selected aspects of the following:

- reactor digital logbook
- reactor annual report to the NRC for 2020
- reviewed various procedures including:
  - PM 4.4.5.1, "Instructions for Use of Utility Room Emergency Gauges"
  - PM 4.4.4.15, "Escape of Airborne Radioactive Material from the Containment Building"
  - PM 4.4.5.3, "Relief of Reactor Building Pressure with the Pressure Relief System"
  - AOP 5.2.3, "Low Level Core Tank"
  - PM 3.5, "Daily Surveillance Checks"

b. Observations and Findings

The inspector noted that procedure revisions were reviewed and approved by the Director of Reactor Operations and submitted to the MIT Reactor Safety Committee for review, and that all procedure changes were routinely routed to all licensed operators for review.

c. Conclusion

The inspector determined that the licensee's program for procedural review, revision, and implementation program satisfied TS requirements.



#### 4. Fuel Movement

a. Inspection Scope (IP 69009)

To ensure that the licensee followed the requirements of TS Sections 3.1.4, 3.1.6, 4.1.5, and 5.4, the inspector reviewed selected aspects of the following:

- reactor digital logbook
- PM 1.15, “Fuel Loading Permission”
- PM 3.3.1, “General Conduct of Refueling Operations”
- PM 7.1.2, “Fuel Acceptance Inspection”
- PM 3.3.1.1, “Fuel Transfer – Core”

b. Observations and Findings

The inspector reviewed the fuel movement process and verified that fuel manipulations were conducted in accordance with established procedures. The inspector also reviewed records of selected fuel movements and interviewed the MIT Reactor Engineer. The inspector noted that a plan for each series of fuel movements was developed prior to the activity and were used for core refueling, core rearrangement, and inspections of fuel elements.

c. Conclusion

The inspector determined that the licensee conducted fuel movements in accordance with written procedures and the TS requirements, and that fuel inspections were also completed annually as required by TS.

#### 5. Surveillance

a. Inspection Scope (IP 69010)

To verify that the licensee met the surveillance requirements specified in TS Section 4, the inspector reviewed selected aspects of the following:

- reactor job workbook
- reactor digital daily operations schedule
- reactor digital logbook
- MIT annual report to the NRC for 2020
- MIT logbook “System Tests and Calibration Logbook” (in the control room)
- PM 3.1.1, “Full Power Startup Checklist”
- containment leak rate data

b. Observations and Findings

The inspector found that surveillance tests and surveillances were completed as required by TS and licensee procedures, and that limiting conditions for operations were satisfied.

c. Conclusion

The inspector found that the licensee's program for completing surveillance inspections and LCO verifications satisfied TS.

**6. Emergency Preparedness**

a. Inspection Scope (IP 69011)

The inspector reviewed selected aspects of the following to verify compliance with the licensee's E-Plan and associated procedures:

- training records for MIT staff
- E-Plan exercise critiques
- PM 4.0, "MITR Emergency Plan and Procedures"
- PM 4.4.4.16, "Instructions to MIT Police During MIT Reactor Radiological Emergencies"
- PM 4.4.5.2, "Instructions for Use of Operations Office Emergency Gauges"
- 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 January 15, 2016
- LOA with City of Cambridge Police Department, dated February 12, 2016
- LOA with Professional Ambulance company, dated May 31, 2013

b. Observations and Findings

The inspector reviewed the MIT E-Plan and implementing procedures and 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 also reviewed the training records, E-Plan exercise records, staffing requirements, off-site support, and emergency equipment maintenance.

c. Conclusion

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

**7. Exit Interview**

The inspector presented the inspection results to licensee management and staff at the conclusion of the inspection on September 15, 2020. The inspector discussed the areas inspected and the inspection observations. The licensee acknowledged the results of the inspection and did not identify as proprietary any of the material provided to or reviewed by the inspector during the inspection.

## LIST OF PERSONS CONTACTED

### Licensee Personnel:

|             |   |
|-------------|---|
| G. Kohse    | Managing Director for Operations at the Nuclear Reactor Laboratory                                      |
| J. Foster   | Director of Reactor Operations  |
| E. Lau      | Assistant Director of Reactor Operations  |
| M. Wade     | Superintendent of Operations  |
| W. McCarthy | Reactor Radiation Protection Officer and Deputy Director, MIT<br>Environment, Health, and Safety Office |
| S. Tucker   | Quality Assurance Supervisor  |
| S. Hauptman | Reactor Engineer  |

## INSPECTION PROCEDURES USED

|          |  |
|----------|--|
| IP 69003 | Class I Research and Test Reactor Operator Licenses, Requalification, and Medical Examinations |
| IP 69006 | Class I Research and Test Reactors Organization and Operations and Maintenance Activities      |
| IP 69008 | Class I Research and Test Reactor Procedures   |
| IP 69009 | Class I Research and Test Reactor Fuel Movement  |
| IP 69010 | Class I Research and Test Reactor Surveillance   |
| IP 69011 | Class I Research and Test Reactor Emergency Preparedness                                       |

## ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened:

None

### Closed:

None

### Discussed:

None