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August 25, 1992

Director Nuclear Reactor Regulations
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Enclosed please find a copy of the Annual Report covering the operations of the University of Massachusetts Lowell Research Reactor for the period from July 1, 1991 to June 30, 1992.

Sincerely yours,

Gunter Kegel,
Director Radiation Laboratory

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OPERATING REPORT

FOR THE

UNIVERSITY OF MASS. LOWELL REACTOR

FOR THE PERIOD

JULY 1, 1991 TO JUNE 30, 1992

Docket No. 50-223

License No. R-125

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A. INTRODUCTION

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 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. No amendment applications have been submitted since that time.

On September 30, 1991 the name of the University was officially changed to The University of Massachusetts Lowell.

B. FUNCTION

The Radiation Laboratory is a major research focal point of the University. More than 200 graduate students have used or are using the Laboratory's services; the comparable number for the faculty is in excess of 25. The University departments utilizing the facility include Biology, Chemistry, Geology, Physics, Mechanical Engineering, Plastics Engineering, Radiological Science and Nuclear Engineering. Much research is correlated with safety and efficiency in the nuclear and radiation industries, including public utilities, pharmaceuticals, medical applications, health effects, 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 facilities are used in the course work of various departments of the University. It also provides these services to other universities in the New England area, government agencies and, to a limited extent, industrial organizations in Massachusetts and the New England area

C. OPERATING EXPERIENCE

1. Experiments and Facility Use

The major uses of the reactor during this fiscal year were activation analysis, dosimetry studies, calibrations, isotope production, neutron damage studies, teaching and personnel training.

Activation techniques were used to study geologic composition of rock samples. The evaluation of the neutron to the gamma ratio for in-core experiments is continuing.

Dosimetry studies and calibrations utilized N-16 production for high energy gamma fields.

Isotopes were produced for calibration standards and lab practicums.

Reactor time used for teaching purposes included a reactor operations course emphasizing control rod calibrations, critical approaches, period measurement, prompt drops and calorimetric measurement of power.

Radiological science students utilized the facility by performing standard surveys. Senior students participated in a laboratory that required locating and identifying an unknown isotope of low activity. The isotope was provided for the students in an isolated area in containment during non-operating hours. During the practicum, the students were supervised by faculty and staff.

Several activation and decay experiments were performed for both university and non-university students alike. For the fifth consecutive year, an activation and decay experiment was provided for local high school physics classes which observed the experiment in their classrooms via live cable T.V. hook-up.

The major outside use for the reactor facility is neutron and gamma damage studies of electronic components.

2. Changes in Facility Design

None.

3. Performance Characteristics

Overall, the performance of the reactor and associate systems has been normal over the past year.

4. Changes in Operating Procedures Related to Reactor Safety

Reactor Operating Procedure RO-4 "Addition and removal of core samples" has been revised to minimize the possibility of operator error while performing this procedure.

Emergency Operating Procedure EO-1 has been revised to clarify the duties of the operating staff during a radiation emergency condition.

The above changes were reviewed and approved by the Reactor Safety Sub-Committee.

5. Results of Surveillance Test and Inspections

All Technical Specification Surveillances required during the fiscal year were performed in a timely manner. The results of each requirement have been reviewed by the Reactor Supervisor and Chief Reactor Operator. All surveillance test results were found to be within specified limits and surveillance inspections revealed no abnormalities which would jeopardize

the safe operation of the reactor. Each required calibration was also performed.

6. Staff

On March 31, 1992 the Chief Reactor Operator resigned. On May 21, 1992, after successfully completing the NRC's SRO exam, Dennis Martineau was appointed Chief Reactor Operator. As of June 30, 1992 the operations staff consists of five Trainees, and three Senior Operators including the Reactor Supervisor.

7. Operations Summary

During the course of the fiscal year 1991-1992 the reactor was critical a total of 222.15 hours. The utilization is broken down as follows:

Operating Hours

Critical hours	222.15
Hours at full power	103.52
Megawatt hours	101.15

Experimental Utilization

Sample hours	154.40
Number of irradiations	402
Number of training hours	76.53

D. ENERGY GENERATED

Total energy generated (MWD)	4.2146
Number of hours reactor was critical	222.15
Total cumulative energy output (MWD)	155.015

E. INADVERTENT AND EMERGENCY SHUTDOWNS

There was one(1) inadvertent scram due to a blown fuse in the Nuclear Instrumentation Cabinet.

There were two (2) manual scrams due to a stuck pneumatic tube sample holder.

F. MAJOR MAINTENANCE

No major maintenance was performed during this fiscal year.

G. CHANGES TO THE FACILITY UNDER 10 CFR 50.59

There have been no facility changes to date which pose an unreviewed safety question. All other changes made throughout the year are listed under changes in Operating Procedures (C.4).

H. ENVIRONMENTAL SURVEYS

Surveys of the environs external to the reactor building have continued to show no increase in levels or concentrations of radioactivity as a result of reactor operations. Air particulate samples collected at a continuously monitored site on the roof of an adjacent building have shown no reactor produced radioactivity. Film badges collected monthly at the same location have failed to show any elevated radiation levels above background.

Analysis of water samples collected from the Merrimack River upstream and downstream of the reactor location have continued to yield no radioactivity associated with reactor operations.

I. RADIATION EXPOSURES AND FACILITY SURVEYS

I. Personnel Exposures

Personnel exposures are maintained at the lowest reasonable level. Doses received by individuals concerned either directly or indirectly with

operation of the reactor were within allowed limits. Measurable whole body penetrating and ring finger shallow dose are given below.

Personal Exposure
Dose Summary

		1991 3rd	1991 4th	1992 1st	1992 2nd	Total
Wallace	Whole Body	0	0	0	0	0
	Ring	0	0	0	0	0
Martineau	Whole Body	0	0	0	0	0
	Ring	20	0	0	40	60
Montesalvo	Whole Body	0	0	0	0	0
	Ring	0	0	0	0	0
Mckee	Whole Body	0	0	0	60	60
	Ring	-	50	20	70	140
Gebrgeorgis	Whole Body	0	0	0	0	0
	Ring	-	-	0	0	0
Leipprandt	Whole Body	-	-	0	0	0
	Ring	-	-	-	-	-
Regan	Whole Body	-	-	-	0	0
	Ring	-	-	-	0	0
Pace	Whole Body	-	-	-	0	0
	Ring	-	-	-	-	-
Church	Whole Body	0	0	0	0	0
	Ring	-	-	-	-	-
McCarthy	Whole Body	0	0	0	20	20
	Ring	60	20	80	0	160
Coakley	Whole Body	0	0	0	0	0
	Ring	40	0	30	0	70
Mayer	Whole Body	0	0	0	10#	10
	Ring	-	-	310*	60	370
DeInnocentis	Whole Body	-	-	-	10	10
	Ring	-	-	-	-	-

Waters	Whole Body	-	-	-	30	30
	Ring	-	-	-	-	-
Shea	Whole Body	-	-	0	0	0
	Ring	-	-	-	-	-
Morro	Whole Body	0	-	-	-	0
	Ring	-	-	-	-	-
LeYang	Whole Body	0	-	-	-	0
	Ring	-	-	-	-	-
Milu	Whole Body	0	-	-	-	0
	Ring	-	-	-	-	-
Hobbs	Whole Body	0	0	0	0	0
	Ring	40	0	0	0	40
Catino	Whole Body	0	0	0	0	0
	Ring	-	-	-	-	-
Chabot	Whole Body	0	0	0	0	0
	Ring	-	-	-	-	-

Total Whole Body 100 mrem
or 0.10 manrem
*Not Reactor Related
#Shallow Dose

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. Dose equivalent levels in the order of 10 mrem/hr are present adjacent to the beam ports during maximum power operation.

3. Contamination Surveys

General area contamination has not been a problem in the reactor building. Contamination can occur at specific locations where samples are handled and particular experiments have been in progress. Monthly Surveys have failed to detect significant contamination levels at these locations.

J. NATURE AND AMOUNT OF RADIOACTIVE WASTES

1. Liquid Wastes

Following is a summary of radioactivity releases to the sanitary sewer during the reporting interval:

Date 1991	Undiluted Gross Beta µCi/ml	Total µCi
7/15/91	1.054×10^{-7}	0.30
8/28/91	5.189×10^{-8}	1.473
11/01/91	2.610×10^{-7}	0.74
12/23/91	1.434×10^{-6}	40.71
1992		
2/28/92	6.195×10^{-7}	17.59
4/7/92	1.899×10^{-7}	1.5
5/20/92	2.588×10^{-7}	7.35
6/15/92	8.874×10^{-7}	23.43

2. Gaseous Wastes

Argon-41 continues to be the only reactor produced radioactivity identifiable in the gaseous effluent. Following are the monthly stack release data for Ar^{41} for the reporting period:

Date	Amount Released (Ci)	Duration of Release (hrs)
July 1991	0.15	7.7
August 1991	0.016	0.7
September 1991	0.064	3.0
October 1991	0.211	13.3
November 1991	0.336	13.0
December 1991	0.000	0.0
January 1992	0.158	8.4
February 1992	0.221	12.4
March 1992	0.159	8.0
April 1992	0.090	6.2
May 1992	0.192	10.0
June 1992	0.355	20.0
Total	1.961	103.5

3. Solid Wastes

Solid wastes, primarily paper, disposable clothing along with other miscellaneous items have been packaged 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.