



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

November 21, 2023

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. 05000020/2023203

Dear Mr. Foster:

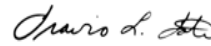
From October 10-13, 2023, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Massachusetts Institute of Technology (MIT) reactor. The enclosed report documents the inspection results which were discussed on October 13, 2023, with you and members of the MIT staff.

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 inspectors 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 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 Juan Arellano at (301) 415-0477, or by email at [Juan.Arellano@nrc.gov](mailto:Juan.Arellano@nrc.gov).

Sincerely,



Signed by Tate, Travis  
on 11/21/23

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: GovDelivery Subscribers

SUBJECT: MASSACHUSETTS INSTITUTE OF TECHNOLOGY – U.S. NUCLEAR  
REGULATORY COMMISSION ROUTINE INSPECTION REPORT  
NO. 05000020/2023203 DATED: NOVEMBER 21, 2023

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DATE	10/31/2023	11/1/2023	11/21/2023

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

Docket No.: 50-020

License No.: R-37

Report No.: 05000020/2023203

Licensee: Massachusetts Institute of Technology

Facility: Massachusetts Institute of Technology Reactor

Location: Cambridge, Massachusetts

Dates: October 10-13, 2023

Inspectors: Juan Arellano

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. 05000020/2023203

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) operator licenses, requalification, and medical examinations, (2) experiments, (3) organization and operations and maintenance activities, (4) procedures, (5) fuel movement, and (6) surveillance. The U.S. Nuclear Regulatory Commission (NRC) staff determined the licensee's program was in compliance with NRC requirements.

### Operator Licenses, Requalification, and Medical Examinations

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

### Experiments

- The program for reviewing, authorizing, and conducting experiments satisfied TS and procedural 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.

## 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 an extended outage for extensive maintenance activities.

### 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 interviewed select personnel and reviewed selected aspects of the following:

- procedure manual (PM) 1.16, "NRC License Training of Personnel," dated February 20, 2013
- "On-the-Job Training Tracking Sheet" from fourth quarter 2022 - present
- select lecture attendance records from 2021 - present
- select medical examination records from 2020 - present
- select written examinations performed 2021 - present
- select procedure review forms from 2021 - present
- reactor digital logbook

#### b. Observations and Findings

The inspector found that licensed operator training was conducted in accordance with 10 CFR 55.59, "Requalification," 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. 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:

- MIT annual report for 2022
- part I irradiation request form 25-89 dated July 13, 2022
- quality assurance document 2022-17
- in-core experiment review guide for SFX dated July 6, 2022
- select part II documents performed fourth quarter 2022

- part I irradiation request form 25-90 dated November 7, 2022
- in-core experiment review guide for FCI dated November 3, 2022
- quality assurance document 2022-23
- part I irradiation request form 25-91 dated November 7, 2022
- quality assurance document 2022-24
- in-core experiment review guide for HPR
- "Special Procedure to Install the HTWL in the Reactor Core Tank," dated November 16, 2022
- "Special Procedure for Moving the Water Loop from the Reactor Core Tank to Hot Cell #1," dated December 15, 2022
- reactor digital logbook

b. Observations and Findings

The inspector reviewed selected safety review forms and irradiation request forms for experiments performed since the last inspection. 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.

### 3. 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 toured the control room, reactor bay, and equipment room, and reviewed selected aspects of the following:

- "Safety Analysis Report for the MIT Research Reactor," dated November 2013
- reactor digital logbook
- unusual occurrence report 2022-2
- organizational chart dated July 28, 2023
- reactor digital daily operations schedule
- MIT annual report for 2022
- PM 7.4.4.2, "In-Service Inspection of Primary Core Tank and Fuel, and Spent Fuel Storage Pool," dated September 21, 2011
- PM 7.1.1.1, "Shim Blade Mechanism Assembly and Disassembly Procedures," dated July 12, 1996
- PM 7.1.1.2, "Regulating Rod Drive Mechanism Disassembly and Reassembly Procedures," dated June 30, 1975
- PM 6.5.18, "Control Blade Thickness Check," dated August 13, 2015
- PM 6.1.4.6, "Electromagnet Coil Resistance Measurements," dated March 26, 2019
- PM 6.5.18, "Control Blade Thickness Check," performed October 22, 2022
- photographs for leak repair

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 the 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.

**4. Procedures**

a. Inspection Scope (IP 69008)

To verify that facility procedures were prepared, reviewed, revised, and implemented as required by TS section 7.4, the inspector observed the performance of procedures and reviewed selected aspects of:

- PM 6.1.3.7B, "ML-3A and ML-3B Calibration Data," dated March 26, 2022
- safety review form number 2021-24 dated October 3, 2023
- safety review form number 2021-23 dated October 3, 2023
- safety review form number 2023-07 dated October 2, 2023
- safety review form number 2023-05 dated May 8, 2023
- safety review form number 2023-04 dated April 26, 2023
- safety review form number 2022-19 dated September 20, 2022

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 routed to all licensed operators for review.

c. Conclusion

The inspector determined the procedural review, revision, and implementation process satisfied the TS requirements.



## 5. 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," performed for core configuration 245
- PM 1.15, "Fuel Loading Permission," performed for core configuration 246
- PM 1.15, "Fuel Loading Permission," performed for core configuration 247
- PM 3.3, "Movement of Fuel," performed September 28, 2023
- PM 3.3.1.1, "Fuel Element Transfers: Core/Storage Ring/ Vault," dated April 16, 2016
- select PM 3.3.2, "General Conduct for the Removal of Spent Fuel," performed fourth quarter 2022 - present
- PM 6.1.3.15, "Primary Coolant and SFP Water Quality," performed from fourth quarter 2022 – present
- report on defueling the MITR-II for leak repair

### 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 MIT reactor personnel. 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 fuel movements were conducted in accordance with written procedures that met the TS requirements and fuel inspections were completed annually.

## 6. Surveillance

### a. Inspection Scope (IP 69010)

To verify that the licensee met the surveillance requirements specified in TS section 4, the inspector observed the performance of the calibration of the primary coolant flow rate channel, shield coolant flow rate channel, and core tank level channel, and reviewed selected aspects of the following:

- reactor digital logbook
- PM 6.1.3.3B, "Primary Coolant Flow Scram Static Calibration (MF-1A, MF-1B)," dated March 26, 2022
- PM 6.1.3.13B, "Shield Coolant Flow Scram Static Calibration (PF-1)," dated March 26, 2022
- select PM 6.1.3.3B performed from 2021 - present
- select PM 6.1.3.13B performed from 2022 - present

- shim blade drop time test logbook
- select PM 6.1.3.7B, "ML-3A and ML-3B Calibration Data," performed 2022 - present
- select PM 6.1.1, "Emergency Cooling System," performed 2021 - present

b. Observations and Findings

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

c. Conclusion

The inspector determined that the surveillance program was conducted as specified by the TS requirements.

**7. Exit Interview**

The inspection scope and results were summarized on October 13, 2023, with members of licensee management. 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.

## **PARTIAL LIST OF PERSONS CONTACTED**

### Licensee Personnel

T. Bork	Reactor Utilization Manager
J. Foster	Director, Reactor Operations
E. Lau	Associate Director, Reactor Operations
S. Tucker	Quality Assurance Supervisor
F. Warmasley	Superintendent of Operations

## **INSPECTION PROCEDURES USED**

IP 69003	Class I Research and Test Reactor Operator Licenses, Qualification, and Medical Examinations
IP 69005	Class I Research and Test Reactor Experiments
IP 69006	Class I Research and Test Reactor 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

## **ITEMS OPENED, CLOSED, AND DISCUSSED**

### Opened

None

### Closed

None