



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

July 17, 2019

Dr. Partha Chowdhury, Director
Nuclear Radiation Laboratory
University of Massachusetts-Lowell
One University Avenue
Lowell, MA 01854

SUBJECT: UNIVERSITY OF MASSACHUSETTS LOWELL – U.S. NUCLEAR
REGULATORY COMMISSION SAFETY INSPECTION REPORT
NO. 05000223/2019201

Dear Dr. Chowdhury:

From June 18-20, 2019, the U.S. Nuclear Regulatory Commission (NRC) conducted an announced safety inspection at the University of Massachusetts Lowell Research Reactor facility. The inspection included a review of activities authorized for your facility. The enclosed report documents the inspection results which were discussed on June 20, 2019, with members of your staff.

The inspection examined activities conducted under your license, as they relate to public health and safety, by confirming compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel. Based on the results of this inspection, no findings of non-compliance 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 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).

Should you have any questions concerning this inspection, please contact Mr. Michael Takacs at 301-415-2042 or by e-mail at Michael.Takacs@nrc.gov

Sincerely,

/RA/

Anthony J. Mendiola, Chief
Research and Test Reactors Oversight Branch
Division of Licensing Projects
Office of Nuclear Reactor Regulation

Docket No. 50-223
License No. R-125

Enclosure:
As stated

cc: See next page

SUBJECT: UNIVERSITY OF MASSACHUSETTS LOWELL – U.S. NUCLEAR
REGULATORY COMMISSION SAFETY INSPECTION REPORT
NO. 05000223/2019201 DATE: JULY 17, 2019

DISTRIBUTION:

PUBLIC	RidsNrrDlpProb	EHelvenston, NRR
PROB R/F	RidsNrrDlpPrIb	GCasto, NRR
MTakacs, NRR	AMendiola, NRR	
NParker, NRR		

ADAMS Accession No.: ML19191A046 *concurrence via e-mail NRC-002

OFFICE	NRR/DLP/PROB/SS*	NRR/DLP/PROB/LA*	NRR/DLP/PROB/BC
NAME	MTakacs	NParker	AMendiola
DATE	7/15/19	7/15/19	7/17/19

OFFICIAL RECORD COPY

University of Massachusetts - Lowell

Docket No. 50-223

cc:

Mayor of Lowell
City Hall
Lowell, MA 01852

Mr. Leo Bobek
Reactor Supervisor
University of Massachusetts - Lowell
One University Avenue
Lowell, MA 01854

Department of Environmental Protection
One Winter Street
Boston, MA 02108

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

John Giarrusso, Planning
and Preparedness Division Chief
Massachusetts Emergency Management Agency
400 Worcester Road
Framingham, MA 01702-5399

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

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

Docket No.: 50-223

License No.” R-125

Report No. 05000223/2019201

Licensee: University of Massachusetts Lowell

Facility: University of Massachusetts Lowell Research Reactor

Location: Lowell, Massachusetts

Dates: June 18-20, 2019

Inspector: Michael Takacs

Approved by: Anthony J. Mendiola, Chief
Research and Test Reactors Oversight Branch
Division of Licensing Projects
Office of Nuclear Reactor Regulation

Enclosure

EXECUTIVE SUMMARY

University of Massachusetts Lowell
Research Reactor Facility
NRC Inspection Report No. 05000223/2019201

The focus of this routine, announced safety inspection involved the onsite review of selected aspects of the University of Massachusetts Lowell Research Reactor (UMLRR or the licensee) Class II research reactor facility safety programs including: (1) organization and staffing, (2) operations logs and records, (3) requalification training, (4) surveillance and limiting conditions for operation (LCO), (5) emergency planning, (6) maintenance logs and records, and (7) fuel handling logs and records. The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with the U.S. Nuclear Regulatory Commission (NRC) requirements.

Organization and Staffing

- Organizational structure and staffing were consistent with licensee technical specification (TS) requirements.

Operations Logs and Records

- Operation logs and records were maintained as required by licensee procedures.

Requalification Training

- Operator requalification was current and being performed as required by the licensee's requalification program and regulatory requirements.

Surveillance and Limiting Conditions for Operation

- Limiting conditions for operation and surveillances required by TS were being properly implemented.

Emergency Planning

- The emergency preparedness program was conducted in accordance with the licensee's emergency plan and regulatory requirements.

Maintenance Logs and Records

- Maintenance activities were conducted in accordance with licensee procedures.

Fuel Handling Logs and Records

- Fuel handling and inspection activities were completed and documented as required by the TS and licensee procedures.

REPORT DETAILS

Summary of Facility Status

The University of Massachusetts Lowell (UML) 1 megawatt research reactor continued to be operated in support of educational experiments and demonstrations, research and service irradiations, reactor operator training, and periodic equipment surveillances. During the inspection, the reactor was operated to support research and service irradiations.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure (IP) 69001)

To ensure that the requirements of TS Section 6.1, "Organization and Management," were being met, the inspector reviewed:

- UML Radiation Laboratory Organizational Chart, dated May 20, 2019
- UMLRR console log books 36 and 37, covering the period from October 24, 2017, to the present
- UMLRR Annual Reports for 2016 and 2017

b. Observations and Findings

The organizational structure at the facility had not changed since the last NRC inspection in this area. In support of reactor operations, there are currently two licensed reactor operators (ROs) and five licensed senior reactor operators (SROs). Through the review of logbooks and records, the inspector determined that operational staffing met the minimum TS requirements.

c. Conclusion

The licensee's organization and staffing was in compliance with the requirements specified in TS 6.1.

2. Operations Logs and Records

a. Inspection Scope (IP 69001)

To ensure that the requirements were being met for TS Section 6.1, and TS Section 6.7, "Plant Operating Records," the inspector reviewed:

- UMLRR console log books 36 and 37, covering the period from October 24, 2017, to the present
- UMLRR Annual Reports for 2016 and 2017
- Reactor Operator Instruction Form (RF-RO-7A), dated October 2015
- Daily Routine Check Sheet (RF-4), dated December 2017
- Radiation Monitoring System Daily Checks (RF-5), dated December 2017
- Pre-Startup Check Sheet – Forced Convection (RF-RO-7B), dated August 2015

b. Observations and Findings

During the inspection, the inspector reviewed the UMLRR console log books for the past two years, including daily surveillance sheets and reactor operation record forms. The inspector verified that the reactor operating characteristics and other procedurally required entries, were logged appropriately and that the checklists were completed. A review of the licensee's logs and records also indicated that the TS operational limits had not been exceeded and that the shift staffing met the minimum requirements.

During the inspection, the inspector observed a reactor startup and verified compliance with the appropriate written procedures and TS requirements. It was noted that the operators on duty were knowledgeable and proficient with facility operations.

c. Conclusion

Operational activities were consistent with the applicable TS and procedural requirements.

3. Requalification Training

a. Inspection Scope (IP 69001)

To ensure that the requirements of the NRC-approved Operator Requalification Program were being met, the inspector reviewed:

- "Operator Requalification Program for the University of Massachusetts Lowell Research Reactor for Licensed Reactor Operators and Licensed Senior Reactor Operators," Revision 3.0, dated November 2016
- Personnel records (i.e., biennial medical exam and reactor operator requalification exams)
- RO and SRO records regarding quarterly reactor operations in order to maintain active status.

b. Observations and Findings

The inspector reviewed the individual files for several licensed operators, verifying completion of the required training and minimum number of hours performing their operator functions. The inspector also verified that licensed operators had passed their annual reactor operations tests and biennial written exams, as well as the completion of their biennial recertification by a medical examiner. All items were completed at the required frequency.

The inspector determined that the requalification program was being administered in a manner that sufficiently maintains the qualifications and proficiency of all licensed operators.

c. Conclusion

Operator requalification was current and was being performed as required by the UMLRR requalification program.

4. Surveillance and Limiting Conditions for Operation

a. Inspection Scope (IP 69001)

To ensure that the requirements of TS Sections 3.0, "Limiting Conditions for Operation," and 4.0, "Surveillance Requirements," were being met, the inspector reviewed:

- Surveillance Master Schedule 2019
- Procedures and forms covering TS Sections 4.1 – 4.7
- UMLRR console log books 36 and 37, covering the period from October 24, 2017, to the present

b. Observations and Findings

Daily, weekly, monthly, semi-annual, annual and other periodic checks, tests, and verifications for TS required LCO were being completed as required. The inspector performed a random sampling of the UMLRR required TS surveillances and verified all of the recorded results were within the TS prescribed parameters. Generally, the records and logs were noted to be complete and were being maintained as required.

The inspector observed an SRO perform the TS required semi-annual calibration of a Geiger-Mueller probe and an ion chamber probe. The inspector noted that the SRO was knowledgeable and completed the calibrations successfully.

c. Conclusion

All surveillances were completed in accordance with TS 4.0 and the licensee was in compliance with the LCO requirements in TS 3.0.

5. Emergency Planning

a. Inspection Scope (IP 69001)

To ensure that the requirements in the UMLRR emergency plan (EP) were being met, the inspector reviewed:

- "Emergency Preparedness Plan for the UMLRR," Revision 6, dated August 2007 and associated emergency procedures
- Biennial training and annual emergency drills
- Emergency Contact Sheet
- Form Health Physics Procedure-16, "Emergency Closet Inventory," and fire extinguisher checks

- Biennial memorandum of understandings (MOUs) with Emergency Services
- EP Review

b. Observations and Findings

The inspector reviewed the licensee's EP and accompanying procedures and verified that the annual review of the EP was completed by the Reactor Supervisor and Radiation Safety Officer (RSO). The inspector noted that the EP incorrectly states that the UMLRR fuel is enriched to 20 percent uranium-235. The inspector was informed by the licensee that the next revision to the EP will correct this error. This correction to the EP will be considered as an Inspection Follow-up Item (IFI) and will be reviewed during a subsequent inspection as IFI 05000223/2019201-01. During the tour of the facility, the inspector noted that the emergency call list was being reviewed periodically to verify its accuracy and that the emergency supply closet contained the required equipment and was being inventoried quarterly as required. The inspector also verified that MOUs with the offsite emergency support services (i.e., hospital, fire department, and emergency medical services) were updated biennially as required.

The inspector reviewed the annual emergency drills held within the last two years and found them to be well organized. The EP requirement for biennial offsite coordination and participation in drills was also being implemented. The inspector noted that the biennial training program was being properly monitored and maintained by the RSO. The inspector observed that the SRO to be very knowledgeable regarding the UMLRR Emergency Preparedness Program.

The inspector and the RSO toured the campus Emergency Operations Center and met with the Assistant Director for Environmental and Emergency Management to discuss their procedures in responding to an emergency at the UMLRR as well as their participation in drills. The inspector and SRO also toured the campus Dispatch Center and met with the Director of Communications and Security. The inspector interviewed the dispatch operator on duty and found her to be knowledgeable on the UMLRR alarm indications and response actions to be followed.

c. Conclusion

The emergency preparedness program was generally conducted in accordance with the licensee EP and regulatory requirements. The IFI referenced above will be reviewed during the next scheduled inspection.

6. **Maintenance Logs and Records**

a. Inspection Scope (IP 69001)

To ensure that maintenance activities were consistent with regulatory requirements, the inspector reviewed:

- UMLRR console log books 36 and 37, covering the period from October 24, 2017, to the present

- UMLRR Annual Reports for 2016 and 2017
- Reactor Pool Liner Repair Report, dated June 2018, submitted to the Reactor Safety Subcommittee

b. Observations and Findings

There were two non-routine maintenance activities performed during the last two years. The first maintenance activity involved the replacement of the air compressor within the reactor building. The air compressor supplies compressed air to experimental facilities, air operated valves in the demineralizer system, and the containment building airlock door seals. The air compressor was replaced, and the new unit successfully tested by the University's Facilities Department.

The second maintenance activity involved leaks in the pool liner. Similar leaks in the aluminum pool liner had been previously repaired in 2001, but in recent years, the pool liner had begun to leak again. In an effort to stop the leak, one section of the reactor pool had to be drained and a new epoxy coating was reapplied to the affected area. The reactor pool has been refilled to its normal water level and the pool liner no longer leaks.

The inspector reviewed associated logs and repair records and found them to be appropriate.

c. Conclusion

Maintenance activities were conducted in accordance with licensee procedures and were acceptable.

7. Fuel Handling Logs and Records

a. Inspection Scope (IP 69001)

To ensure the requirements of TS Sections 4.7, "Fuel Surveillance," and 6.7, "Plant Operating Records," were being met, the inspector reviewed:

- UMLRR console log books 36 and 37, covering the period from October 24, 2017, to the present
- Current record of all fuel locations in the fuel storage racks, dated June 6, 2019

b. Observations and Findings

The licensee primarily conducted fuel handling as part of the visual inspection of fuel surveillance. The inspector verified that fuel handling was conducted in compliance with procedures and the TS. The inspector also verified that the licensee was maintaining the required records of fuel movements as they were completed.

The inspector requested that the licensee perform a random fuel element location verification in the fuel storage rack. The inspector observed that the fuel

element identified in the fuel storage rack, based on its serial number, was consistent with the licensee's current fuel storage rack record.

c. Conclusion

Fuel handling and inspection activities were completed and documented as required by the TS and licensee procedures.

8. Exit Meeting Summary

The inspector presented the inspection results to licensee management at the end of the inspection on June 20, 2019. The inspector described the areas inspected and discussed the inspection observations. The licensee acknowledged the results of the inspection and did not identify any of the material, provided to or reviewed by the inspector, as proprietary.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

L. Bobek	Reactor Supervisor
T. Regan	Reactor Engineer
D. Lajeunesse	Senior Reactor Operator
S. Lucas	Reactor Operator
R. LaCouture	Reactor Operator

Other personnel

S. Snay	Radiation Safety Officer, UML
D. Stewart	Assistant Director, Environmental and Emergency Management, UML
K. Wilson	Director, Communications and Security, UML
T. Gauthier	Dispatcher, UML

INSPECTION PROCEDURES USED

IP 69001	Class II Research and Test Reactors
----------	-------------------------------------

ITEMS OPENED, CLOSED, AND DISCUSSED

OPENED

IFI 05000223/2019201-01	The UMLRR EP, dated August 2007, contains incorrect information pertaining to uranium-235 fuel enrichment and needs to be updated.
-------------------------	--

CLOSED

None

Discussed

None

LIST OF ACRONYMS USED

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
EP	Emergency Plan
IFI	Inspection Follow-up Item
IP	Inspection Procedure
LCO	Limiting Condition for Operation
MOU	Memorandum of Understanding
NRC	U.S. Nuclear Regulatory Commission
RF-RO	Reactor Operator Instruction Form
RO	Reactor Operator
RSO	Radiation Safety Officer

SRO	Senior Reactor Operator
TS	Technical Specification(s)
UML	University of Massachusetts Lowell
UMLRR	University of Massachusetts Lowell Research Reactor