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RADIATION LABORATORY

Leo M. Bobek
Reactor Supervisor

August 28, 2008

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Re: License No. R-125, Docket No. 50-223

Pursuant to Technical Specification NRC License No. R-125 we are submitting the Annual Report for the University of Massachusetts Lowell Research Reactor.

Sincerely,

Leo M. Bobek,
Reactor Supervisor

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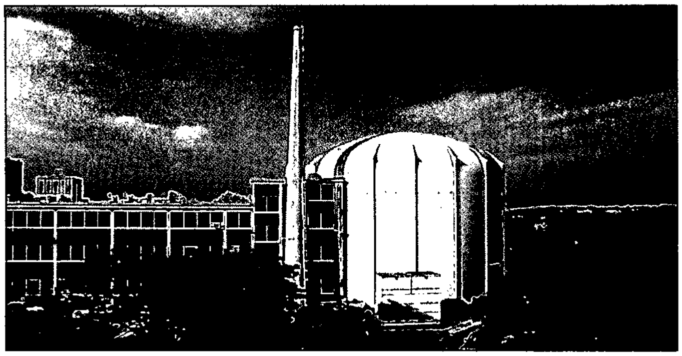
University of Massachusetts Lowell Research Reactor (UMLRR)



2007-2008 OPERATING REPORT

NRC Docket No. 50-223

NRC License No. R-125

University of Massachusetts
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One University Avenue
Lowell, Massachusetts 01854

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This report is submitted as required by the Technical Specification 6.6.4 of reactor license R-125 and provides the information as outlined in the specification.

OVERVIEW

In the late 1950's, the decision was made to build a Nuclear Center at what was then Lowell Technological Institute. Its stated aim was to train and educate nuclear scientists, engineers and technicians, to serve as a multi-disciplinary research center for LTI and all New England academic institutes, to serve the Massachusetts business community, and to lead the way in the economic revitalization of the Merrimack Valley. The decision was taken to supply a nuclear reactor and a Van-de-Graaff accelerator as the initial basic equipment.

Construction of the Center was started in the summer of 1966. Classrooms, offices, and the Van-de-Graaff accelerator were in use by 1970. Reactor License R-125 was issued by the Atomic Energy Commission on December 24, 1974, and initial criticality was achieved on January 1975.

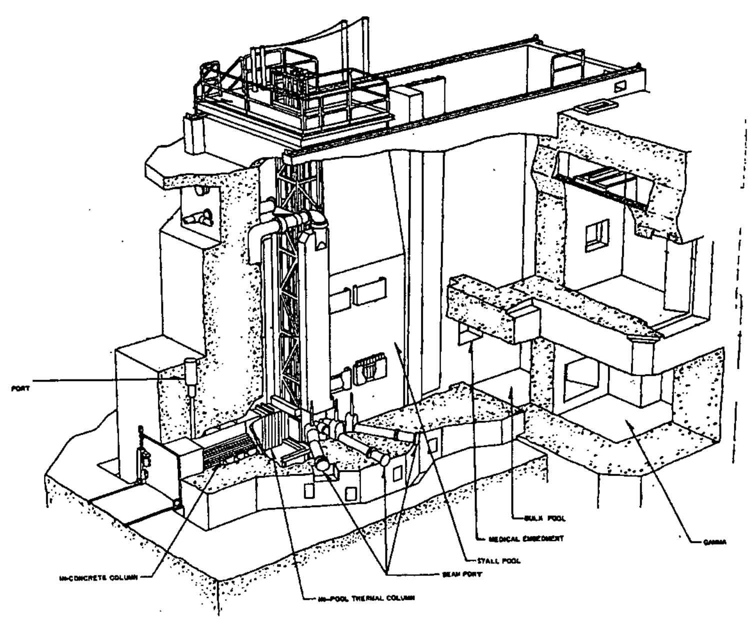
The name of the Nuclear Center was officially changed to the "Pinanski Building" in the spring of 1980. The purpose was to reflect the change in emphasis of work at the center from strictly nuclear studies. At that time, the University of Lowell Reactor became part of a newly established Radiation Laboratory. The Laboratory occupies the first floor of the Pinanski Building and performs or coordinates research and educational studies in the fields of physics, radiological sciences, and nuclear engineering. The remaining two floors of the Pinanski Building are presently occupied by various other University departments.

On February 14, 1985, the University of Lowell submitted an application to the Nuclear Regulatory Commission for renewal of the facility operating license R-125 for a period of 30 years. On November 21, 1985, the license renewal was granted as Amendment No. 9 of License R-125 in accordance with the Atomic Energy Act of 1954.

In 1991, the University of Lowell name was changed to University of Massachusetts Lowell. On August 4, 2000, the reactor was converted from high enrichment uranium fuel to low enrichment uranium fuel.

The University of Massachusetts Lowell Radiation Laboratory (UMLRL) is one of 22 research centers at the University. The University departments utilizing the laboratory include Biology, Chemistry, Earth Sciences, Physics, Mechanical Engineering, Plastics Engineering, Radiological Sciences, and Chemical/Nuclear Engineering. The University's Amherst campus and Medical Center have active research programs at the Radiation Laboratory. Much research is concerned with safety and efficiency in the nuclear and radiation industries, including pharmaceuticals, medical applications, health affects, public utilities, etc.; however, much research is also done by workers in other fields who use the unique facilities as analytical tools.

In addition, the Laboratory's reactor and Cobalt-60 facilities are used in the course work of various departments of the University. It also provides these services to other campuses of the Massachusetts system, other universities in the New England area, government agencies and to a limited extent, industrial organizations in Massachusetts and the New England area, as well as numerous school science programs in the Merrimack Valley.



UMLRR Cutaway View

A. NARRATIVE SUMMARY

1. Operating Experience and Experiments

The major uses of the reactor during the reporting period were activation analysis, neutron radiography, neutron irradiation of electronics, production of short-lived isotopes for educational purposes, teaching and personnel training.

Neutron activation analysis was used for several research projects involving the study the volcanic materials; characterizing the concentration of trace metals in nanotech materials; determining the trace metal content of tree rings to study air pollution; and for analyzing the chemistry of 2.7 billion year old granites. The neutron radiography system was used to evaluate various neutron imaging and detection platforms. Neutron irradiation of various electronics was performed to enhance performance characteristics and for tolerance testing. Short lived isotopes (e.g., Al-28, Na-24) were produced for routine practicum and demonstration purposes. The reactor was used for several nuclear engineering and non-nuclear engineering practicum and demonstration purposes. In addition, the reactor was used for training operator license candidates.

2. Facility Design Changes

During the reporting period, a capability for remote control of the secondary cooling system was installed. The purpose of this change was allow students and instructors to make limited changes to the secondary cooling system to demonstrate and observe thermodynamics principles. This change is further described in Section G of this report.

In June, a shipment of Co-60 sources representing approximately 4% of the licensed limit for the reactor was received from MDS Nordion. The total inventory in possession after the shipment is less than 7% of the license possession limit.

3. Performance Characteristics Changes

A perforation of the city water supply line to the secondary cooling system was discovered during the reporting period. The supply line was re-plumbed to restore normal operation. In addition, distribution sparges for the secondary cooling system cooling tower were found to be in disrepair and replaced. It should be noted the secondary system has no safety significance associated with the reactor. Performance of all other the reactor and related equipment has been normal during the reporting period. There were no discernable changes that would indicate any degradation of other systems or components.

4. Changes in Operating Procedures Related to Reactor Safety

As part of a continuing effort to update and re-format all procedures associated with the reactor, several procedures had minor revisions or updates non-substantive in nature. Such changes are kept on file and summarized for the RSSC at each meeting.

5. Results of Surveillance Test and Inspections

All surveillance test results were found to be within specified limits and surveillance inspections revealed no abnormalities that could jeopardize the safe operation of the reactor. Each required calibration was also performed.

B. TABULATIONS

Energy generated this period (MWD)	3.61
Critical hours	89.88
Cumulative energy to date (MWD)	32.21

C. INADVERTENT AND EMERGENCY SHUTDOWNS

There was one inadvertent non-emergency shutdown. This was due to a linear power range switch being left in manual, causing a trip on a low power range. Descriptions of each scram are noted in operator logs and are analyzed by an SRO for any safety significance.

D. MAJOR MAINTENANCE

As described in A.3, repairs were made to the secondary cooling system. This maintenance had no effect on the safe operation of the reactor.

E. FACILITY CHANGES RELATED TO 10CFR50.59

There was one change to the facility related to 10CFR 50.59. A capability for remote control of the secondary cooling system was installed to allow remote users some limited control of the secondary cooling system, including on/off control of the secondary pump and cooling tower fans, and continuous control of a motor-operated valve (MOV) that adjusts the secondary flow rate. Interlocks were installed to prevent inadvertent use of the controls without an operator present in the control room. Calculations using the experimentally determined temperature coefficient of reactivity show negligible reactivity effect associated with use of the secondary cooling system. A review of the safety evaluation by the reactor safety committee concluded the change does not involve a modification of Technical Specifications and meets the criteria specified in 10 CFR 50.59.

F. ENVIRONMENTAL SURVEYS

Members of the Radiation Safety Office performed an ALARA review for the 2006 calendar year with the results summarized below. Included is a summary of the environmental release pathways (sewer and stack) and the maximum environmental and occupational dosimetric exposures documented through the Global Dosimetry film badge service.

Thermoluminescent dosimeters, provided by Global Dosimetry, were used to monitor unrestricted areas outside of the Reactor and indicated that doses in these areas were statistically equivalent to background radiation levels for the 2006 calendar year. Surveys of the environs external to the reactor building also show no increase in levels or concentrations of radioactivity as a result of continued reactor operations.

All environmental releases were below the goals set by the Radiation Safety Office (10 mrem per year). All releases were well within federal, state, city, and university release limits. The reactor stack release during the 2006 was conservatively estimated to be less than 2.46 Ci and resulted in an estimated annual dose at the site boundary of 0.05 mrem in 2006. The dose estimate was obtained using the EPA Comply Code at a level 4 screening. This estimated did not take into account the removal of three reactor beamports, which would have further lowered the total estimated Argon-41 production and therefore the dose at the site boundary.

G. RADIATION EXPOSURES AND FACILITY SURVEYS

2006 ALARA Data

OCCUPATIONAL EXPOSURES

GROUP	NUMBER	MAXIMUM	MAXIMUM
	BADGED	Wole Body DOSE (<500)	Extremity DOSE (<5000)
Reactor	16	50*	30

* NOTE: This annual whole body exposure was to a film badge placed in test room 2 opposite a closed beam port. Presently, additional shielding is being added to the beam port. The highest annual *personnel* dose was 14 mrem for 2006.

1. Personnel Exposures

Personnel exposures were maintained at the lowest reasonable levels. Doses received by individuals concerned either directly or indirectly with operation of the reactor were within allowed limits. The annual ALARA goal established by the Radiation Safety Committee is less than 500 mrem per employee whole body and 5,000 mrem per employee Shallow Dose. Of the 16 badged individuals, the highest measured annual whole body dose was 14 mrem and the highest annual shallow dose was 30 mrem. All other total whole body doses for 2006 were below 10 mrem.

2. Radiation Surveys

Radiation levels measured in the reactor building have been typically less than 0.1 mrem/hr in general areas. Experiments have been conducted in which transient levels at specific locations have been in excess of 100 mrem/hr. Doses in these instances have been controlled by use of shielding and/or personnel access control. The pump room remains designated as a high radiation area during reactor operation and access is controlled.

3. Contamination Surveys

General area contamination has not been a problem in the reactor building. Contamination has occurred at specific locations where samples are handled and particular experiments have been in progress. Contamination in these areas is controlled by the use of easily replaced plastic-backed absorbent paper on work surfaces, contamination protection for workers, and restricted access.

H. NATURE AND AMOUNT OF RADIOACTIVE WASTES

2006 ALARA Data

ENVIRONMENTAL RELEASES

SOURCE	ACTIVITY	DOSE	GOAL
	mCi	mrem	mrem
Sewer Releases	0.006	M*	≤10
Stack Releases	2.46 E3	0.05	≤10

*NOTE: M indicates a level below detection limits of facility instrumentation

1. Liquid Wastes

Liquid radioactive wastes are stored for decay of the short lived isotopes and then released to the sanitary sewer in accordance with 20 CFR 2003. Approximately six microCuries (6 μCi) were released over the 12 month period consisting of small amounts campus produced laboratory waste (H-3 and C-14) which was incorporated into the Reactor waste water tanks for purposes of better waste release control. Each sewer release was diluted to concentrations below the detection limits of the UML proportional counting system. The UML proportional counter detection limit is calculated to be approximately 4 pCi/L.

2. Gaseous Wastes

Argon-41 continues to be the only significant reactor produced radioactivity identifiable in the gaseous effluent. This release represents a 12 month dose less than 0.1 mrem to the nearest member of the public using the EPA Comply code at the highest screening level (level 4).

3. Solid Wastes

Solid wastes, primarily paper, disposable clothing, and gloves, along with other miscellaneous items have been disposed of in appropriate containers. Most of the activity from these wastes consisted of short lived induced radioactivity. These wastes were held for decay and then released if no activity remained. The remaining long lived wasted (<10 cubic feet) is stored in a designated long lived waste storage area awaiting ultimate disposal at low-level radioactive waste disposal site.

End of Report