August 28, 2003

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

SUBJECT: NRC ROUTINE, ANNOUNCED INSPECTION REPORT NO. 50-223/2003-201

Dear Dr. Kegel:

This letter refers to the inspection conducted on May 27 - 30, 2003, at the University of Massachusetts - Lowell Research Reactor. The enclosed report presents the results of that inspection.

Areas examined during the inspection are identified in the report. 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, no safety concern or noncompliance to NRC requirements was identified. No response to this letter is required.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) http://www.nrc.gov/reading-rm/adams.html. If you have any questions concerning this inspection, please contact Mr. Thomas Dragoun at 610-337-5373.

Sincerely,

/RA by Daniel E. Hughes Acting for/
Patrick M. Madden, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program (RNRP)
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

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

Enclosure: NRC Inspection Report No. 50-223/2003-201

cc w/enclosures: Please see next page

cc:

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Lowell, MA 01852

Mr. Leo Bobek
Reactor Supervisor
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Test, Research, and Training
Reactor Newsletter
University of Florida
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Gainesville, FL 32611

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

Docket No:	50-223
License No:	R-125
Report No:	50-223/2003-201
Licensee:	University of Massachusetts
Facility:	Research Reactor at University of Massachusetts Lowell
Location:	Lowell, Massachusetts
Dates:	May 27 - 30, 2003
Inspector:	Thomas F. Dragoun
Approved by:	Patrick M. Madden, Section Chief Research and Test Reactors Section New, Research and Test Reactors Program (RNRP) Division of Regulatory Improvement Programs Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

University of Massachusetts - Lowell
Report No:50-223/2003-201

The focus of this routine, announced inspection was the on-site review of selected aspects of the licensee's Class II non-power research reactor operation including: organization and staffing; procedures; requalification training; surveillance and limiting conditions for operation; health physics; design changes; committees, audits, and reviews; fuel movement; and the special nuclear material control and accounting program.

Organization and Staffing

The licensee's organization and staffing remain in compliance with the requirements specified in the Technical Specifications Section 6.

Procedures

- The licensee's procedures and changes thereto were being reviewed and approved by the Reactor Safety Subcommittee as required.

Requalification Training

- Operator requalification was conducted as required by the Requalification Program.

Surveillance and Limiting Conditions for Operation

- The conduct of surveillances satisfied the requirements in Technical Specifications Section 4.0.

Health Physics

- The inspector determined that, because: 1) surveys were being completed and documented acceptably to permit evaluation of the radiation hazards that might exist; 2) postings met regulatory requirements; 3) personnel dosimetry was being worn as required and doses were well within the licensee's procedural action levels and the NRC's regulatory limits; and, 4) radiation monitoring equipment was being maintained and calibrated as required, the Radiation Protection Program being implemented by the licensee satisfied regulatory requirements.

Design Changes

- The safety review of changes to procedures satisfied the requirements specified in 10 CFR 50.59 and Technical Specifications Section 6.2.2(d).

Committees, Audits, and Reviews

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

Fuel Handling

- The fuel handling program satisfied licensee Technical Specification and procedural requirements.

SNM Control and Accountability

- The licensee was acceptably controlling and tracking SNM in accordance with the regulatory requirements.

REPORT DETAILS

Summary of Plant Status

The licensee's one megawatt open pool reactor continues to be operated in support of undergraduate instruction and demonstrations for high school students. During the inspection, the reactor was operated on several occasions. The Medical Embedment, a 3 ft by 3 ft opening through the bioshield near the bottom of the reactor pool, was being converted to a Enhanced Low Dose Rate Sensitivity (ELDRS) facility. The control console displays were replaced by a touch screen

1. Organization and Staffing

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

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of Technical Specification (TS) Section 6.1, Amendment 12, dated July 31, 1997, were being met:

- organizational structure
- management responsibilities
- staffing requirements for safe operation of the research reactor facility

b. Observations and Findings

Through discussions with licensee representatives, the inspector determined that management responsibilities and the organization at the facility had not changed since the previous NRC inspection in June 2002 (Inspection Report No. 50-223/2002-201).

c. Conclusions

The licensee's organization and staffing remain in compliance with the requirements specified in the TS Section 6.

2. Procedures

a. Inspection Scope (IP 69001)

The inspector reviewed the changes to procedures since the last inspection to ensure that the requirements of TS Sections 6.2.2(a) and 6.3 and administrative procedure AP-2 dated March 19, 1990 were being met:

- Procedure SP - 23, "Scram Function Test" revision 23, dated August 19, 2003
- Procedure RO - 9, "Reactor Checkout" revision 14, dated August 19, 2003
- Procedure RO -6, "Reactor Operations" revision 2, dated August 19, 2003

b. Observations and Findings

The reactor control console displays were replaced and significantly upgraded with a touch screen for reactor system parameters including control rod positions. The new equipment also added automatic control of the regulating rod and additional reactor scrams. The original control and safety systems remained unchanged. In addition, the control rod mechanical drives, limit switches, and position encoders were replaced with new equipment.

The licensee identified and changed the procedures affected by the console upgrades and rod drive replacement. The review and approval of the revised procedures was conducted in accordance with TS requirements and licensee administrative requirements.

c. Conclusions

The licensee's procedures and changes thereto were being reviewed and approved by the Reactor Safety Subcommittee as required.

3. Requalification Training

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of:

- the Requalification Program
- operator licenses
- operator training records
- operator physical examination records
- operator examination records
- operator active duty status

b. Observations and Findings

Four reactor operator licenses were active at this facility. None require renewal until August 2004. Records showed that the physical exams, annual evaluations, biennial written exams, and reactivity manipulations were up to date as required by the requalification program. Records also showed that procedure changes and the five Standing Orders were reviewed by the operators.

c. Conclusions

Operator requalification was conducted as required by the Requalification Program.

4. Surveillance

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the periodic surveillance tests on safety systems were performed as stipulated in TS Section 4.0:

- Surveillance Master Schedule 2003
- Procedure SP-16, “Rod Drop and Drive Measurements”, Revision 5, dated October 3, 1994. Data for July 30, 2002.
- Procedure SP-17, “Visual Inspection of Control Blades, Regulating Rod, and Fuel Elements”, Revision 4, dated August 27, 1998. Data for August 27, 2002.
- Procedure CP-1, “Logarithmic Power Channel Check and Calibration”, Revision 1, dated May 31, 2001. Data for July 3, 2002.
- Procedure CP-2, “Linear Power Channel Calibration”, Revision 1, dated May 31, 2001. Data for August 27, 2002.
- Procedure SP-13, “Calibration of Flow Measuring Devices and Pressure Measuring Devices”, Revision 6, dated September 25, 1995. Data for May 31, 2002.
- Procedure SP-14, “Calibration of Float Actuated Devices”, Revision 2, dated July 31, 1987. Data for May 5, 2003.
- Procedure SP-23,”Scram Function Test”, draft Revision for post-installation of new console displays. Data for January 2, 2003.

b. Observations and Findings

During inspection 50-223/2002-201 conducted in June 2002, the Reactor Supervisor stated that a problem with schedule creep of surveillance intervals was remedied by issuing a Surveillance Master Schedule which fixes the month when a surveillance must be done regardless of when it was last performed. The review of surveillance and calibration records during this inspection confirms that the corrective action was effective.

All the recorded results were within the TS and procedurally prescribed parameters. The records and logs reviewed were complete and were being maintained as required.

c. Conclusions

The conduct of surveillances satisfied the requirements in TS Section 4.0.

5. Health Physics

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with 10 CFR Part 20 and licensee administrative requirements:

- University of Massachusetts Lowell Research Reactor (UMLRR) , 2001-2002 Operating Report
- Letter to TDragoun, NRC, from GKegel, University of Massachusetts - Lowell, subject: "Appointment of new Radiation Safety Officer for UMASS LOWELL", dated March 5, 2002
- Licensee report, "Audit of the UMass Lowell Research Reactor Radiation Safety Program", by D.C.Medich - Radiation Safety Officer dated May 14, 2003.
- UMass Lowell Radiation Safety Guide (revised) dated July 2000.
- Procedure HPP-1, "Calibration of Portable Survey Meters" Revision A, dated July 25, 2002. Data for 2003.
- Procedure HPP-7, "Radiation Survey Procedures" Revision A, dated October 10, 2002. Data for January to April 2003, and October to December 2002.
- Procedure RxHp-1, "Swipe Counting Procedures" Revision B, dated March 23, 2003. Data for January to April 2003, and October to December 2002.
- Procedure RxHp-3, "Offsite Radiation Monitoring Program" Revision A, dated January 10, 2003. Data for January 2 to May 19, 2003.
- Procedure SP10, "Reactor Water Analysis" Revision 4, dated May 5, 2003, including draft "Work Instructions." Data for January to May, 2003.
- Form HP-20, "UMass Lowell Special Work Permit for Project Involving Radiation Sources" (undated). A permit issued for the Enhanced Low Dose Rate Sensitivity project. Special permit radiation surveys completed August 8 and 9, and December 3, 2002.
- Internal memorandum, from T. Regan, Chief Reactor Operator, to D. Medich, Radiation Safety Officer: "Accessing of Medical Embedment", dated September 27, 2002.
- Internal memorandum, from T. Regan, Chief Reactor Operator, to D. Medich, Radiation Safety Officer: "Conversion of Medical Embedment at UMLRR to an ELDRS Facility", dated March 18, 2003

The inspector also toured the facility to note any changes that may have been made and observed the use of dosimetry and radiation monitoring equipment. Licensee personnel were interviewed and radiological signs and postings were observed as well.

b. Observations and Findings

The incumbent RSO assumed the position on March 1, 2002, and replaced the previous RSO who retired. On October 17, 2002, the new RSO published the detailed results of an audit he conducted of the radiation safety program for the campus broad scope license and the research reactor license. On May 14, 2003, the RSO published a second audit of the radiation safety program for the reactor alone using an audit plan derived from NRC Inspection Procedure 69001. Weaknesses were reported, in particular with routine survey records, counting room practices, and laboratory records. Findings included the need to revise the waste tank recirculation time as discussed in the last NRC inspection. The

inspector reviewed the corrective action for these weaknesses and found it satisfactory. Licensee action to review and update the radiation protection policies and procedures was complete and satisfactory. Therefore, Inspector Follow up Item 50-233/2001-201-01 regarding this matter is closed.

The inspector reviewed the precautions and radiological controls associated with the initial opening of the Medical Embedment and construction of the ELDRS facility. To control the high radiation area anticipated during operation of ELDRS, the licensee has constructed a wall to enclose the area, installed a lockable door, remote readout area radiation monitor, viewing window, and a beam stop. The controls were appropriate for the projected hazards.

(1) Surveys

The inspector reviewed the monthly contamination and general area radiation surveys. The surveys had been completed by the Health Physics Technician (HP Tech) as required by procedures HPP-7 and RxHp-1. The results were documented on revised forms. The new forms require the technician to record, among other items, the status of the postings in the survey area.

(2) Postings and Notices

The inspector reviewed the postings at the entrances to various controlled areas. The postings were acceptable and indicated the radiation and contamination hazards present.

(3) Dosimetry

The licensee used a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor (Landauer) to process personnel dosimetry. An examination of the records for the past year showed that all exposures were well within NRC limits and within licensee action levels. Processing of the dosimeters was changed from a period of every two months to every month. The RSO added the capability for detecting fast and slow neutron doses to dosimeters worn by the reactor staff as of May 5, 2003. These changes constitute radiation safety program improvements.

(4) Radiation Monitoring Equipment

The calibration of portable survey meters was typically completed by the HP Tech. A new pulser was purchased for calibration of friskers. Calibration and record keeping procedures were revised to include detailed instructions, resulting in improved data records. Check sources were installed for operational checks of survey meters in the field prior to use. These changes were made as a result of the RSO's audit of the program. The calibration records of selected portable survey meters,

friskers, and air monitoring equipment in use at the facility were reviewed. Calibration frequency met the requirements established in licensee procedures.

(5) Radiation Safety Program

The licensee's radiation safety program was established in the Radiation Safety Guide dated July 2000. This includes the ALARA policy. The documentation and audits of this program by the RSO satisfied the requirements in 10 CFR 20.1101. The inspector also reviewed the training that was being conducted for licensee personnel in the area of radiation protection. The training covered the topics required to be taught in 10 CFR 19.

c. Conclusions

The inspector determined that, because: 1) surveys were being completed and documented acceptably to permit evaluation of the radiation hazards that might exist; 2) postings met regulatory requirements; 3) personnel dosimetry was being worn as required and doses were well within the licensee's procedural action levels and the NRC's regulatory limits; and, 4) radiation monitoring equipment was being maintained and calibrated as required, the Radiation Protection Program being implemented by the licensee satisfied regulatory requirements.

6. Design Change Control

a. Inspection Scope (IP 69001)

The inspector reviewed the following document to verify compliance with 10 CFR Part 50.59 and TS Section 6.2.2(d):

- Safety Evaluation Determination (SED) for UMLRR Drives Control System approved by the Reactor Safety Subcommittee on February 20, 2003

b. Observations and Findings

The licensee has implemented the revised 10 CFR 50.59 requirements and associated regulatory guidance that were effective on March 13, 2001. The SED reviewed by the inspector included the following system changes: new rod drive motors; limit switches; position encoders; touch screen display; and automatic control of the regulating rod. The SED documented a detailed description of system operation as it related to the screening questions required by the regulation. The screening process concluded that further evaluation was not required. However, the licensee identified 11 sections of the Final Safety Analysis Report that may require changes. These changes will not require NRC approval but will require notification of NRC. The licensee stated that the appropriate notification will be made after the changes are finalized.

c. Conclusions

The safety review of changes to procedures satisfied the requirements specified in 10 CFR 50.59 and TS Section 6.2.2(d).

7. Committees, Audits, and Reviews

a. Inspection Scope (IP 69001)

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

- Reactor Safety Subcommittee (RSS) membership
- RSS minutes of meetings held February 20, 2003, and November 26, August 19, April 11, 2002.

b. Observations and Findings

The composition of the RSS was as specified in the TS. A review of records indicated that the RSS provided the oversight and reviews of the reactor programs as required by the TS. The RSO advised the inspector that the RSS meeting for the first quarter of 2002 was missed. This was due to the change of RSOs. He stated that the RSO served as secretary for scheduling meetings and documenting the minutes of meeting. The new RSO was not aware of this responsibility before the first quarter ended. The inspector noted that the new RSO assumed the position on March 1, the last month in the calender quarter. A meeting was held as soon as practical on April 11. There have been no missed meetings since that time.

c. Conclusions

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

8. Fuel Handling

a. Scope (69001)

The inspector reviewed selected aspects of:

- Procedure RO-2, “Reloading the Core to a Known Configuration” Revision 4, dated May 9, 1991
- Comparison of the current core loading as indicated on the tally board and a visual inspection of the core
- fuel handling records dated January 3, 2003

b. Observations and Findings

Fuel handling records indicated that the last fuel movement was conducted and recorded in accordance with the proscribed procedure. The initial and final configurations were known configurations. The core loading records and tally board were in agreement. The fuel handling activities were well documented.

c. Conclusions

The fuel handling program satisfied licensee TS and procedural requirements.

9. Material Control and Accounting

a. Inspection Scope (IP 85102)

To verify compliance with 10 CFR Parts 70 and 74, the inspector reviewed:

- Procedure RxHp-2, "SNM Inventory, Control, and Accountability Procedures" Revision A, dated August 1, 2002
- Licensee letter to NAC International from D. Medich, RSO, dated May 8, 2002, sending corrected SNM status reports for following reporting periods: April 1 to September 30, 2000; October 1, 2000, to March 31, 2001; April 1 to September 30, 2001; and October 1, 2001, to March 31,2002.
- assignment of responsibility for special nuclear material
- accountability records and reports
- nuclear material inventory and locations
- SNM semiannual reports for 2000, 2001, 2002, and 2003

b. Observations and Findings

The RSO administered a SNM control and accountability program that provided the quantity, identity, and current location of SNM held under the R-125 license. A physical inventory was completed annually or semiannually as required by the revised regulations 10 CFR 70.51(d). The possession and use of SNM was limited to the purposes and locations authorized under the license. The inventory and material control and accountability forms (DOE/NRC Forms 741, 742, and 742C) were prepared and transmitted as required by 10 CFR 74.13(1).

Soon after assuming his responsibilities, the RSO detected errors in some semiannual reports. These were promptly corrected.

c. Conclusion

The licensee was acceptably controlling and tracking SNM in accordance with the regulatory requirements.

10. Exit Interview

The inspection scope and results were summarized on May 30, 2003, with members of licensee management. 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
D. Medich, Radiation Safety Officer
T. Regan, Chief Reactor Operator
G. Kegel, Radiation Laboratory Director

INSPECTION PROCEDURES

IP 69001 Class II Non-power Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

50-223/2001-201-01	IFI	Review and update radiation protection procedures and policies.

LIST OF ACRONYMS USED

CFR	Code of Federal Regulations
ELDRS	Enhanced Low Dose Rate Sensitivity
IFI	Inspector Follow up Item
IP	Inspection procedure
NRC	Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
RSO	Radiation Safety Officer
RSS	Reactor Safety Subcommittee
SED	Safety Evaluation Determination
SNM	Special Nuclear Material
TS	Technical Specification