January 19, 2000

Mr. Stephen G. Frantz, Director
Reed Reactor Facility
Reed College
3203 S.E. Woodstock Boulevard
Portland, OR 97202-8199

SUBJECT: NRC INSPECTION REPORT NO. 50-288/99-202

Dear Mr. Frantz:

This refers to the inspection conducted on December 13-16, 1999, at your Reed Reactor Facility. 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 concerns or violations of NRC requirements were 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 placed in the NRC Public Document Room.

Should you have any questions concerning this letter, please contact Craig Bassett at 404-562-4712.

Sincerely,

/RA/

Ledyard B. Marsh, Chief
Events Assessment, Generic Communications
and Non-Power Reactors Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-288
License No. R-112

Enclosure: NRC Inspection Report

cc w/encl: See next page

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cc:

Peter Steinberger, Ph.D.
Dean of the Faculty
Reed College
3203 S.E. Woodstock Boulevard
Portland, OR 97202-8199

Dr. Steven S. Koblik, President
Reed College
Reed Reactor Facility
3203 S.E. Woodstock Boulevard
Portland, OR 97202-8199

David Stewart-Smith, Director
Division of Radiation Control
Oregon Department of Energy
625 Marion Street, N.E.
Salem, OR 97310

Test, Research and Training
Reactor Newsletter
202 Nuclear Sciences Center
University of Florida
Gainesville, FL 32611

U.S. NUCLEAR REGULATORY COMMISSION

Docket No: 50-288

License No: R-112

Report No: 50-288/99-202

Licensee: Reed College

Facility: Reed Reactor Facility

Location: 3203 S.E. Woodstock Boulevard
Portland, OR 97202-8199

Dates: December 13-16, 1999

Inspector: C. H. Bassett

Approved by: Ledyard B. Marsh, Chief
Events Assessment, Generic Communications
and Non-Power Reactors Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

Reed College
Report No: 50-288/99-202

This routine, announced inspection included onsite review of selected aspects of the following: organizational structure and functions program; review and audit program; radiation protection and ALARA programs; environmental monitoring program; procedural control program; transportation of radioactive material program; the safeguards and security program; and the material control and accounting program.

Organizational Structure and Functions

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

Review and Audit Functions

- The review and audit program satisfied Technical Specification requirements.

Radiation Protection Program

- Postings met the regulatory requirements.
- Personnel dosimetry was being worn as required and doses were well within the licensee's procedural action levels, and NRC's regulatory limits.
- Surveys were generally completed and documented acceptably to permit evaluation of the radiation hazards that might exist.
- Radiation monitoring equipment was generally being maintained and calibrated acceptably.
- The Radiation Protection and ALARA Programs satisfied regulatory requirements.

Environmental Monitoring Program

- Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and TS limits.

Procedures

- Facility procedures were acceptably reviewed and approved. The licensee satisfied TS and administrative procedure requirements for revising facility procedures.

Transportation of Radioactive Materials

- A Non-Cited Violation was noted for failure to correctly complete the required shipping papers for four shipments of radioactive material.

Safeguards and Security

- The NRC-approved security program at the facility was acceptably carried out.

Material Control and Accountability

- Special Nuclear Materials were acceptably controlled and inventoried.

REPORT DETAILS

Summary of Plant Status

The licensee's two hundred and fifty-kilowatt (250 kW) TRIGA Mark-I research reactor continues to be operated in support of undergraduate instruction and laboratory experiments, reactor operator training, and various types of research. During the inspection, the reactor was operated for a laboratory experiment.

1. Organizational Structure and Functions (69001)

a. Inspection Scope

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of the TS were being met:

- organization and staffing
- qualifications
- management responsibilities
- administrative controls

b. Observations and Findings

The organizational structure and staffing had not changed since the last NRC inspection of this type in December 1997 (Inspection Report No. 50-288/97-202). The organizational structure and staffing at the facility and as reported in the Annual Report was as required by the TS. Qualifications of the staff met TS requirements. Review of records verified that management responsibilities were administered as required by the TS and applicable procedures.

c. Conclusions

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

2. Review and Audit Functions (69001)

a. Inspection Scope

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

- safety review and audit records
- Reactor Operations Committee (ROC) meeting minutes
- Radiation Safety Committee (RSC) meeting minutes
- Reed Reactor Facility (RRF) Administrative Procedures
- TS duties specified for the ROC and the RSC including the committees' review and audit functions

b. Observations and Findings

Records showed that the safety reviews were conducted at the TS required frequency. Topics of these reviews were also consistent with TS requirements to provide guidance, direction, and oversight, and to ensure acceptable use of the reactor.

The audit records showed that audits had been completed in those areas outlined in the TS and at the required frequency.

The inspector noted that the safety reviews and audits and the associated findings were acceptably detailed and that the licensee responded and took corrective actions as needed.

The safety review and audit personnel qualifications satisfied TS requirements and licensee administrative controls. Further, the number of personnel involved in the safety reviews and audits also satisfied TS and licensee procedural requirements.

c. Conclusions

The review and audit program satisfied TS requirements.

3. Radiation Protection Program (69001)

a. Inspection Scope

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

- the Radiation Protection Program
- radiological signs and posting
- routine surveys and monitoring
- dosimetry records
- maintenance and calibration of radiation monitoring instruments
- the As Low As Reasonably Achievable (ALARA) Program

The inspector also observed the use of dosimetry and radiation monitoring equipment during tours of the facility. Licensee personnel were interviewed as well.

b. Observations and Findings

The radiation protection program had not changed since the last inspection. The licensee reviewed the radiation protection program at least annually in accordance with 10 CFR 20.1101(c). The review included all areas and no weaknesses were reported. The licensee showed that the air emissions or radioactive material to the environment met the 10 millirem constraint specified in 10 CFR 20.1101(d).

NRC Form 3, “Notice to Employees,” was posted in accordance with 10 CFR 19.11. Caution signs, postings, and controls to radiation areas were as required in 10 CFR

Part 20, Subpart J. Licensee personnel observed the indicated precautions for access the radiation areas.

Use of dosimeters and exit frisking practices were in accordance with radiation protection requirements. The licensee used a National Voluntary Laboratory Accreditation Program (NVLAP)-accredited vendor to process dosimetry. Radiological exposure records showed that occupational doses and doses to the public were within 10 CFR Part 20 limitations. Training records showed that personnel were acceptably trained in radiation protection practices.

ALARA reviews were acceptably performed as required.

The licensee did not require a respiratory protection program or planned special exposure program.

Radiation monitoring and survey activities were generally completed as required. However, two examples of lack of adequate oversight in this area were noted. RRF Standard Operating Procedure (SOP) 23, entitled "Health Physics Wipe Tests," requires in Section 23.2 that wipe tests shall be performed at least every two weeks, not to exceed 18 days. During the period of December 1998 and January 1999 a wipe test was performed on December 16 and not again until January 4, a period exceeding 18 days by one day. During July 1999 a wipe test was performed on July 2 and not again until July 30, a period exceeding 18 days by ten days. The licensee indicated that the occurrence in December-January was the result of staff taking vacations during the holiday season and the fact that the reactor was not operated during that period and no one was available to perform the survey. The instance noted in July was apparently the result of reviewing the results of special wipe test performed July 15 and mistaking that for the routine/required survey. This failure constitutes a violation of minor significance and is being treated as a Non-Cited Violation (NCV), consistent with Section IV of the NRC Enforcement Policy (NCV 50-288/99-202-01).

The inspector also reviewed two self-reported violations of TS requirements. By letter dated July 20, 1998, the licensee indicated that a weekly checklist, required by SOP 70, Weekly Checklist, was not completed in the time interval allowed during July 1998. By letter dated September 23, 1999, the licensee again indicated that a weekly checklist required by SOP 70 had not been completed in the time interval allowed during August of 1999. TS Section F.2 requires that the primary water be sampled weekly for conductivity and Section G.3 requires that the alarm setpoints of the Radiation Area Monitor and the Continuous Air Monitor (CAM) be checked weekly. These two TS requirements on the checklist were therefore not completed in a timely manner. The licensee indicated that the reactor was not operating during the time period in July 1998 and that no adverse conditions appeared as a result. The instance in August 1999 was apparently a problem with turnover of responsibilities. There was a change of reactor supervisors at the beginning of the new school year in 1999. The RRF director had been ensuring that the checklists were performed on time during that summer but had intended to turn that responsibility over to the new student reactor supervisor when the school year began. However, the director apparently did not explicitly state that the new supervisor was responsible for that function. This licensee-identified and corrected

violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy (NCV 50-288/99-202-02).

Equipment used for facility monitoring activities were generally maintained, calibrated, and used acceptably. A review of the calibration records for the Radiation Area Monitors (RAMs) used at the facility indicated that some of the records were not available. It was noted that the TS requires only one RAM, located in the reactor room, to be operable during reactor operation. The records for that RAM were being maintained as required. The licensee indicated that, because the other RAMs were not TS-required equipment, close scrutiny and control of the records for those RAMs had not been maintained in the past. That was recognized as a potential problem and the licensee had started to keep more detailed records of the calibration of all the RAMs in use at the facility. This will be followed as an inspector follow-up item by the inspector (IFI 50-288/99-202-03).

Also related to calibration of equipment, the inspector noted that survey meters used at the RRF were generally maintained and calibrated as required. RRF SOP 25, Portable Radiation Monitor Calibration, requires in Section 25.2 that portable radiation monitors shall be calibrated semi-annually with the interval between calibrations not to exceed 7½ months. However, two survey meters had been in service past their calibration due date and past the 7½ months time frame allowed by procedure. In one instance, this situation was recognized by the licensee and a memorandum had been written to the ROC concerning the finding. However, the inspector noted that another meter had been available for use in the reactor room beyond the calibration due date but this had not been detected by the licensee. Survey meter, Ludlum 19, Serial Number 131287, had been calibrated March 3, 1999, and not again until October 20, 1999. It was noted that, although the meter was available for use, it had not been used for any reactor-related documented survey. This failure constitutes a violation of minor significance and is being treated as another example of a Non-Cited Violation, consistent with Section IV of the NRC Enforcement Policy (NCV 50-288/99-202-04).

c. Conclusions

Postings met regulatory requirements. Personnel dosimetry was being worn as required and doses were well within the licensee's procedural action levels and the NRC's regulatory limits. Surveys were generally completed and documented acceptably to permit evaluation of the radiation hazards that might exist. Radiation monitoring equipment was generally being acceptably maintained and calibrated. The Radiation Protection Program and the ALARA Program satisfied regulatory requirements.

4. Environmental Monitoring Program (69001)

a. Inspection Scope

The inspector reviewed selected aspects of the following:

- the environmental monitoring program
- annual reports
- release records
- counting and analysis records

b. Observation and Findings

Environmental samples were collected, prepared, and analyzed consistently with the TS requirements. Laboratory equipment was maintained and calibrated acceptably. Data indicated that there was no measurable dose above background. This was acceptably documented in the Annual Reports. Observation of the facility found no new potential release paths.

The program for the monitoring of radioactive liquid, gases, and solids was consistent with applicable regulatory requirements. Radioactive material was monitored and released when below acceptable limits or was acceptably transferred to the broad-scope license for disposition. The principles of ALARA were acceptably implemented to minimize radioactive releases. Monitoring equipment was acceptably maintained and calibrated. Records were current and acceptably maintained.

c. Conclusion

Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and TS limits.

5. Procedures (69001)

a. Inspection Scope

The inspector reviewed selected aspects of the following:

- administrative controls
- selected safety procedures
- procedural implementation

b. Observations and Findings

Administrative controls of changes and temporary changes to procedures and associated review and approval processes were as required. Training of personnel on procedures and changes was acceptable. Personnel conducted activities in accordance with applicable procedures. Records showed that procedures for potential malfunctions

(e.g., radioactive releases and contaminations, and reactor equipment problems) were implemented as required.

c. Conclusions

Facility procedures were acceptably reviewed and approved. The licensee satisfied TS and administrative procedure requirements for revising facility procedures.

6. Transportation (86740)

a. Inspection Scope

The inspector interviewed licensee personnel and reviewed selected aspects of the following:

- radioactive materials shipping procedures
- radioactive materials transportation and transfer records

b. Observations and Findings

10 CFR 71.5(a) requires that a licensee, who delivers licensed material to a carrier for transport, comply with the applicable requirements of the regulations appropriate to the mode of transport of the Department of Transportation (DOT) in 49 CFR Parts 171-189.

49 CFR 171.2(a) prohibits any person from offering hazardous material for transportation unless, among other requirements, the hazardous material is properly classified, described, packaged, marked, labeled, and in condition for shipment required or authorized under the Hazardous Material Regulations (49 CFR 171-177).

Through records reviews and discussions with licensee personnel, the inspector determined that various shipments of licensed material had been made since the last inspection. All shipment records had been completed and were being maintained as required. The records showed that, in general, the material had been properly described and classified, that the correct labeling had been provided, and that the contamination and radiation levels of the packages shipped had been recorded acceptably. However, some discrepancies were noted on the shipping papers.

With respect to Shipment Number (No.) 98-1, the licensee had determined that the dose rate at contact with container was 2.3 millirem per hour (mr/hr) and the dose rate at one meter from the package was 0.3 mr/hr. With a contact dose rate of 2.3 mr/hr, the container was required to have a “Radioactive Yellow II” label attached. However, the licensee had shipped the package using a “Radioactive White I” label. The licensee had realized this problem during an internal review of the paperwork and had submitted a letter to the NRC dated January 25, 1999, identifying this as a shipping violation. The reason for the problem was determined by the licensee to be operator error because RRF SOP 54, Shipping Radioactive Materials, indicates that a “Radioactive Yellow II” label is required for the shipment.

A review of Shipments No. 98-1 & -2 and 99-1 & 3 indicated that the calculated activity of the material shipped by the licensee was incorrect according to SOP 54. For Shipments No. 98-1 & 2 the activity in the respective packages had been overestimated by approximately a factor of three (1000x). This was apparently due to the use of an inaccurate formula to calculate the activity present. For Shipment No. 99-1, although SOP 54 had been revised, the calculated activity of the material shipped was again overestimated and was stated to be approximately four times larger than it should have been. This apparently occurred because the digits in the conversion factor used in the formula were transposed. The activity in Shipment No. 99-3 had been underestimated and was reported to be only one-seventh of the amount actually shipped. This was operator error because the decimal point was apparently not written in the correct position when figuring the activity amount.

This failure constitutes a violation of minor significance and is being treated as a Non-Cited Violation, consistent with Section IV of the NRC Enforcement Policy (NCV 50-288/99-202-05).

c. Conclusions

One Non-Cited Violation was noted for failure to correctly complete the information required to be included on the shipping papers for four shipments of radioactive material.

7. Physical Security (81401, 81402, 81431)

a. Inspection Scope

To verify compliance with the licensee's NRC-approved Physical Security Plan (PSP) and to assure that changes, if any, to the plan had not reduced its overall effectiveness, the inspector reviewed:

- logs, records, and reports
- the security organization
- key control
- intruder detection and physical barriers
- access controls
- procedures

b. Observations and Findings

The inspector determined that the licensee's physical protection program conformed to NRC requirements and the licensee's PSP and implementing procedures.

c. Conclusion

The NRC-approved security program at the facility was acceptably carried out.

8. Material Control and Accounting (85102)

a. Inspection Scope

To verify compliance with 10 CFR Part 70, the inspector reviewed:

- storage areas
- procedures for tracking the quantity, identity, and location of Special Nuclear Material (SNM)
- assignment of responsibilities
- annual inventory results
- associated records and reports

b. Observations and Findings

The inventory of special nuclear material (SNM) was verified. The material control and accountability program tracked locations and content of fuel and fission detectors under the research reactor license. The possession and use of SNM was limited to the locations and purposes authorized under the license. The material control and accountability forms (DOE/NRC Forms 741 and 742) were prepared and transmitted as required.

c. Conclusion

Special Nuclear Materials were acceptably controlled and inventoried.

9. Follow-up on Previously Identified Items (92701, 92702)

a. Inspection Scope

The inspector reviewed the licensee's actions taken in response to previously identified Inspector Follow-up Items and Violations.

b. Observation and Findings

(Closed) Inspector Follow-up Item (IFI) 50-288/97-201-01 - Follow-up on the licensee's resolution of the suspected relationship between the temperature of the pool water and the fuel element leak. During a previous inspection in 1997 the licensee was trying to determine the source of a suspected fuel leak and the possible relationship between reactor operations and the leak. The licensee did determine which fuel element was leaking and that the leak was apparently tied to reactor operation and pool water temperature. This is detailed in the licensee's Annual Report for September 1997 through August 1998. This item is considered closed.

(Closed) IFI 50-288/97-201-02 - Follow-up on the results of switching out various fuel elements to resolve the fuel element leak problem. As noted above, during a previous inspection in 1997 the licensee was trying to determine the source of a suspected fuel leak. The licensee did determine which fuel element was leaking and took corrective

action to replace the fuel and put an end to the problem. This is detailed in the licensee's Annual Report for September 1997 through August 1998. This item is considered closed.

(Closed) VIO 50-288/97-202-05 - Failure to fill out radioactive material shipping papers according to the 49 CFR Parts 171-189 as required by 10 CFR 71.5(a). Various deficiencies were noted with respect to the shipping papers used by the licensee to ship radioactive material during an inspection in December 1997. During the current inspection the inspector verified that the actions specified by the licensee as corrective actions to the problem had been taken. This item is considered closed.

c. Conclusion

These items were acceptably closed.

10. Exit Interview

The inspection scope and results were summarized on December 15, 1999, 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. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspector.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

S. Frantz, Director, Reactor Facility
R. Gaffney, Assistant Director, Reactor Facility
A. George, Operations Supervisor
E. Weis, Training Supervisor
C. Savage, Radiation Safety Officer
M. Parrott, Reactor Health Physicist

INSPECTION PROCEDURES USED

IP 69001:	Class II Non-Power Reactors
IP 81401:	Plans, Procedures, and Reviews
IP 81402:	Reports of Safeguards Events
IP 81431:	Fixed Site Physical Protection of Special Nuclear Material of Low Strategic Significance
IP 85102:	Material Control and Accounting - Reactors
IP 86740:	Inspection of Transportation Activities

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-288/99-202-01	NCV	Two examples of failure to perform wipe tests every two weeks as required by the TS.
50-288/99-202-02	NCV	Two examples of failure to complete the weekly checklist within the time frame prescribed in the TS.
50-288/99-202-03	IFI	Detailed records on calibration of RAMs.
50-288/99-202-04	NCV	Failure to calibrate a survey meter within the time constraints allowed by the TS.
50-288/99-202-05	NCV	Failure to correctly fill out radioactive material shipping papers according to the 49 CFR Parts 171-189 as required by 10 CFR 71.5(a).

Closed

50-288/97-201-01	IFI	Follow-up on the licensee's resolution of the suspected relationship between the temperature of the pool water and the fuel element leak.
50-288/97-201-02	IFI	Follow-up on the results of switching out various fuel elements to resolve the fuel element leak problem.
50-288/97-202-05	VIO	Failure to fill out radioactive material shipping papers according to the 49 CFR Parts 171-189 as required by 10 CFR 71.5(a).

LIST OF ACRONYMS USED

ALARA	As low as reasonably achievable
CAM	Continuous Air Monitor
CFR	Code of Federal Regulations
IFI	Inspector Follow-up Item
IP	Inspection Procedure
kW	kilowatt
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
PSP	Physical Security Plan
RAM	Radiation Area Monitor
ROC	Reactor Operations Committee
RRF	Reed Reactor Facility
RSC	Radiation Safety Committee
SOP	Standard Operating Procedure
SNM	Special Nuclear Material
TI	Transportation Index
TS	Technical Specification
VIO	Violation