

U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report No.: 50-223/88-01

Docket No.: 50-223

License No.: R-125

Licensee: University of Lowell  
1 University Avenue  
Lowell, Massachusetts 01854

Facility Name: University of Lowell Reactor

Inspection At: Lowell, Massachusetts

Inspection Conducted: March 14 - 16 and March 22, 1988

Inspectors: A. Cerne, Senior Resident Inspector  
Seabrook Station

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4/15/88  
date

Inspection Summary: Inspection on March 14 - 16, and 22, 1988 (Report No. 50-223/88-01)

Areas Inspected: Routine, unannounced facility tour and inspection (48 hours) of facility organization, action on previous NRC findings, logs and records, procedures, surveillances, management oversight and Reactor Safety Subcommittee activities.

Results: Several areas of concern involving apparent violations were identified. An enforcement conference has been scheduled with the licensee to address NRC concerns identified in sections 5, 6 and 7 of this report.

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\*The NRC Inspection Manual inspection procedure that was used as inspection guidance is listed for each applicable report section.

## DETAILS

### 1. Persons Contacted

- \* Mr. G. Chabot, Radiation Safety Officer
- \* Dr. G. Kegel, Director, Radiation Laboratory
- \* Dr. L. Beghian, Associate Vice President of Research
- \* Mr. T. Wallace, Reactor Supervisor
- Ms. M. Montesalvo, Reactor Operator
- Mr. L. Bobek, Senior Reactor Operator
- Mrs. K. Williams, Reactor Operator

\*Denotes those present at the exit interview.

### 2. Licensee Action on Previous Inspection Findings

(Open) Unresolved Item (84-03-01). During the conduct of this inspection plant cleanliness was closely observed. The inspector noted that combustible material, including cardboard boxes and wooden skids, was stored within the containment structure at various locations. It was also noted that tools and miscellaneous equipment were left laying around, and areas used for preparing experiments were cluttered and disorderly. These observations were discussed with licensee management, who indicated that appropriate action would be taken. This item will continue to remain open pending further NRC observation of the effectiveness of licensee actions to improve plant cleanliness and housekeeping conditions; however, it is hereby converted to an NRC Open Item.

### 3. Plant Tours

The inspector toured the facility on March 14 and witnessed an experiment to calculate the value of the negative temperature coefficient of reactivity. The inspector also witnessed the conduct of the daily reactor shutdown. On March 15, the inspector witnessed the performance of the Daily Checkout and the subsequent reactor startup. During the plant tours, the general condition of plant mechanical and electrical equipment, radiation and air monitoring systems, plant housekeeping, arrangement of experimentation equipment and control room instrumentation were observed.

The inspector also toured the gamma irradiation facilities (gamma cave) located in the biological shield.

### 4. Facility Operations

The inspector observed reactor operations during the conduct of facility training for personnel from the Yankee Nuclear Power Station. It was noted that in accordance with the "Authority" provision of the operational program, written permission for the trainees to enter containment with unescorted access and manipulate the controls under the supervision of a licensed reactor operator had been provided and posted. The inspector reviewed the Daily Routine Check Sheet for Run No. 2176 of the reactor and witnessed the manual scram and check-out activities in accordance with

procedure R.O.9. Routine startup of the reactor in accordance with procedure R.O.5 was observed and reactor safety system component status and instrument channel readings were spot-checked within the control room. During the conduct of operations on March 15, 1988, a separate experiment involving gamma radiation of materials utilizing a Cobalt-60 source was in progress in the pool away from the reactor under the direction of another reactor operator.

The inspector interviewed the Reactor Supervisor regarding the potential impact of irradiation activities and experiments upon reactor operations. Based on these discussions, the inspector determined that appropriate controls appeared to be available to ensure no unanalyzed impact or effects on reactor operations existed. The reactor shutdown schedule and applicable check-out forms (reference: R.O.7) were also discussed with the Reactor Supervisor. Operator Log Book No. 15 entries dating back to May 3, 1987 were spot-checked and the inspector noted the availability of routine, abnormal and emergency procedures within the control room. Also, two specific surveillance procedures, S.P. Nos. 2 and 14, were reviewed to inspect the operability criteria for one safety system and the containment building.

Additionally, the inspector conducted a sample review of the following records:

- Irradiation Request Forms
- Reactor Use Records
- Daily Routine Check Sheets
- Radiation Monitoring System Daily Checks

These operating records were checked for the proper designation of the Reactor Supervisor and Radiation Safety Officer signatory authority, for evidence of the control of test and irradiation sample entry and exit from the core, and for the correct use of the reactor pre-startup and shutdown check sheets. The inspector evaluated the documented data for operability considerations with respect to both reactor instrumentation and the radiation monitoring system.

During the course of this inspection, four of the five facility licensed operators were interviewed with respect to either the conduct of operations or operational procedures and records.

No violations or safety concerns were identified regarding ongoing reactor operations.

## 5. Surveillance

The inspectors reviewed the facility records associated with the conduct of certain surveillance activities required by the Technical Specifications. It was noted that Section 6.7 of the Technical Specification prescribes that such records shall be retained for a period of at least five years.

The following surveillance packages were examined:

<u>Technical Specification Reference</u>	<u>Subject</u>
4.1.1	blade worth determination
4.1.2a	blade drop times
4.1.2b	blade drive times
4.1.3	blade inspections
4.2.3a	neutron channel calibration-LOG N
4.2.3b	neutron channel calibration-linear
4.2.4b	primary coolant flow rate
4.2.4c	pool water level
4.2.4d(1)	primary coolant inlet temperature
4.2.4d(2)	primary coolant core outlet temperature
4.2.8	scram function testing
4.3	radiation monitoring
4.4.2	containment isolation valve closure times

The inspector identified the following cases where the records provided evidence of surveillance activities not being performed at the periodicity required by the Technical Specification and determined that these cases constitute an apparent violation (50-223/88-01-01).

- A period of approximately seventeen months elapsed between the 1985 and 1987 channel calibration of the pool water level (reference TS 4.2.4c, an annual channel calibration is required).
- A period of approximately twelve months elapsed between the 1986 and 1987 tests of the protective channel manual scram from the health physics office (reference TS 4.2.8, a semi-annual operability verification is required).
- A period of approximately twenty-four months elapsed between 1985 and 1987 tests of the primary coolant flow rate instruments (reference TS 4.2.4b, an annual calibration is required).

Discussion with operations personnel regarding the missing TS surveillance records provided neither assurance nor any method for checking whether the subject surveillances had, in fact, been performed. Furthermore, with regard to the control blade and regulating rod surveillance results, the bases for Technical Specification 4.1 indicate that the appropriate inspection data will be analyzed for trends. In fact, however, no operations trending program had been established or had been implemented. Also, several of the individual records within the examined surveillance packages were lacking supervisory signature or other evidence of test results review.

The inspector noted that the most recent control blade differential and integral worth data (reference 4.1.1), was available in the control room. However, these curves had been plotted for Core C-5-3. No new calculations had been performed subsequent to March 11, 1988 when a new fuel assembly (F27) had been inserted into the core to replace a spent fuel assembly with a structural failure. The inspector reviewed a reactor check-out instruction sheet which indicated that the reactivity evaluation for the new Core C-7-3 had been performed using the old blade calibration data.

The inspector questioned the Reactor Supervisor regarding his interpretation of Technical Specification 4.1.1, which requires that reactivity worth of all rods be determined "prior to routine operation of any new fuel configuration in the reactor core". His response indicated that replacement of one fuel assembly did not technically constitute a "new fuel configuration". While the inspector concurred with this decision for this particular case of single fuel assembly replacement, it was noted that such a similar definition of "new fuel configuration" for multiple fuel replacement (e.g., an entire core refueling) would be inappropriate. Therefore, the inspector expressed a view that the licensee should formulate a definition of the term "new fuel configuration" that has some quantitative basis with respect to reactivity changes (e.g., blade height at criticality) and which meets the intent of the Technical Specification for the measurement of reactivity worths. Pending the documentation of such a definition by the licensee, its approval by the Reactor Safety Subcommittee and further review by an NRC inspector, this issue remains open (50-223/88-01-02).

#### 6. Reactor Safety Subcommittee (RSS)

The RSS meeting minutes for the past four years were reviewed in detail. In addition to verifying proper meeting frequency and quorum, the inspector looked for evidence of performance of the review responsibilities mandated by Technical Specifications, Section 6.2. The following concerns were identified with regard to the management oversight provided by the subcommittee, the conduct of the meetings and the performance of responsibilities.

- During the past two years, the RSS has not met at the quarterly frequency required by the Technical Specifications. The RSS did not meet for as long as seven months between October, 1986 and May, 1987.
- The majority of the meetings of the RSS were conducted with only three of five members present. The quorum requirement for the RSS is 3 members, including one member from outside the reactor facility line organization. However, on one occasion, the TS requirement of at least one member present from outside the reactor facility line organization was not met.

- Meeting minutes are issued without review signatures of the attendees; therefore, there is no verification on the record copy of the minutes that the attendees concur with the minutes. The minutes are the documentation of the procedure review function of the RSS required by the Technical Specification which require formal, documented evidence of review.

The above items constitute an apparent violation of TS 6.2 requirements (50-223/88-01-03). In addition, the inspectors identified the following concerns regarding RSS performance.

- Tracking and accountability for action items assigned at RSS meetings are not always provided. At the August 18, 1987 RSS meeting, the only item of discussion was an identified leak of reactor coolant from the pool. The Reactor Supervisor was assigned responsibility to provide a method to contain and collect the leak, to monitor the leak rate on a continuing basis, to conduct further radiological analysis of the leaking coolant and to inform the NRC. No subsequent RSS meeting addressed this issue and the only actions performed to date have been to collect and monitor the leak.
- During the last two years the minutes of the RSS did not indicate who chaired the meetings.

Collectively the above five items indicate a degradation in the performance of the RSS in the conduct of its Technical Specification required functions. Separate from the followup of the apparent violations of TS requirements listed above, the adequacy of the conduct of activities by the RSS will remain open pending further inspection by the NRC (88-01-04).

The inspector also noted that while specific RSS review functions were delineated in the Technical Specifications, no audit requirements were clearly defined. Discussion with the Reactor Supervisor revealed that an informal agreement with the Nuclear Science Center of the Rhode Island Atomic Energy Commission has resulted in the conduct of audits by that organization at the Lowell reactor. However, the last such audit had been performed in 1979. The inspector reviewed the available audit reports, 1979 and earlier, noting that such visits appeared to fulfill a need for independent "third party" audits of reactor operations.

Since the Reactor Safety Subcommittee has no clearly designated audit function and the visits by the Rhode Island AEC appear to have not been requested over the last several years, the inspector indicated that the licensee should consider the reestablishment of an active audit program. The objective views and comments provided by an independent party would provide valuable recommendations and input to programmatic improvements required of the licensee. The performance of an audit function by either the Reactor Safety Subcommittee or some other independent organization is an initiative that will require further licensee management attention.

## 7. Management Oversight

As an indirect result of the other areas which were observed during the conduct of the inspection there are strong indications of lack of management oversight at this facility as evidenced by the concerns discussed below.

- All special procedures (SP) including TS required surveillance procedures, were rewritten and implemented in August, 1987 prior to review by the RSS as required by TS. The revised SP's were given to the RSS members in September 1987 and still have not been reviewed.
- As discussed in section 5, results of surveillance tests conducted over the past two years have not been reviewed. Prior to 1986 this review function was performed by the Chief Reactor Operator (CRO), which is not a TS-required management position. The position, however, was left vacant upon departure of the last CRO from the staff.

The above failures to conduct management reviews of special procedures and surveillance test results constitute an apparent violation of TS 6.1.2 requirements (50-223/88-01-05). In addition, the following items indicate weaknesses at all levels of management.

- Reactor coolant leakage from the pool for which specific follow-up actions were identified by the RSS were not carried out by the Reactor Supervisor and not followed up by the RSS (see section 6).
- Based on inspector observations and interviews with the licensee's staff, the inspector found that line managers above the Reactor Supervisor do not routinely conduct tours of the reactor facility and are not involved in day-to-day reactor operations.
- Annual reports provided by the facility management to the NRC, as required by TS Section 6.6.4, contain a large amount of "boiler plate", that apparently is not receiving appropriate management review. For example, Section C.6 of each annual report generally states that "surveillance tests and inspections were performed according to schedule." However, as noted in section 5 of this report, certain surveillance tests, in fact, were not performed at their required frequencies. Increased management attention to review of the annual report information is warranted.

Separate from the followup of the apparent violations of TS requirements listed above, the adequacy of management oversight remains a concern pending further inspection by the NRC (88-01-06).

## 8. Exit Meeting

The inspectors met with licensee representatives (denoted in section 1) at the conclusion of the inspection on March 22, 1988 and presented the scope and findings of this inspection. The licensee acknowledged the findings and indicated that corrective actions would be taken where appropriate.

Additionally, a concern was raised during the course of this inspection regarding the fitness for duty of an individual fulfilling a regulatory required position at the facility. Discussion with management representatives resulted in immediate compensatory actions and corrective measures which were or would be taken by the licensee, to address this issue. The inspectors and regional management deemed such measures to be both necessary and appropriate to the situation. The NRC is considering what further action, if any, is necessary relative to this matter.

Subsequent to the inspection, during a telephone discussion on April 7, 1988 between the NRC Project Section Chief for the Lowell reactor and the University of Lowell Associate Vice President for Research, the apparent violations were summarized as discussed in this report and arrangements were initiated for an enforcement conference.