

December 13, 2011

Dr. Melinda Krahenbuhl, Director  
Reed Reactor Facility  
Reed College  
3203 S.E. Woodstock Boulevard  
Portland, OR 97202-8199

SUBJECT: REED COLLEGE – NRC ROUTINE INSPECTION REPORT NO.  
50-288/2011-203

Dear Dr. Krahenbuhl:

On November 28 – 30, 2011, the U.S. Nuclear Regulatory Commission (NRC, the Commission) conducted an inspection at your Reed Research Reactor Facility (Inspection Report No. 50-288/2011-203). The enclosed report documents the inspection results which were discussed with Dr. Patrick McDougal, Interim Dean of the Faculty, Kathleen Fisher, Radiation Safety Officer and Campus Environmental Director, Reuven Lazarus, Associate Reactor Director, and you on November 30, 2011.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspector reviewed selected procedures and records, observed various activities, and interviewed personnel. Based on the results of this inspection, no findings of significance were identified. No response to this letter is required.

In accordance with Title 10 of the *Code of Federal Regulations* Section 2.390, "Public inspections, exemptions, and requests for withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (Agencywide Documents Access and Management System (ADAMS)). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, please contact Craig Bassett at 301-466-4495 or by electronic mail at [Craig.Bassett@nrc.gov](mailto:Craig.Bassett@nrc.gov).

Sincerely,

**/RA/**

Johnny H. Eads, Jr., Chief  
Research and Test Reactors Oversight Branch  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

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

Enclosure: NRC Inspection Report 50-288/2011-203  
cc w/encl.: Please see next page

Reed College Docket No. 50-288

cc:

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1220 Southwest 5<sup>th</sup> Avenue  
Portland, OR 97204

Reed College  
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3203 S.E. Woodstock Boulevard  
Portland, OR 97202-8199

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ATTN: David Stewart-Smith, Director  
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Test, Research, and Training  
Reactor Newsletter  
University of Florida  
202 Nuclear Sciences Center  
Gainesville, FL 32611

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Johnny H. Eads, Jr., Chief  
Research and Test Reactors Oversight Branch  
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**\*concurrence via e-mail**

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DATE	12/5/2011	12/13/2011	12/13/2011

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**U.S. NUCLEAR REGULATORY COMMISSION**  
**OFFICE OF NUCLEAR REACTOR REGULATION**

Docket No: 50-288

License No: R-112

Report No: 50-288/2011-203

Licensee: Reed College

Facility: Reed Reactor Facility

Location: 3203 S.E. Woodstock Boulevard  
Portland, OR

Dates: November 28 – 30, 2011

Inspector: Craig Bassett

Accompanied by: Ossy Font, Inspector Trainee

Approved by: Johnny H. Eads, Jr., Chief  
Research and Test Reactors Oversight Branch  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

## EXECUTIVE SUMMARY

Reed College  
TRIGA Mark-I Research Reactor  
Report No: 50-288/2011-203

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the Reed College (the licensee's) Class II 250 kilowatt (kW) research and test reactor safety program including: 1) organization and staffing, 2) review and audit and design change functions, 3) radiation protection; 4) effluent and environmental monitoring, 5) procedures, and 6) transportation of radioactive material since the last U.S. Nuclear Regulatory Commission (NRC) inspection of these areas. The licensee's program was acceptably directed toward the protection of public health and safety and in compliance with NRC requirements. No violations or deviations were identified.

### Organizational Structure and Staffing

- Facility organization and staffing were in compliance with the requirements specified in Section I of the Technical Specifications.

### Review and Audit and Design Change Functions

- Reviews and audits were being conducted by the Reactor Operations Committee and the Radiation Safety Committee in compliance with the requirements specified in the Technical Specifications.
- Proposed changes at the facility had been analyzed using Title 10 of the *Code of Federal Regulations* Section 50.59 safety evaluation process and had been reviewed and approved by the Reactor Operations Committee or the Radiation Safety Committee as required.

### Radiation Protection Program

- Signs, notices and 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 completed and documented acceptably to permit evaluation of the radiation hazards present.
- Radiation survey and monitoring equipment was being maintained and calibrated acceptably.
- Radiation protection training was acceptable and was being conducted as required.
- The Radiation Protection and the As Low As Reasonably Achievable Programs satisfied regulatory requirements.

Environmental Monitoring Program

- Effluent monitoring satisfied licensee procedural and regulatory requirements and releases were calculated to be within the specified regulatory and Technical Specification limits.

Procedures

- Facility procedures were acceptably reviewed, approved, and implemented.

Transportation of Radioactive Materials

- The program for shipping radioactive material satisfied regulatory requirements.
- Licensee personnel needed to receive the necessary training to become qualified to ship radioactive material.

## REPORT DETAILS

### **Summary of Plant Status**

The Reed College (the licensee) Class II two hundred and fifty-kilowatt (250 kW) TRIGA Mark-I research and test reactor continued to be operated in support of undergraduate instruction, laboratory experiments, reactor operator training, and various types of research. During the inspection, the reactor was operated as needed for laboratory experiments and training.

### **1. Organizational Structure and Staffing**

#### **a. Inspection Scope (Inspection Procedure [IP] 69001)**

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of the Technical Specification (TS), Section I, Amendment No. 7, dated March 11, 2003, were being met:

- Current facility organization and staffing
- Management responsibilities as outlined in the applicable procedures
- Reed Research Reactor (RRR) Administrative Procedures, latest revision (Rev.) dated November 2009
- Reed Research Reactor Annual Report for the period from September 1, 2009 through June 30, 2010, submitted August 23, 2010
- Reed Research Reactor Annual Report for the period from July 1, 2010 through June 30, 2011, submitted August 1, 2011

#### **b. Observations and Findings**

The organizational structure had not changed since the last NRC inspection which occurred in December 2010 (Inspection Report No. 50-288/2010-201). However, the inspector did note that the former Reactor Director, who had been at the facility for 17 years, had retired and a new person had been selected to assume the position and the associated responsibilities. It was noted that the new Reactor Director had previously held that position at the Dow Chemical RTR facility and also at the University of Utah research reactor.

During the past several years the radiation protection duties at the facility were completed by various individuals who were Reed College part-time employees. They filled the position at the RRR facility designated as the Reactor Health Physicist (RHP). Recently, after discussions among Reed College management and staff, it was decided that the RHP position was not needed and that the College would be better served by having staff members and/or students complete the radiation protection duties at the RRR facility. Because the facility TS still required that there be an RHP on various committees, the Reactor Director was assigned as the interim RHP. Reed College management also decided that a Certified Health Physicist (CHP) would be retained once each year to conduct an audit of the campus radiation protection program. It was noted that the campus Environmental Director continued to fill both that position and the position of Radiation Safety Officer for the campus as well. The licensee was informed that the elimination of the facility RHP position, the completion of the RHP duties by staff members and/or students, and the completion of an annual

audit of the radiation protection program by someone from outside the facility, such as a CHP, would be considered by the NRC as an Inspector Follow-up Item (IFI) and would be reviewed during a subsequent inspection (IFI 50-288/2011-203-01).

The organizational structure and staffing at the facility were as required by the TS. Review of records verified that management and staff responsibilities were carried out as required by the TS and applicable procedures.

c. Conclusion

The licensee's organization and staffing were in compliance with the requirements specified in the TS, Section I.

**2. Design Change and Review and Audit Functions**

a. Inspection Scope (IP 69001)

In order to ensure that the audits and reviews stipulated in the requirements of TS Sections I.2 and I.3 were being completed and to verify that any modifications to the facility were consistent with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.59 and were reviewed as stipulated in TS Section I.4 and RRR Administrative Procedures, Section 2.3.1, the inspector reviewed the following:

- Recent changes reviewed using the licensee's RRR 10 CFR 50.59 Screen Forms
- TS responsibilities specified for the Reactor Operations Committee (ROC) and the Radiation Safety Committee (RSC)
- Safety review and audit records for 2009-2010 and 2010-2011 as documented on RRR Standard Audit Forms
- Reactor Review Committee (RRC) meeting minutes from November 2009 to the present (this was a joint committee composed of both the ROC and the RSC)
- RRR Administrative Procedures, latest Rev. dated November 2009
- RRR Standard Operating Procedure (SOP) 62, "Changes, Tests, and Experiments," latest Rev. dated May 27, 2010
- RRR SOP 62, Appendix A, "10 CFR 50.59 Screen Form," latest Rev. dated May 27, 2010
- RRR SOP 62, Appendix B, "10 CFR 50.59 Evaluation Form," latest Rev. dated May 27, 2010
- RRR SOP 62, Appendix C, "10 CFR 50.59 Screen Log," latest Rev. dated May 27, 2010
- RRR SOP 69, "Corrective Action Report," latest Rev. dated August 5, 2010
- RRR SOP 69, Appendix A, "Corrective Action Report Form," latest Rev. dated August 5, 2010
- RRR SOP 69, Appendix B, "Corrective Action Report Log," latest Rev. dated June 9, 2009

- Reed Research Reactor Annual Report for the period from September 1, 2009 through June 30, 2010, submitted August 23, 2010
- Reed Research Reactor Annual Report for the period from July 1, 2010 through June 30, 2011, submitted August 1, 2011

b. Observations and Findings

1) Review and Audit Functions

The inspector reviewed the ROC and RSC meeting minutes from November 2009 to the present. These meeting minutes showed that the committees met as required by the TS with a quorum being present. Recently, the committees had typically met jointly. Records showed that the safety reviews and audits conducted by the committees were completed at the TS required frequency. Topics of these reviews were also consistent with TS requirements and provided guidance, direction, and oversight of the reactor.

The inspector noted that the safety reviews and audits that had been completed, as well as the associated findings, were acceptably detailed and that the licensee responded and took corrective actions as needed. The inspector also reviewed the Corrective Action Log. Various problems had been discussed and reviewed and a solution to each problem had been determined and subsequently implemented.

2) Design Change

Through review of the ROC and RSC meeting minutes, and through interviews with licensee personnel, the inspector determined that no major changes had been initiated and/or completed at the facility since the last NRC inspection. Three 10 CFR 50.59 screens were completed in 2010 and three have been completed to date in 2011. It was also noted that, as a result of the screens being conducted, no evaluations were required to be completed in 2010 and none were required so far in 2011. Because the licensee determined that the changes were minor in nature, they had been reviewed and approved by the Facility Director but were not required to be approved by the ROC/RSC.

c. Conclusion

Review, audit, and oversight functions required by TS Section 6.2 were acceptably completed by the ROC and the RSC. Proposed changes at the facility had been analyzed using the 10 CFR 50.59 safety review process as required.

**3. Radiation Protection Program**

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with 10 CFR Parts 19 and 20 and TS Section G requirements:

- Radiological signs and posting
- Radiation Work Permit Notebook
- RRC Audits for 2009-2010 and 2010-2011
- Routine surveys and monitoring records for 2010 and 2011
- Personnel dosimetry records for 2009, 2010, and to date in 2011
- Daily Reactor Startup and Shutdown Checklists for the past 12 months
- Records of maintenance and calibration of radiation survey and monitoring instruments
- Reed Reactor Facility Radiation Protection Plan, latest Rev. dated August 2006
- Wipe Test Log Book containing "A-Week Routine Wipes" and "B-Week Routine Wipes" forms for 2010 and 2011
- As Low As Reasonably Achievable (ALARA) Program as described in the Reed Reactor Facility Radiation Protection Plan and in the Radioisotope and Radiation Safety Committee ALARA Policy Statement dated July 17, 1990
- RRR Administrative Procedures, latest Rev. dated November 2009
- RRR SOP 20, "Startup," latest Rev. dated May 4, 2011
- RRR SOP 20, Appendix A, "Startup Checklist Form," latest Rev. dated May 4, 2011
- RRR SOP 22, "Shutdown," latest Rev. dated May 4, 2011
- RRR SOP 22, Appendix A, "Shutdown Checklist Form," latest Rev. dated May 4, 2011
- RRR SOP 23, "Weekly Checklist," latest Rev. dated January 11, 2011
- RRR SOP 23, "Weekly Checklist Form," latest Rev. dated April 15, 2011
- RRR SOP 40, "Air Monitors," latest Rev. dated January 11, 2011
- RRR SOP 40, Appendix B, "CAM Calibration Form," latest Rev. dated March 20, 2009
- RRR SOP 42, "Exit Monitors," latest Rev. dated January 11, 2011
- RRR SOP 42, Appendix A, "Hand and Shoe Monitor Calibration Form," latest Rev. dated November 11, 2009
- RRR SOP 42, Appendix B, "Walkthrough Monitor Calibration Form," latest Rev. dated November 11, 2009
- RRR SOP 43, "Portable Monitors," latest Rev. dated October 6, 2011
- RRR SOP 43, Appendix A, "Portable Meter Calibration Form," latest Rev. dated December 21, 2009
- RRR SOP 43, Appendix B, "Meter Calibration Qualification Form," latest Rev. dated September 15, 2008
- RRR SOP 44, "Personal Dosimetry," latest Rev. dated October 6, 2011
- RRR SOP 44, Appendix A, "EPD Calibration Form," latest Rev. dated January 11, 2011
- RRR SOP 50, "Health Physics," latest Rev. dated October 6, 2011
- RRR SOP 50, Appendix A, "Personnel Contamination Form," latest Rev. dated August 24, 2010
- RRR SOP 51, "Wipe Tests," latest Rev. dated September 6, 2011
- RRR SOP 51, Appendix A, "A-Week Routine Wipe Form," latest Rev. dated September 15, 2009
- RRR SOP 51, Appendix B, "B-Week Routine Wipe Form," latest Rev. dated September 15, 2009

- RRR SOP 51, Appendix C, "Source Wipe Test Form," latest Rev. dated May 17, 2010
- RRR SOP 51, Appendix D, "Special Wipe Test Form," latest Rev. dated September 15, 2008
- RRR SOP 51, Appendix E, "Wipe Test Calibration Form," latest Rev. dated May 15, 2009
- RRR SOP 51, Appendix F, "Wipe Test QC Log," latest Rev. dated June 5, 2009
- RRR SOP 53, "Radiation Work Permits," latest Rev. dated January 11, 2011
- RRR SOP 53, Appendix A, "Radiation Work Permit," latest Rev. dated September 15, 2008
- RRR SOP 53, Appendix B, "Radiation Work Permit Log," latest Rev. dated September 15, 2008
- RRR SOP 54, "Waste Handling and Disposal," latest Rev. dated January 11, 2011
- "Radioactive Materials Handling Study Guide," Rev. dated April 2009
- "Reed College Radioactive Materials Policy and Procedures Manual," Rev. dated October 2011
- Reed Research Reactor Annual Report for the period from September 1, 2009 through June 30, 2010, submitted August 23, 2010
- Reed Research Reactor Annual Report for the period from July 1, 2010 through June 30, 2011, submitted August 1, 2011

The inspector also observed the use of dosimetry and radiation monitoring equipment during tours of the facility.

b. Observations and Findings

(1) Postings and Notices

Copies of current notices to workers were posted inside the Reactor Control Room at RRF. Radiological signs were typically posted at the entrances to controlled areas as well. The posted copies of NRC Form-3, "Notice to Employees," observed at the facility were the latest issue, as required by 10 CFR Part 19.11, and were posted in the Reactor Bay, and in the Laboratory Room.

Caution signs, postings, and controls for radiation areas were as required in 10 CFR Part 20, Subpart J. The inspector verified that licensee personnel observed the precautions for access to radiation areas.

(2) Dosimetry

The inspector determined that the licensee used optically stimulated luminescent (OSL) dosimeters for whole body monitoring of beta and gamma radiation exposure. The licensee also used thermoluminescent dosimeter (TLD) finger rings for monitoring beta and gamma radiation exposure of the extremities. The dosimetry was supplied and processed by a National Voluntary Laboratory Accreditation Program (NVLAP)

accredited vendor (Landauer). An examination of the OSL and TLD results indicating radiological exposures at the facility for the past two years showed that the highest occupational doses, as well as doses to the public, were well within 10 CFR Part 20 limitations. The records showed that the highest annual whole body exposure received by a single individual for 2009 was 9 millirem deep dose equivalent (DDE). The highest annual extremity exposure for 2009 was 12 millirem shallow dose equivalent (SDE). The highest annual whole body exposure received by a single person for 2010 was 3 millirem DDE and the highest annual extremity exposure for that year was 40 millirem SDE. Through September 2011, the highest individual whole body exposure that had been received was 21 millirem DDE and the highest extremity exposure through September was 700 millirem SDE. The relatively high whole body and extremity doses received thus far in 2011 were received during the course of an experiment when the sample and sample holder were removed after a long irradiation and the aluminum sample holder was more radioactive than anticipated. The SOP has been revised as a result (discussed further in Paragraph (6) below).

Through direct observation the inspector determined that dosimetry was acceptably used by facility personnel and exit frisking practices were in accordance with facility radiation protection requirements.

(3) Surveys

Selected daily and weekly radiation and/or contamination surveys were reviewed by the inspector. The surveys had been completed by staff members as required. Any contamination detected in concentrations above the established action level was noted and the area was decontaminated. Results of the surveys were documented so that licensee personnel would be knowledgeable of the radiological conditions that existed in the various areas of the facility.

(4) Radiation Monitoring Equipment

Examination of selected radiation monitoring equipment indicated that the instruments had an acceptable up-to-date calibration sticker attached. The instrument calibration records indicated that the calibration of portable survey meters was typically completed by reactor staff personnel and/or the Reactor Health Physicist. Calibration frequency met procedural requirements and records were maintained as required. Fixed location radiation area monitors (RAMs) and stack monitors were also being calibrated as required. These RAMs and stack monitors were also typically calibrated by reactor staff personnel and/or the RHP.

The inspector compared selected calibration records with reactor operations logs and startup and shutdown checklists for the past 18 months. The daily startup checklists typically contained a listing of portable monitors that were available during reactor operations. The

inspector determined that the instruments that were available and ready for use in the Reactor Bay had been calibrated as required.

(5) Radiation Protection and ALARA Programs

The licensee's Radiation Protection and ALARA programs were established and described in the Reed Reactor Facility Radiation Protection Plan, latest Rev. dated August 2006, and through associated SOPs that had been properly reviewed and approved. The programs contained instructions concerning organization, training, monitoring, personnel responsibilities, audits, record keeping, and reports. The ALARA program provided guidance for keeping doses as low as reasonably achievable and was consistent with the guidance in 10 CFR Part 20. The programs, as established, appeared to be acceptable.

The inspector determined that the licensee had completed an annual review of the radiation protection program as required by 10 CFR 20.1101(c).

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

(6) Radiation Work Permits (RWPs)

The inspector reviewed the RWPs that had been written and used during the past several years as stipulated in RRR SOP 53. It was noted that none had been used in 2010 but three had been initiated to date in 2011. The controls specified in the RWPs were generally acceptable and applicable for the types of work being done. The RWPs had been initiated, reviewed, and approved as indicated on the forms.

In reviewing the RWPs, it was noted that one had been used in connection with work involving the removal of a sample and sample holder from the Central Thimble (as noted above in Paragraph (2) above). After the RWP was used and the personnel dosimetry was processed for those involved in the work, the licensee discovered that one individual had received a dose to the extremities of 640 mr. Upon investigation the licensee determined that the sample and sample holder had been irradiated in the Central Thimble for an extended period and the person who removed the sample and holder probably did not take all the proper precautions during the work evolution. The inspector indicated that non-routine jobs are often the ones that can lead to problems because the work evolution is not familiar and individuals may not complete the operation properly without extensive training and practice. This can be especially true with those jobs involving highly irradiated samples can. Through discussions it was agreed that such jobs should be reviewed not only by the Facility Director, but also by the Radiation Safety Committee. This would allow others to consider the work and through their collective

expertise and experience, possibly determine better or more efficient ways to complete the job.

(7) Radiation Protection Training

The inspector reviewed the radiation worker (or rad worker) training given to RRF staff members, to student operators, to those who were not members of the reactor staff but who were authorized to handle radioactive material (Principal Users), and to students who worked with/for the Principal Users (Authorized Users). The licensee indicated that rad worker training for staff members was given upon initial entry into the RRF program and then reiterated during Operator Requalification training required every three years. Training records showed that personnel were acceptably trained in radiation protection practices. The training program was acceptable.

(8) Facility Tours and Inspector Observations

The inspector toured the Control Room, the Reactor Bay, the Mechanical Room, the Laboratory Room, and the Counting Room at the facility. Control of radioactive material was acceptable, as was control of access to radiation areas.

During the inspection the inspector also visited the calibration range at the facility and discussed the calibration of survey meters with the Acting RHP. The inspector concluded that the calibrations of instruments at the facility were completed using the appropriate techniques and according to procedure. Proper precautions were in place to maintain doses ALARA.

c. Conclusion

The inspector determined that the Radiation Protection and ALARA Programs, as implemented by the licensee, satisfied regulatory requirements because:

- 1) postings met regulatory requirements;
- 2) personnel dosimetry was being worn as required and recorded doses were well within the NRC's regulatory limits;
- 3) surveys and associated checks were completed and documented acceptably to permit evaluation of the radiation hazards present;
- 4) radiation survey and monitoring equipment was being maintained and calibrated as required; and
- 5) the radiation protection training program was acceptable.

**4. Environmental Monitoring Program**

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with the requirements of 10 CFR Part 20 and TS Section G:

- Health Physics Logbook
- RRC Audits for 2009-2010 and 2010-2011
- Routine surveys and monitoring records for 2010 and 2011

- Release calculation records maintained by the RRF Director
- Counting and analysis records documented in Health Physics Logbook 3B
- RRR Administrative Procedures, latest Rev. dated November 2009
- RRR SOP 25, "Semiannual Checklist," latest Rev. dated January 11, 2011
- RRR SOP 25, Appendix A, "Semiannual Checklist Form," latest Rev. dated January 11, 2011
- RRR SOP 25, Appendix B, "Console Checklist Form," latest Rev. dated January 11, 2011
- RRR SOP 26, "Annual Checklist," latest Rev. dated January 11, 2011
- RRR SOP 26, Appendix A, "Annual Checklist Form," latest Rev. dated January 11, 2011
- RRR SOP 40, "Air Monitors," latest Rev. dated January 11, 2011
- RRR SOP 40, Appendix B, "CAM Calibration Form," latest Rev. dated March 20, 2009
- RRR SOP 40, Appendix C, "APM Calibration Form," latest Rev. dated March 20, 2009
- RRR SOP 40, Appendix D, "GSM Calibration Form," latest Rev. dated March 20, 2009
- RRR SOP 41, "Area Monitors," latest Rev. dated October 6, 2011
- RRR SOP 41, Appendix A, "RAM Calibration Form," latest Rev. dated January 11, 2011
- RRR SOP 52, "Environmental Sampling," latest Rev. dated January 11, 2011
- RRR SOP 52, Appendix A, "Environmental Sampling Nuclides," latest Rev. dated August 24, 2010
- RRR SOP 52, Appendix B, "Environmental Sampling Checklist," latest Rev. dated May 12, 2010
- Reed Research Reactor Annual Report for the period from September 1, 2009 through June 30, 2010, submitted August 23, 2010
- Reed Research Reactor Annual Report for the period from July 1, 2010 through June 30, 2011, submitted August 1, 2011

b. Observation and Findings

It was noted that SOP 52 was updated and an environmental sampling checklist developed on May 12, 2010, to replace the HP Logbooks. This action made the process easier to record and verify. Environmental soil and water samples were collected, prepared, and analyzed generally every six months consistent with procedural requirements. Only naturally occurring radionuclides were detected in the soil samples and no tritium or Carbon-14 were detected in the water samples during 2010 and to date in 2011.

Radiation monitoring inside the Reactor Bay and outside the facility was completed using TLDs placed in accordance with the applicable procedures as well. The data, along with licensee records and calculations, indicated that the air emissions of radioactive material to the environment were well below the 10 millirem constraint specified in 10 CFR 20.1101(d). These calculations indicated an average effective dose equivalent to the public of 0.68 millirem (mr) for the period from September 1, 2009, through June 30, 2010, and 1.31 mr for the period from July 1, 2010, through June 30, 2011. This information was outlined in

the RRF Annual Reports. Because other methods were used, it was noted that the licensee did not use the EPA COMPLY code to demonstrate compliance with 10 CFR 20.1101. The inspector found no new potential release paths following observation of the facility.

The program for the monitoring, storage, or transferring of radioactive liquid, gases, and solids was consistent with applicable regulatory requirements. The principles of ALARA were acceptably implemented to minimize radioactive releases. Records were current and acceptably maintained and indicated that no radioactive liquid had been released from the reactor facility during 2010 or to date in 2011. Monitoring equipment was acceptably maintained and calibrated as noted previously.

c. Conclusion

Effluent monitoring satisfied procedural and regulatory requirements and releases were calculated to be within the specified regulatory and TS limits.

**5. Procedures**

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify compliance with TS Section I.5:

- Selected facility procedures
- Procedural implementation and compliance
- Recent minor and substantive procedural changes
- ROC and RSC meeting minutes for November 2009 through the present
- Administrative controls specified in RRR Administrative Procedures, latest Rev. dated November 2009
- RRR SOP 61, "Procedure Writing and Use," Rev. dated October 6, 2011
- RRR SOP 61, Appendix A, "Document Structure," Rev. dated October 6, 2011
- RRR SOP 61, Appendix B, "Document Locations," Rev. dated October 6, 2011
- RRR SOP 61, Appendix C, "Temporary Procedure Changes," Rev. dated October 6, 2011

b. Observations and Findings

The inspector verified that facility procedures were being reviewed biennially as required and upgraded/revised as needed. Administrative control of changes to procedures, and the associated review and approval process, were as stipulated by RRR SOP 61. Training of personnel on procedures and changes was acceptable. Through observation of activities in progress, the inspector verified that licensee personnel conducted operations and radiological surveys in accordance with applicable procedures. Observation and review also showed that procedures for instrument calibration, reactor operation, maintenance, and emergency conditions were available as required.

c. Conclusion

Facility procedures were acceptably reviewed, approved, and implemented.

**6. Transportation**

a. Inspection Scope (IP 86740)

To verify compliance with 10 CFR Part 71.5 and procedural requirements for the transfer or shipment of licensed radioactive material, the inspector reviewed the following:

- Records of radioactive material shipments completed since 2010 and 2011
- RRR Administrative Procedures, latest Rev. dated November 2009
- RRR SOP 54, "Waste Handling and Disposal," latest Rev. dated January 11, 2011
- RRR SOP 67, "Shipping Radioactive Material," latest Rev. dated October 6, 2009
- RRR SOP 67, Appendix A, "Radioactive Materials Shipping Record," latest Rev. dated October 27, 2008
- RRR SOP 67, Appendix B, "RAM Shipping Flowchart," latest Rev. dated October 27, 2008
- RRR SOP 67, Appendix C, "A1 and A2 Limits," latest Rev. dated October 21, 2008
- RRR SOP 67, Appendix D, "Determining A1 and A2 Limits," latest Rev. dated October 21, 2008
- RRR SOP 67, Appendix E, "Vehicle Radiation Survey Record," latest Rev. dated September 15, 2008
- RRR SOP 67, Appendix F, "Driver's Responsibilities," latest Rev. dated September 15, 2008
- RRR SOP 67, Appendix G, "Emergency Instructions," latest Rev. dated October 21, 2008
- RRR SOP 67, Appendix H, "Returning Empty Containers," latest Rev. dated October 21, 2008
- RRR SOP 67, Appendix I, "Shipping Labels," latest Rev. dated October 21, 2008
- RRR SOP 67, Appendix J, "Training Checklist," latest Rev. dated October 21, 2008
- Reed Research Reactor Annual Report for the period from September 1, 2009 through June 30, 2010, submitted August 23, 2010
- Reed Research Reactor Annual Report for the period from July 1, 2010 through June 30, 2011, submitted August 1, 2011

b. Observations and Findings

Through records reviews and discussions with licensee personnel, the inspector determined that the licensee had completed various shipments of licensed material since the last inspection of transportation in December 2009. The

licensee had completed one solid radioactive waste shipment to date in 2011. The necessary forms containing the appropriate information were completed as required. Appropriate procedures were in place for shipping various types of radioactive material.

It was noted that the licensee had also received a shipment of fuel and had completed a fuel shipment in 2011. These shipments were reviewed by the NRC and the results of these reviews were documented in Inspection Report Nos. 50-288/2011-201 and 50-288/2011-202 respectively.

The inspector noted verified that the licensee individuals who were designated as "shippers" no longer worked at the facility. The licensee acknowledged that selected staff members would need to attend the appropriate training and become qualified to ship radioactive material.

c. Conclusion

The program for shipping radioactive material satisfied regulatory requirements. However, licensee personnel needed to receive the necessary training to become qualified to ship radioactive material.

**7. Exit Interview**

The inspection scope and results were summarized on November 30, 2011, 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. No proprietary material was reviewed by the inspector during the inspection.

## **PARTIAL LIST OF PERSONS CONTACTED**

### **Licensee Personnel**

M. Carlson	Reactor Supervisor
K. Conahan	Training Supervisor
M. Krahenbuhl	Director, Reed Reactor Facility
R. Lazarus	Associate Director, Reactor Facility
P. McDougal	Interim Dean of the Faculty
E. McManis	Senior Reactor Operator
M. Vignal	Assistant Training Supervisor

### **Other Reed College Personnel**

K. Fisher	Radiation Safety Officer and Campus Environmental Director
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## **INSPECTION PROCEDURES USED**

IP 69001:	Class II Non-Power Reactors
IP 86740:	Inspection of Transportation Activities

## **ITEMS OPENED, CLOSED, AND DISCUSSED**

### **Opened**

50-288/2011-203-01	IFI	Review the results of the elimination of the facility RHP position, the completion of the RHP duties by staff members and/or students, and the completion of an annual audit of the Radiation Protection Program by someone from outside the facility, such as a CHP.
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### **Closed**

None

## **LIST OF ACRONYMS USED**

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ALARA	As low as reasonably achievable
DDE	Deep dose equivalent
IFI	Inspector Follow-up Item
IP	Inspection Procedure
kW	kilowatt
mr/yr	millirem per year
NRC	U. S. Nuclear Regulatory Commission

NVLAP	National Voluntary Laboratory Accreditation Program
OSL	Optically stimulated luminescent (dosimeter)
Rev.	Revision
RHP	Reactor Health Physicist
ROC	Reactor Operations Committee
RRC	Reactor Review Committee
RRF	Reed Reactor Facility
RRR	Reed Research Reactor
RSC	Radiation Safety Committee
RWP	Radiation Work Permit
SDE	Shallow dose equivalent
SOP	Standard Operating Procedure
TLD	Thermoluminescent dosimeter
TS	Technical Specification