

U.S. NUCLEAR REGULATORY COMMISSION

Docket No: 50-123  
License No: R-079  
Report No: 50-123/97201 (DRPM)  
Licensee: University of Missouri at Rolla  
Facility Name: Rolla Nuclear Research Reactor  
Location: Rolla, Missouri  
Dates: May 27-30, 1997  
Inspector: T. M. Burdick  
Approved by: Marvin M. Mendonca, Acting Director  
Non-Power Reactors and Decommissioning  
Project Directorate

## Executive Summary

### Rolla Research Reactor Report No. 50-123/97201(DRPM)

This routine, announced inspection included aspects of organization, periodic and special reports, operations, maintenance and procedures; requalification training; surveillance; experiments; radiation controls; environmental protection; design change, audit, and review; emergency preparedness; fuel handling activities (69001)<sup>a</sup>; transportation activities (86740); and review of licensee reports (90713).

#### Organization (69001)

- The Rolla Research Reactor organization has been stable over the past several years. The Reactor Director had been on an extended leave of absence since last summer and the Reactor Manager has been performing the duties of both positions. (Section 1.0)

#### Operations and Maintenance (69001)

- Recently the reactor experienced trips the licensee attributed to switching noise in the nuclear instrumentation circuitry. Overall, operations were acceptable. (Section 2.0)

#### Procedures (69001)

- The licensee had approved procedures to acceptably conduct reactor operations, maintenance, experiments, surveillance testing, instrument calibrations, and shipping in compliance with T.S. requirements. (Section 3.0)

#### Requalification Training (69001)

- An acceptable training program was being conducted. Training records were being maintained as required. (Section 4.0)

#### Surveillance (69001)

- Reactor surveillance tests reviewed by the inspector had been completed and documented at the required frequencies, and the surveillance test results met T.S. requirements. (Section 5.0)

#### Experiments (69001)

- Those reactor experiments reviewed by the inspector were conducted in accordance with properly reviewed and approved procedures and acceptably documented in the reactor operations log, except for one minor oversight. (Section 6.0)

#### Radiation Control (69001)

- The radiation protection program was effective in minimizing exposure to the staff, students and public. The licensee reviewed exposures for As Low As Reasonably Achievable (ALARA) at low thresholds. (Section 7.0)

#### Environmental Protection (69001)

- The licensee has abandoned the practice of regenerating demineralizer resin to reduce liquid waste. (Section 8.0)

#### Audits and Reviews (69001)

- Operations and Radiation safety audits were acceptable. One minor documentation error was identified. (Section 9.0)

#### Emergency Preparedness (69001)

- Program changes were implemented acceptably. The licensee will evaluate the removal of respirators from their emergency supply locker. (Section 10.0)

#### Fuel Handling (69001)

- The licensee shipped all the High Enriched Uranium (HEU) fuel offsite last summer that allowed them adequate reactor fuel storage space to conduct control rod inspections. (Section 11.0)

#### Review of Periodic and Special Reports (90713)

- The licensee had submitted required reports to the NRC in accordance with T.S. requirements. (Section 12.0)

#### Transportation (86740)

- The licensee transferred or shipped radioactive materials without incident and all transfers and shipments were acceptably documented. (Section 13.0)

## DETAILS

### 1.0 Organization

#### a. Inspection Scope (69001)

The inspector reviewed Technical Specifications (T.S.) and the Safety Analysis Report (SAR) related to organization and staffing and compared the requirements with current conditions.

#### b. Observations and Findings

The inspector determined that the organizational structure and assignment of responsibilities were as specified in T.S. 6.0. although the Reactor Director has been on extended absence since last summer. The Director was present to conduct the Spring 1997 nuclear engineering lab sessions but was not engaged in day-to-day reactor activities. Meanwhile, the Reactor Manager has taken responsibility for both positions.

Membership of the Radiation Safety Committee (RSC) was in accordance with T.S. and the SAR. Meetings were conducted as required.

The inspector verified that minimum staffing requirements were met during reactor operations.

#### c. Conclusions

Compliance with T.S. organizational requirements was acceptable

### 2.0 Operations and Maintenance Activities

#### a. Inspection Scope (69001)

The inspector reviewed the reactor operations and maintenance logs to determine compliance with Operating License Condition 2.C(1) and the requirements in T.S. 2.0 and T.S. 3.0. No reactor operations or other significant activities occurred during the inspection.

#### b. Observations and Findings

The licensee had operated the reactor intermittently at various thermal power levels in accordance with Operating License Condition 2.C(1). The inspector verified that they were in compliance with T.S. 2.1.

Selected reactor operator logs from March 1995 through March 1997 were reviewed. The operator logs were acceptable to determine routine data.

The inspector noted log entries during April 18 and 21, 1997 regarding unexplained 120% rundown reactor trips. The licensee concluded these were due to recently installed nuclear instrumentation that was more sensitive to noise when switching ranges on the nuclear instrument drawer. They were contemplating a plan to either move the trip to another nuclear instrument channel or justify removing the T.S. requirement for the trip.

c. Conclusions

The reactor was operated and maintained in accordance with the reactor's license conditions, safety limits and limiting conditions for operation. The licensee's logs and records acceptably documented reactor operations and maintenance activities.

3.0 Procedures

a. Inspection Scope (69001)

The inspector reviewed the licensee's written procedures for operating and maintaining the reactor, performing surveillance activities, conducting experiments, and shipping radioactive materials to determine compliance with the requirements in T.S. 6.3.

b. Observations and Findings

The inspector verified that procedures were reviewed by the licensee as required. Changes were reviewed and approved by the RSC. The inspector noted that the licensee had developed some procedures that were not required by T.S.

c. Conclusions

The licensee had approved procedures to acceptably conduct reactor operations, maintenance, experiments, surveillance testing, instrument calibrations, and shipping in compliance with T.S. requirements.

4.0 Requalification Training

a. Inspection Scope (69001)

The inspector reviewed the reactor operator requalification training program to determine compliance with the requirements in 10 CFR 19.12 and 10 CFR 55.59.

b. Observations and Findings

The licensee's biennial written exam was comprehensive, acceptably covered the required topics, and tested operator knowledge. Each licensed operator had a current license and physical examination. Operators were aware of the required physical examinations every two years.

The inspector identified one instance, in a limited sample, of a grading error in which a licensed operator was awarded credit for an incorrect answer on the last requalification examination. This minor error did not affect the pass or fail results, and was not indicative of a significant problem.

The inspector noted that the Reactor Director has not been participating in the requalification program in the past year. The inspector reminded the licensee that they, must be in compliance with the applicable requirements "routines" of 10 CFR 55.53(f) and 55.59(a) before the reactor director is restored to licensed duties..

c. Conclusions

An acceptable training program was being conducted. Training records were being maintained as required.

5.0 Surveillance

a. Inspection Scope (69001)

The inspector reviewed selected surveillance test documentation to determine compliance with the requirements in T.S. 4.0.

b. Observations and Findings

Surveys and pre-startup surveillances were acceptably documented. Setpoints for Limiting Safety System Settings were maintained within the allowable values.

The licensee met the requirements of T.S. Amendment No. 14 to inspect the reactor shim/safety rods prior to October 7, 1996.

c. Conclusions

Reactor surveillance tests reviewed by the inspector had been completed and documented at the required frequencies, and the surveillance test results met T.S. requirements.

6.0 Experiments

a. Inspection Scope (69001)

The inspector reviewed the licensee's program to control and conduct experiments performed in the reactor to determine compliance with the requirements in T.S. 3.7. and 6.2.3.

b. Observations and Findings

No new types of experiments were conducted since the last inspection.



The inspector identified one instance in which the licensee had not completely documented the removal of an experiment from the reactor pool. The irradiated material had an unusually long decay period and remained in the pool for about two weeks after irradiation. The licensee bagged and labeled the article with the necessary information when it was removed from the pool on May 23, 1997 and placed in shielded storage. However, they overlooked entering the information in the appropriate log. The licensee immediately corrected this minor oversight.

c. Conclusions

Those reactor experiments reviewed by the inspector were conducted in accordance with properly reviewed and approved procedures and acceptably documented in the reactor operations log, except for one minor oversight.

7.0 **Radiation Control**

a. Inspection Scope (69001)

The inspector reviewed the radiation protection program to determine compliance with the requirements in 10 CFR Part 20 and T.S. 3.4, 3.5, 3.6, 4.4, 4.5, and 4.6.

b. Observations and Findings

The inspector reviewed the licensee's ALARA evaluation in response to a 40-70 mrem fast neutron dose to a pair of students. The licensee performed an evaluation and determined that the dose was a likely error by the dosimetry vendor although the vendor disagreed. The licensee kept the dose on the students' record as a conservative measure.

The control room, pool floor, counting room, demineralizer area, and beam port area were acceptably posted, illuminated, and clean. Potentially contaminated tools and equipment were adequately stored and marked.

The licensee used pool floor space to conduct lab experiments for undergraduate classes. Activities in the area were designed and controlled to minimize the spread of contamination and unnecessary radiation exposure.

c. Conclusions

All badged reactor personnel exposures were significantly below 10 CFR 20.1201 limits and generally less than detectable. The licensee was very sensitive to dose even in low exposures that assured a careful review. The licensee evaluation and conclusion of the exposure for the two students was reasonable.

## 8.0 Environmental Protection

### a. Inspection Scope (47050)

The inspector reviewed the licensee's program for the discharge or removal of radioactive liquid, gases, and solids from the reactor laboratory.

### b. Observations and Findings

The licensee has adopted a no-discharge policy for radioactive liquid waste and has abandoned the practice of regenerating demineralizer resins to eliminate liquid effluent. They have partially dismantled their regeneration system for disposal.

They did accumulate some liquid in one 55-gallon drum from the High Enriched Uranium (HEU) fuel shipment activity last summer. It contained a small amount of soluble activity and they were holding it until they have decided the proper disposal method.

Airborne effluent monitoring records for 1995-1996 showed that the releases were within the regulatory limits.

The inspector determined that they properly stored and transferred solid radioactive waste to the university broadscope license.

The licensee initiated a trial unrestricted area environmental monitoring program by placing dosimetry at various locations around the reactor building exterior. They are considering whether to continue this practice since the results were negligible. The inspector confirmed that dose records for the staff, students and the restricted area monitoring results indicate that exposure in the restricted areas were below the limits for an unrestricted area.

### c. Conclusions

Airborne releases and solid waste disposal were within the regulatory limits. The licensee has tried to reduce waste. Direct exposure in unrestricted areas were negligible.

## 9.0 Audit and Reviews

### a. Inspection Scope (69001)

The inspector reviewed the meetings, audits and reviews conducted by the Radiation Safety Committee (RSC) to determine compliance with the requirements in T.S. 6.2.

### b. Observations and Findings

They held RSC meetings quarterly and the Reactor Manager presented relative matters to the committee as required.



The licensee prepared and presented several 50.59 reviews to the RSC for approval. Each of these was exceptionally well researched and detailed. Modification packages were of equally high quality.

The inspector identified errors of omission in the monthly radiation protection audits regarding radioactive material transfers to storage during the months of May and July 1996 and August 1995. The auditor correctly identified transfers of material to other authorized campus users but overlooked several transfers to waste storage. The HP was unable to identify the cause of these minor errors in the documentation but was considering differentiating between transfer of radioactive material to storage and material transferred to other campus users on the audit form to prevent recurrence of the oversight.

The required T.S. operations safety audits were conducted by an outside evaluator with applicable experience.

c. Conclusions

RSC meetings were conducted as required by T.S. The licensee will review possible steps to ensure that the monthly radiation protection audits document their intended function. Operations audits were adequate.

10.0 **Emergency Preparedness**

a. Inspection Scope (82745)

The inspector reviewed the emergency plan and the last two annual drills for the reactor laboratory; interviewed licensee and campus employees; and inventoried storage lockers to determine compliance with the requirements in 10 CFR 50.54(q) and (r).

b. Observations and Findings

Recent program changes approved by the NRC were implemented as required.

The inspector identified half-face respirators as part of the emergency equipment locker inventory. The licensee has not maintained the masks and their use under an approved program. Since the licensee does not specifically require staff to respond to situations requiring the use of respiratory equipment for emergency response, they will consider removal of the devices from the inventory.

c. Conclusions

The licensee maintained their emergency program in a state of operational readiness.

## 11.0 Fuel Handling

### a. Inspection Scope (60745)

The inspector reviewed the fuel handling procedures and records at the reactor laboratory, and interviewed employees to determine compliance with T.S. 4.5.

### b. Observations and Findings

The licensee handled HEU fuel for shipment last summer without incident. They also similarly handled reactor fuel for control rod inspection purposes.

### c. Conclusions

The licensee's procedures and documentation for fuel movement were acceptable.

## 12.0 Review of Periodic and Special Reports

### a. Inspection Scope (90713)

The inspector reviewed the licensee's submittal of reports and notifications to the NRC to determine compliance with the requirements in T.S. 6.6.

### b. Observations and Findings

The inspector found that the last two annual reports were routine.

### c. Conclusions

The licensee had submitted required reports to the NRC in accordance with T.S. requirements.

## 13.0 Transportation of Radioactive Materials

### a. Inspection Scope (86740)

The inspector reviewed the licensee's radioactive material shipping program; reviewed logs; and interviewed employees to determine compliance with the requirements in Department of Transportation (DOT) and NRC regulations, 49 CFR Parts 172 & 173 and 10 CFR Part 71, respectively.

### b. Observations and Findings

In the past two years the licensee transferred byproduct material to the campus broadscope license for storage or to other campus users. They also made HEU fuel shipments last summer.

c. Conclusions

The licensee transferred or shipped radioactive materials without incident and all transfers and shipments were acceptably documented.

14.0 Inspector Follow-up Items

(Closed) IFI No. 50-123/95001-01: Operability of magnet status lights

This concern was resolved when the licensee obtained NRC approval to amend the T.S. to remove the operability requirement of the control rod magnet contact lights with Amendment No.14 dated August 28, 1995. This item is closed

15.0 Persons Contacted

University of Missouri at Rolla

\*David Freeman - Acting Reactor Director and Reactor Manager  
\*Ray Bono - Director, Occupational Health/Safety and Health Physicist  
N. Tsoulfanidis - Radiation Safety Officer  
\*William Bonzer - Senior Reactor Operator  
\*Jim Jackson - Reactor Operator  
\*David Wells - HP Technician  
\*Linda Pierce - Senior Secretary

The inspector also contacted other technical and administrative staff personnel during the inspection.

\* Denotes those attending the exit meeting on May 11, 1997.

15.0 Exit Interview (30703)

The inspector presented the inspection results to members of the licensee management at an exit meeting on May 30, 1997. The licensee acknowledged the findings presented. The inspector asked the licensee whether any material examined during the inspection should be considered proprietary. They identified no proprietary information.

### Inspection Procedures Used

IP 69001 Class II Non-power Reactors  
IP 86740 Inspection of Transportation Activities  
IP 90713 Review of Periodic and Special Reports

### Items Opened and Closed

#### Closed

50-123/95001-01 IFI Operability of magnet status lamp switches

### List of Documents Reviewed

Safety Analysis Report  
Safety Evaluation Report  
Reactor Operating License  
Technical Specifications  
Administrative Procedures  
Operating Procedures  
Maintenance Procedures  
Surveillance Procedures  
Shipping records and procedures  
Maintenance and Surveillance Records  
Emergency procedures  
Training Program  
Emergency Plan  
Dosimetry Records  
Training Records  
Various Reports

### List of Acronyms Used

ALARA As Low as Reasonably Achievable  
CFR Code of Federal Regulations  
DRPM Division of Reactor Project Management  
DOT Department of Transportation  
HEU High Enriched Uranium (fuel)  
HP Health Physicist  
NRC Nuclear Regulatory Commission  
PDR Public Document Room  
RSO Radiation Safety Officer  
RSC Radiation Safety Committee  
SAR Safety Analysis Report  
T.S. Technical Specifications