

March 5, 2009

Dr. Gunter Kegel  
Director, Radiation Laboratory  
University of Massachusetts - Lowell  
One University Avenue  
Lowell, MA 01854

SUBJECT: UNIVERSITY OF MASSACHUSETTS – LOWELL - NRC ROUTINE  
INSPECTION REPORT NO. 50-223/2009-201

Dear Dr. Kegel:

The U.S. Nuclear Regulatory Commission (NRC, the Commission) conducted an inspection on February 2-6, 2009, at the University of Massachusetts – Lowell Research Reactor facility (Inspection Report No. 50-223/2009-201). The inspection included a review of activities authorized for your facility. The enclosed report presents the results of that inspection.

This inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress. Based on the results of this inspection, the NRC has determined that a Severity Level IV violation of NRC requirements occurred. This violation is being treated as a Non-Cited Violation (NCV) consistent with Section VI.A of the Enforcement Policy. The NCV is described in the subject inspection report. If you contest the violation or the significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to (1) the Director, Office of Nuclear Reactor Regulation; (2) the Director, Office of Enforcement,; and (3) Marcus Voth, the inspector at the United States Nuclear Regulatory Commission, Washington DC 20555-0001.

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

Should you have any questions concerning this inspection, please contact Marcus Voth at 301-415-1210 or by electronic mail at [Marcus.Voth@nrc.gov](mailto:Marcus.Voth@nrc.gov).

Sincerely,

**/RA/**

Johnny H. Eads, Chief  
Research and Test Reactors Branch B  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

Docket No.: 50-223

License No.: R-125

Enclosure: As stated

cc w/ encl.: See next page

University of Massachusetts - Lowell

Docket No.: 50-223

cc:

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Should you have any questions concerning this inspection, please contact Marcus Voth at 301-415-1210 or by electronic mail at [Marcus.Voth@nrc.gov](mailto:Marcus.Voth@nrc.gov).

Sincerely,  
**/RA/**  
Johnny H. Eads, Chief  
Research and Test Reactors Branch B  
Division of Policy and Rulemaking  
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**U. S. NUCLEAR REGULATORY COMMISSION**  
**OFFICE OF NUCLEAR REACTOR REGULATION**

Docket No: 50-223

License No: R-125

Report No: 50-223/2009-201

Licensee: University of Massachusetts

Facility: University of Massachusetts - Lowell Research Reactor

Location: Lowell, Massachusetts

Dates: February 2-6, 2009

Inspector: Marcus H. Voth

Accompanied by: Shungo Nakamura

Approved by: Johnny H. Eads, Jr., Chief  
Research and Test Reactors Branch B  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

## EXECUTIVE SUMMARY

University of Massachusetts - Lowell  
Research Reactor Facility  
Inspection Report No. 50-223/2009-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the University of Massachusetts – Lowell Research Reactor (UMLRR, the licensee) facility safety programs including organization and staffing; operations logs and records; procedures; surveillance and limiting conditions for operation; design changes; committees, audits and reviews; maintenance logs and records; fuel handling logs and records; and follow-up on previously identified items. The licensee's programs were acceptably directed toward the protection of public health and safety, and were in compliance with the U.S. Nuclear Regulatory Commission (NRC) requirements.

### Organization and Staffing

- The licensee's organization and staffing were in compliance with the requirements of the license. Records confirmed that shift staffing met the minimum requirements for duty and on-call personnel.

### Operations Logs and Records

- Within the scope of this review, the licensee's record keeping program conformed to license requirements.

### Procedures

- The licensee was maintaining and implementing written procedures in accordance with license requirements.

### Surveillance and Limiting Conditions for Operation

- The surveillance program required by the Technical Specifications was being implemented effectively with the exception that the licensee failed to perform one test when scheduled, constituting a non-cited violation.

### Design Changes

- Records indicated that changes at the facility were acceptably reviewed in accordance with 10 CFR Part 50.59 and applicable licensee administrative controls.

### Committees, Audits, and Reviews

- The Reactor Safety Subcommittee provided the oversight required by the Technical Specifications.

Maintenance Logs and Records

- The inspector reviewed reactor logbook entries that documented principal maintenance activities in compliance with license requirements.

Fuel Handling Logs and Records

- Fuel movements were performed safely in accordance with TS requirements and licensee procedural requirements.

Follow-up of Previously Identified Items

- The inspector closed out an unresolved item and a follow-up item from a previous inspection based on changes the licensee had made in the operator requalification program and in the experiment review and approval process.

## REPORT DETAILS

### Summary of Facility Status

The UMLRR continued to be operated in support of educational experiments and demonstrations, research and service irradiations, reactor operator training, and periodic surveillances. During the inspection, the inspector witnessed a reactor checkout and startup, trouble-shooting of an interlock problem, ascension to power, insertion and removal of experiments, and surveillance testing.

### 1. Organization and Staffing

#### a. Inspection Scope (Inspection Procedure (IP) 69001-02.01)

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of Technical Specifications (TS) Section 6.1, Organization and Management, were being met:

- University of Massachusetts - Lowell (UML) Radiation Laboratory Organizational Chart, Revision (Rev) September 2007
- Reactor Console Logbook #29, June 29, 2007 to February 5, 2009

#### b. Observations and Findings

The licensee reported that two students who held NRC Reactor Operator (RO) licenses had left the facility since the last inspection and that four students had begun training for an RO examination. Licensed operators consisted of one part-time and three full time employees with Senior Reactor Operator (SRO) licenses and two students holding RO licenses. In addition to the reactor operators identified above, one part time employee and one student were qualified as operators for the cobalt-60 irradiator which was in the reactor pool, licensed as part of the R-125 reactor license.

The minimum staffing required at the reactor and on call when the reactor is not secured was specified in TS 6.1.4 and 6.1.5. The inspector reviewed the console logbook for the past year and determined that staffing requirements had been met.

#### c. Conclusions

The licensee's organization and staffing were in compliance with the requirements of the license. Records confirmed that shift staffing met the minimum requirements for duty and on-call personnel.

## 2. Operations Logs and Records

### a. Inspection Scope (IP 69001-02.02)

The inspector observed operations and reviewed selected reactor operations records to ensure that the requirements of TS Section 6.7, Plant Operating Records, were being met:

- Procedure RO-5, Reactor Operation, Rev 3, October 12, 2005
- Procedure RO-7, Reactor Checkout, Rev 1, July 28, 2008
- Procedure SP-23, Scram Function Test, February 14, 2008
- Reactor Console Logbook #29, June 29, 2007 to February 5, 2009

### b. Observations and Findings

The inspector observed a reactor checkout, reactor startup, loading and unloading of samples into and out of the reactor, and performance of a routine scram function surveillance test. The reactor operator was observed to make reactor logbook entries in accordance with TS 6.7, Plant Operating Records, related to each evolution. For the records included in this review, the licensee's administrative requirements were met.

### c. Conclusions

Within the scope of this review, the licensee's record keeping program conformed to license requirements.

## 3. Procedures

### a. Inspection Scope (IP 69001-02.03)

The inspector reviewed the following to ensure that the requirements of TS Sections 6.2, Review and Audit, and 6.3, Operating Procedures, were being met:

- Procedure AP-1, Control and Distribution, Rev 1, September 18, 2003
- Procedure AP-2, Procedure Development, Rev 1, September 18, 2003
- Procedure RO-5, Reactor Operation, Rev 3, October 12, 2005
- Procedure RO-7, Reactor Checkout, Rev 1, July 28, 2008
- Procedure SP-23, Scram Function Test, February 14, 2008

### b. Observations and Findings

The inspector observed that written procedures were used by the reactor operator during routine operations and routine tests. The inspector also observed that the licensee maintained written procedures covering the areas specified in TS Section 6.3. A systematic approach was being used to update and reissue procedures in accordance with a written procedure on document control. New procedures and major changes were reviewed and approved by the

Reactor Safety Subcommittee (RSSC) as required by TS 6.2, Review and Audit. Minor changes did not require committee approval but were reviewed by the subcommittee; the reviews and approvals were documented in the minutes of RSSC committee meetings.

c. Conclusions

The licensee was maintaining and implementing written procedures in accordance with license requirements.

**4. Surveillance and Limiting Conditions for Operation**

a. Inspection Scope (IP 69001-02.05)

The inspector reviewed the following to determine if the periodic surveillance tests on safety systems were being performed in accordance with TS Section 4.0, Surveillance Requirements:

- Surveillance Master Schedule 2007
- Surveillance Master Schedule 2008
- Technical Specifications Surveillance Audit, 2007
- Internal Memo from N. Rashidifard to L. Bobek, June Scram Function Test, January 30, 2009
- Procedure SP-23, Scram Function Test, February 14, 2008

b. Observations and Findings

The inspector reviewed the licensee's master schedule of surveillances against selected TS to check if each surveillance required by the TS was included in the surveillance program. The schedule of surveillances performed was then reviewed to assure that each surveillance required was being performed at its required frequency. With one exception, all the recorded results were within the TS prescribed frequency.

On the last workday prior to the inspection the licensee documented the discovery of a missed surveillance, the semi-annual Scram Function Test. The test was performed during the next reactor startup, showing that the interlock functioned properly. TS 4.2.8 required each protective channel in the reactor safety system to be verified as operable semi-annually. While scheduling a February 2009 test the SRO could not find evidence that the mid-2008 test was performed.

Records revealed that in mid-2008 two student SROs left, one of them having major responsibilities for tracking surveillance. At the same time, the reactor entered an extended shutdown awaiting delivery of a replacement component. The surveillance test was scheduled to be done when the reactor was returned to

operation. There was no record that this was done so the licensee assumed that the surveillance had not been done.

Since the missed TS surveillance requirement was self-identified and immediately performed, was not a repetitive occurrence in the licensee's surveillance program, and because the test indicated that the interlocks were functional when tested, this was classified a non-cited violation (NCV) of the TS. Since corrective action was observed by the inspector no written response to this NCV is required. (Non-cited violation 50-223/2009-201-01 NCV)

c. Conclusions

The surveillance program required by the TSs was being implemented effectively with the exception that the licensee failed to perform one test when scheduled, constituting a non-cited violation.

**5. Design Changes**

a. Inspection Scope (IP 69001-02.08)

In order to verify that any modifications to the facility were consistent with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50.59 and TS Section 6.2, Review and Audit, the inspector reviewed selected aspects of:

- Reactor Safety Subcommittee (RSSC) Meeting Minutes for meeting on September 18, 2008
- Safety Evaluation Determination for Secondary Cooling System Remote Control Considerations within the UMLRR Online Application, 7 pages, undated document
- Form RO-7, Reactor Checkout, Rev 1, July 28, 2008
- Reactor Power High Voltage Power Supply Failure and Replacement, September 18, 2008
- Procedure FP-5 (formerly Procedure SP-25)
- Procedure Changes to Remote Control of Secondary Cooling System
- Operator Requalification Program for the UMLRR for Licensed Reactor Operators and Licensed Senior Reactor Operators, Rev 2, September 18, 2008

b. Observations and Findings

The inspector reviewed a series of documents listed above which were reviewed by the RSSC at their September 18, 2008 meeting as part of a 10 CFR 50.59 review of facility changes, test and experiments. In all cases the inspector found that the licensee staff and the RSSC met the requirements of the regulations and facility TS.

The licensee did not have a written procedure for performing such reviews but indicated an interest in developing one to improve the efficiency over the case-by-case review process currently in effect.

c. Conclusions

Records indicated that changes at the facility were acceptably reviewed in accordance with 10 CFR 50.59 and applicable licensee administrative controls.

**6. Committees, Audits, and Reviews**

a. Inspection Scope (IP 69001-02.09)

The inspector reviewed the following to ensure that the audits and reviews stipulated in TS Section 6.2, Review and Audit, were being completed:

- Reactor Safety Subcommittee (RSSC) Meeting Minutes for meetings of December 12, 2007, March 14, 2008, June 3, 2008, September 18, 2008 and December 18, 2008

b. Observations and Findings

The inspector verified that the composition of the RSSC was as specified in the TS, quorums were present at meetings, meetings were held at the required frequency, and meeting minutes were published in accordance with TS requirements. A review of records indicated that the RSSC provided the oversight and reviews of the reactor programs as required by the TS. Specific examples of the latter are addressed elsewhere in this report. (e.g., review of procedures per Section 3 and review of facility changes per Section 5.)

c. Conclusions

The RSSC provided the oversight required by the TS.

**7. Maintenance Logs and Records**

a. Inspection Scope (IP 69001-02.11)

The inspector reviewed the following selected maintenance and reactor operations records to ensure that the requirements of TS Sections 6.7, Plant Operating Records, were being met:

- Reactor Console Logbook #29, June 29, 2007 to February 5, 2009

b. Observations and Findings

The licensee stated that their practice was to keep records of principal maintenance activities, as required by TS Section 6.7, in the reactor console logbook. The inspector reviewed the logbook for maintenance records related to scheduled and unscheduled preventive and corrective maintenance activities that had occurred during the inspection period.

c. Conclusions

The inspector reviewed reactor logbook entries that documented principal maintenance activities in compliance with license requirements.

**8. Fuel Handling Logs and Records**

a. Inspection Scope (IP 69001-02.12)

The inspector reviewed the following records to verify implementation of the requirements of TS Section 6.7, Plant Operating Records:

- Procedure RO-2, Unloading and Reloading the Core to a Known Configuration, Rev 5, April 1, 2005
- Procedure RO-8, Handling of Irradiated Fuel, Rev 2, May 22, 1991
- Reactor Console Logbook #29, June 29, 2007 to February 5, 2009

b. Observations and Findings

The inspector found that the procedures used for fuel handling provide for the safe handling of fuel elements. The only fuel movement recorded in recent years was for the biennial inspection of a representative sample of fuel elements required by TS Section 4.6, Fuel Surveillance.

c. Conclusions

Fuel movements were performed safely in accordance with TS requirements and licensee procedural requirements.

**9. Follow-up of Previously Identified Items**

a. Inspection Scope (IP 92701)

The inspector reviewed the following to assess action taken by the licensee in response to two items identified for follow-up consideration in a previous inspection:

- Operator Requalification Program for the UMLRR for Licensed Reactor Operators and Licensed Senior Reactor Operators, Rev 2, September 18, 2008

- Irradiation Request Form, March 14, 2008
- Procedure FP-5, Sample Handling for the Reactor, Rev 1, September 18, 2008
- Procedure RO-4, Addition or Removal of Core Samples, Rev 6, June 14, 2005

b. Observations and Findings

In a previous inspection the inspector created an Unresolved Item (URI), noting that medical examinations given to reactor operators did not indicate the criteria on which the medical examiner was basing a professional opinion of being medically fit. The inspector noted that since that time the licensee had revised the operator requalification program calling for medical examinations to be performed pursuant to the applicable ANS/ANSI standard. (URI 50-223/2007-201-01 was therefore closed.)

In a previous inspection the inspector created an Inspector follow-up Item (IFI), noting that approval of experiments did not clearly indicate that the individual reviewing experiment requests was considering all TS requirements. The inspector reviewed changes made to documents governing the experiment review and approval process and found that the revised process clarified the issue at hand. (IFI 50-223/2007-201-03 was therefore closed.)

c. Conclusions

The inspector closed out an unresolved item and a follow-up item from a previous inspection based on changes the licensee had made in the operator requalification program and in the experiment review and approval process.

**10. Exit Interview**

The inspector summarized the inspection scope and results with members of licensee management during an exit meeting on February 6, 2009. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

## **PARTIAL LIST OF PERSONS CONTACTED**

### Licensee

L. Bobek	Reactor Supervisor
P. Chowdhury	Vice Provost for Research
G. Kegel	Director, Radiation Laboratory
D. Lajeunesse	Reactor Operator
D. Medich	Director of Radiation safety and Radiation Safety Officer
N. Rashidifard	Senior Reactor Operator
T. Regan	Chief Reactor Operator
J. White	Professor of Nuclear Engineering and Chairman of the Reactor Safety Subcommittee

## **INSPECTION PROCEDURES USED**

IP 69001	Class II Research and Test Reactors
IP 92701	Follow-up

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

### Opened

50-223/2009-201-01	NCV	Surveillance test missed, identified, and performed late
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### Closed

50-223/2007-201-01	URI	Documentation of the application of ANS/ANSI-15.4-1988 in reactor operator medical examinations
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50-223/2007-201-03	IFI	Documentation of TS compliance when approving minor variations of routine experiments
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50-223/2009-201-01	NCV	Surveillance test missed, identified, and performed late
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### Discussed but not Closed

None

**LIST OF ACRONYMS USED**

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ADAMS	Agencywide Document Access and Management System
IFI	Inspection Follow-up Item
IP	Inspection Procedure
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
Rev	Revision
RO	Reactor Operator
RSSC	Reactor Safety Subcommittee
SRO	Senior Reactor Operator
TS	Technical Specifications
UML	University of Massachusetts - Lowell
UMLRR	University of Massachusetts - Lowell Research Reactor
URI	Unresolved Item