

February 26, 2013

Dr. Steven Reese, Director  
Radiation Center and TRIGA Reactor  
Oregon State University  
Radiation Center, A100  
Corvallis, OR 97331-5903

SUBJECT: OREGON STATE UNIVERSITY – NRC INSPECTION REPORT NO.  
50-243/2013-201

Dear Dr. Reese:

From February 4 to 7, 2013, the U.S. Nuclear Regulatory Commission (NRC or the Commission) conducted an inspection at the Oregon State University Radiation Center TRIGA Mark-II reactor facility (Inspection Report No. 50-243/2013-201). The enclosed report documents the inspection results, which were discussed on February 7, 2013, with you and other members of your staff, as well as Dr. G. Rich Holdren, Associate Vice President for Research, and Dr. Andrew Klein, Chair of the Reactor Operations Committee.

This inspection was an examination of 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 representative records, interviewed personnel, and observed activities in progress. 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 Document Access and Management System (ADAMS)). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>.

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/

Gregory T. Bowman, Chief  
Research and Test Reactors Oversight Branch  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

Docket No.: 50-243  
License No.: R-106

Enclosure: NRC Inspection Report No. 50-243/2013-201  
cc w/encl: Please see next page

Oregon State University

Docket No.: 50-243

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Test, Research, and Training  
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**ACCESSION NO.:** ML13050A003

**\* concurrence via e-mail**

**TEMPLATE #:** NRC-002

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

Docket No: 50-243

License No: R-106

Report No: 50-243/2013-201

Licensee: Oregon State University

Facility: TRIGA Mark-II Reactor Facility

Location: Corvallis, OR

Dates: February 4-7, 2013

Inspector: Craig Bassett

Approved by: Gregory T. Bowman, Chief  
Research and Test Reactors Oversight Branch  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

## EXECUTIVE SUMMARY

Oregon State University  
TRIGA Mark-II Reactor Facility  
Report No. 50-243/2013-201

The primary focus of this routine, announced inspection included onsite review of selected aspects of Oregon State University's (the licensee's) Class II research reactor safety program, including: (1) organizational structure and staffing, (2) review and audit and design change functions, (3) radiation protection, (4) environmental protection, (5) procedures, and (6) transportation activities 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 was in compliance with NRC requirements. No deviations or violations were identified.

### Organizational Structure and Staffing

- The organizational structure and staffing were consistent with Technical Specification (TS) requirements.

### Review and Audit and Design Change Functions

- The review and audit program was being conducted acceptably and completed by the Reactor Operations Committee as stipulated in TS 6.2.
- Changes made at the facility since the last NRC inspection had been evaluated using the licensee's 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 as required.

### Radiation Protection

- Periodic surveys were completed and documented as required by procedure.
- Postings and signs met regulatory requirements.
- Personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits.
- Radiation survey and monitoring equipment were being maintained and calibrated as required.
- The radiation protection training program was acceptable and training was being completed as required.
- The radiation protection and as low as reasonably achievable programs satisfied regulatory requirements.

### Environmental Protection

- Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and TS limits.
- The environmental protection program satisfied NRC requirements.

### Procedures

- The procedural change and control program satisfied the applicable TS and procedure requirements.
- Activities were conducted in accordance with the applicable procedures as required.

### Transportation of Radioactive Material

- The program for transportation of radioactive materials satisfied NRC and Department of Transportation requirements.
- Training of staff members responsible for shipping radioactive materials was being conducted as required.

## REPORT DETAILS

### Summary of Plant Status

The Oregon State University (OSU or the licensee) 1.1 megawatt TRIGA Mark-II research reactor continued normal, routine operations in support of sample irradiations, laboratory testing, reactor system testing, and surveillance. During the inspection the licensee's reactor was operated several hours per day at varying power levels for class tours and instruction, as well as for an experiment and sample irradiations.

### 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 Section 6 of the Technical Specifications (TS), revised through Amendment No. 22 of the facility operating license, dated September 30, 2008, were being met:

- Management responsibilities and administrative controls
- OSU Radiation Center facility organizational structure and staffing
- Administrative controls outlined in Oregon State TRIGA Reactor Operating Procedure (OSTROP) 6, "Administrative and Personnel Procedures," Rev. LEU-2, reprinted August 2012
- Training requirements stipulated in American National Standards Institute/American Nuclear Society (ANSI/ANS) 15.4-1988, "American National Standard for the Selection and Training of Personnel for Research Reactors"
- OSU TRIGA Reactor Annual Report for the period of July 1, 2010, through June 30, 2011, submitted to the NRC on October 26, 2011
- OSU TRIGA Reactor Annual Report for the period of July 1, 2011, through June 30, 2012, submitted to the NRC on October 26, 2012

#### b. Observations and Findings

The organizational structure and staffing with respect to the licensee's health physics organization had not changed since the last inspection in the area of radiation protection (refer to NRC Inspection Report No. 50-243/2011-201). It was noted that there was one senior health physicist and one health physicist on staff at the licensee's reactor facility.

The reactor operations organization remained unchanged as well. However, the staffing level had changed with the addition of five new reactor operators at the facility. They had been trained and qualified since the last NRC inspection (refer to NRC Inspection Report No. 50-243/2012-201).

The organizational structure and staffing were consistent with the requirements of the TS. Qualifications of the staff were adequate and met those recommended in ANSI/ANS 15.4. Review of records verified that management

responsibilities were administered as required by the TS and applicable procedures.

c. Conclusion

The organizational structure and staffing were consistent with the TS requirements.

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

a. Inspection Scope (IP 69001)

In order to ensure that the audits and reviews stipulated in the requirements of TS 6.2 were being completed and that facility changes were evaluated prior to implementation as required, the inspector reviewed the following:

- Reactor Operations Committee (ROC) meeting minutes and records from February 2011 to the present
- ROC safety review and audit records from February 2011 to the present
- Responses to the findings outlined in reviews and audits conducted by the ROC
- OSTROP 6, "Administrative and Personnel Procedures," Rev. LEU-2, reprinted August 2012
- Changes reviewed using the licensee's safety evaluation process outlined in OSTROP 6, and documented on forms:
  - Figure 6.1, "Oregon State TRIGA Reactor (OSTR) 10 CFR 50.59 Screen Form"
  - Figure 6.2, "OSU TRIGA Reactor (OSTR) 10 CFR 50.59 Evaluation Form"
- Radiation Center Health Physics Procedure (RCHPP) No. 1, "Guidelines for the Radiation Protection Program at the OSU Radiation Center," Rev. 9, dated November 2012

b. Observations and Findings

(1) Review and Audit Functions

ROC meeting minutes and associated records from February 2011 through the present were reviewed. The records showed that meetings were being held and safety reviews and audits were conducted by various members of the ROC or other designated persons as required and at the TS required frequency. Topics of these reviews were consistent with TS requirements to provide guidance, direction, and oversight, and to ensure acceptable use of the reactor and appropriate implementation of the radiation protection program. 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.

(2) Design Change Functions

Through interviews with licensee personnel, the inspector determined that various changes had been initiated and/or completed at the facility since the last NRC inspection. The inspector reviewed the licensee's Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.59 screen forms numbered 11-01 through 11-05 and 12-01 through 12-06 and the licensee's 10 CFR 50.59 evaluation forms numbered 11-01 and 12-01. It was noted that none of the screenings that had been completed required that an evaluation be conducted based on the criteria in 10 CFR 50.59 (the two evaluations that were conducted in 2011 and 2012 were ones that were automatically required by licensee procedure OSTROP 6).

Review of these documents indicated that facility changes had been "screened" (i.e., analyzed and reviewed) and evaluated using the licensee's 10 CFR 50.59 review process outlined in OSTROP 6. The appropriate forms had been completed as required and reviewed and signed by members and the Chair of the ROC. It was also noted that none of the changes required NRC approval prior to implementation.

c. Conclusion

Review and oversight functions required by TS 6.2 were acceptably completed by the ROC. Changes made at the facility since the last NRC inspection had been evaluated using the 10 CFR 50.59 safety evaluation process and had been reviewed and approved by the ROC as required.

**3. Radiation Protection**

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify compliance with 10 CFR Parts 19 and 20 and licensee administrative requirements:

- OSU Radiation Center radiation protection program
- As low as reasonably achievable (ALARA) reviews
- Radiological signs and postings in various areas of the facility
- Maintenance and calibration of radiation monitoring equipment
- Dosimetry/exposure records for January 2010 through November 2012
- Training records for Radiation Center staff, health physics (HP) monitors, and facility users
- Radiation Center TRIGA Mark-II Reactor Facility Radiation Protection Program
- Occupational exposure records documented on forms entitled, "Form 5: Occupational Exposure Record for a Monitoring Period," for licensee employees for 2010 and 2011 (forms for 2012 were not yet available)

- Various HP notebooks entitled:
  - HP Notebook - Surveys, Volume I, "Daily/Weekly/ Monthly/Neutron Generator/and Semi-Annual Floor Surveys"
  - HP Notebook - Surveys, Volume II, "Special Surveys"
  - HP Notebook - Surveys, Volume IV, "Work Surveillance Reports"
- Routine periodic surveys documented on the following forms:
  - Form RCHPP-24A, "Daily Routine Radiation Survey Record," latest revision dated October 2004
  - Form RCHPP-24B, "Weekly Routine Radiation Survey Record," latest revision dated July 2005
  - Form RCHPP-24C, "Monthly Routine Radiation Survey Record," latest revision dated October 2004
  - Form RCHPP-24D, "Non-Routine (Special) Radiation Survey Record," latest revision dated January 2000
  - Form RCHPP-27, Attachment 1, "Semi-Annual Floor Survey For Fixed and Removable Radiation Contamination - Part I Direct and Gross Floor Smear," latest revision dated November 2012
  - Form RCHPP-27, Attachment 1, "Semi-Annual Floor Survey For Fixed and Removable Radiation Contamination - Part II Worksheet," latest revision dated November 2012
  - Form RCHPP-27, Attachment 2, "Floor Survey Map," latest revision dated November 2012
- Calibration records documented on the following forms:
  - "Calibration Results for the Tracerlab Dual-Channel Reactor Facility Continuous Stack-Effluent Monitor"
  - "Calibration Results for the NMC AM-22BF Dual-Channel Reactor Top Continuous Air Monitor (CAM)"
  - "Calibration Results for the Area Radiation Monitoring Systems Located Throughout the TRIGA Reactor Facility and in the Pneumatic Transfer (PT) Rabbit Laboratory"
  - Calibration Results for various portable instruments generated by the Scientific Instrument Technician
- RCHPP No. 1, "Guidelines for the Radiation Protection Program at the OSU Radiation Center," Rev. 9, dated November 2012
- RCHPP No. 18, "Maintenance and Calibration Procedures for Radiation Protection Instrumentation (Including Operator Training Manual and Operating Procedures for the Radiation Center Gamma Instrument Calibration Facility)," Rev. 10 dated September 2008
- RCHPP No. 20, "Radiation Survey Procedures for the Release of Items for Unrestricted Use," Rev. 3, dated July 2001
- RCHPP No. 24, "Procedures for Performing Routine (Daily, Weekly, Monthly, and Annual) Radiation Surveys and Non-Routine (Special) Radiation Surveys," Rev. 10, dated October 2004
- RCHPP No. 27, "Procedure for Performing the Semi-Annual Floor Survey for Fixed and Removable Radioactive Contamination," Rev. 7, dated November 2012

- RCHPP No. 34, "Orientation and Training Program for the OSU Radiation Center," Rev. 19, dated October 2010
- RCHPP No. 37, "Dosimetry," Rev. 3, dated December 2006
- OSU TRIGA Reactor Annual Report for the period of July 1, 2010 through June 30, 2011, submitted to the NRC on October 26, 2011
- OSU TRIGA Reactor Annual Report for the period of July 1, 2011 through June 30, 2012, submitted to the NRC on October 26, 2012

b. Observations and Findings

(1) Surveys

Selected daily, weekly, monthly, semiannual, and annual radiation and/or contamination surveys were reviewed by the inspector. The surveys had been completed by HP staff members or students who had received the appropriate training to conduct surveys. Any contamination detected in concentrations above established action levels was noted and the area was decontaminated. Results of the surveys were acceptably documented.

During the inspection the inspector accompanied a licensee representative during completion of a routine daily radiation and contamination survey. Areas surveyed at the facility included the reactor bay and associated laboratories, and the heat exchanger room. The techniques used during the survey were adequate and the survey was conducted and documented in accordance with the guidance specified by procedure. The inspector conducted a radiation survey along with the licensee representative using an NRC-supplied instrument. The radiation levels noted by the inspector were comparable to those found by the licensee and no anomalies were noted.

(2) Postings and Notices

Radiological signs were typically posted at the entrances to controlled areas. Other postings also showed the industrial hygiene hazards that were present in the areas as well. Caution signs, postings, and controls for radiation areas were as required by 10 CFR Part 20, Subpart J. The inspector noted that licensee personnel observed the signs and postings and the precautions for access to radiation areas.

Copies of current notices to workers were posted in appropriate areas in the facility. The copies of NRC Form 3, "Notice to Employees," noted at the facility were the latest issue and were posted in various areas throughout the facility as required by 10 CFR 19.11. These locations included on the main bulletin board in the hallway by the front office, in the corridor leading to the reactor building, and in the reactor control room.

(3) Dosimetry

The inspector determined that the licensee used pocket ion chambers and thermoluminescent dosimeters (TLD) for whole body monitoring of beta and gamma radiation exposure, as well as track-etch/albedo neutron dosimeters to measure neutron radiation. The licensee also used TLD finger rings for extremity monitoring. The dosimetry was supplied and processed by a National Voluntary Laboratory Accreditation Program accredited vendor, Mirion Technologies. An examination of the TLD results indicating radiological exposures at the facility for the past three years showed that the highest occupational doses, as well as doses to the public, were within 10 CFR Part 20 limitations.

The records showed that the highest annual whole body exposure received by a single reactor staff member for 2010 was 129 millirem (mr) deep dose equivalent (DDE) and 135 mr shallow dose equivalent (SDE). The highest annual extremity exposure for an individual for 2010 was 766 mr SDE. The highest annual whole body exposure received by a reactor staff member for 2011 was 192 mr DDE and 193 mr SDE. The highest annual extremity exposure for an individual for 2011 was 789 mr SDE. The records also showed that the highest annual whole body exposure received by a single staff member for 2012 (through November) was 124 mr DDE and 128 mr SDE. The highest annual extremity exposure for 2012 (through November) was 1192 mr SDE.

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.

(4) Radiation Monitoring Equipment

Examination of selected items of radiation monitoring equipment indicated that the instruments had the acceptable up-to-date calibration sticker attached. Review of the instrument calibration records for various meters indicated the calibration of portable survey meters was typically completed by licensee staff personnel. However, some instruments were shipped to vendors for calibration. The inspector verified that the instruments were calibrated annually which met procedural requirements and calibration records were maintained as required. Area radiation monitors and stack monitors were also being calibrated annually as required. These monitors were typically calibrated by licensee staff personnel as well.

(5) Work Surveillance Report Program

Through interviews with licensee personnel and records review, the inspector determined that no work surveillance reports (WSRs) had been issued during 2011 or 2012. (WSRs are similar to radiation work permits,

but are used by the licensee mainly in situations involving non-routine maintenance or other work being performed at the facility on highly contaminated structures, systems, or components (SSCs) or work on SSCs with elevated radiation levels.) The inspector verified that, if WSRs were needed, they would be prepared in accordance with the requirements specified on the WSR form, including work controls, protective clothing requirements, and dose tracking and limits.

(6) Radiation Protection Training

The inspector reviewed the radiation worker training given to Radiation Center staff members, to those who are not on staff but who are authorized to use the experimental facilities of the reactor, and to student assistants working as part-time HP monitors. The training program was outlined in RCHPP No. 34. It included initial radiation worker training for those new to the facility and refresher training for faculty and staff. The appropriate training was required to be completed before a person was allowed unescorted access to various restricted areas of the Radiation Center. The type of initial training given was based upon the position and/or duties of the person. Initial training was divided into the following categories: general orientation, radiation/radioactive material user orientation, reactor bay unescorted access orientation, student orientation, visitor orientation, and/or Radiation Center non-resident worker orientation. Refresher training was divided into two categories, training for non-radioactive material users and training for radioactive material users.

As noted above, initial training was provided when a person first started work or classes at the facility. Refresher training was given on a 3-year cycle. The most recent radiation worker refresher training for Radiation Center personnel had been completed in December 2010. The training consisted of having staff members read procedure RCHPP No. 34, "Orientation," Parts 1 and 2, and sign a form verifying completion thereof. The inspector reviewed the completed forms of various staff members and verified that they had completed the training. The training program was acceptable.

(7) Radiation Protection Program

The licensee's radiation protection and ALARA programs were established and described in the RCHPP No. 1 and through associated HP procedures that had been reviewed and approved. The programs contained instructions concerning organization, training, monitoring, personnel responsibilities, audits, record keeping, reports, and maintaining doses ALARA. The programs, as established, appeared to be acceptable. The ALARA program provided guidance for keeping doses as low as reasonably achievable which was consistent with the requirements in 10 CFR Part 20.

The licensee did not have a respiratory protection program or planned special exposure program; neither program was required based on the current level of activity at the facility.

(8) Facility Tours

The inspector toured the reactor bay, the heat exchanger room, and selected support laboratories with licensee representatives on various occasions. The inspector noted that facility radioactive material storage areas were properly posted. No unmarked radioactive material was noted. Radiation areas and radioactive material storage areas were posted as required.

c. Conclusion

The inspector determined that the radiation protection and ALARA programs, as implemented by the licensee, satisfied regulatory requirements because: (1) periodic surveys were completed and documented acceptably to permit evaluation of the radiation hazards present, (2) postings and signs met regulatory requirements, (3) personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits, (4) radiation survey and monitoring equipment was being maintained and calibrated as required, and (5) the radiation protection training program was being implemented as stipulated in procedure.

**4. Environmental Protection**

a. Inspection Scope (IP 69001)

To determine that the licensee was complying with the requirements of the regulations and TS 6.7.e, the inspector reviewed selected aspects of:

- OSU Radiation Safety Radioactive Waste Tag forms for 2011 and 2012
- Environmental monitoring release records documented in various notebooks, including:
  - HP Notebook - Environmental Monitoring, Volume I, "Airborne Gamma Emitters TLD Reports/Ion Chamber, TE and FE Results"
  - HP Notebook - Environmental Monitoring, Volume II, "Soil, Water, and Vegetation Data"
  - HP Notebook - Environmental Monitoring, Volume III, "Solid and Liquid Waste, Hold-up Tank"
  - HP Notebook - Environmental Monitoring, Volume IV, "Gaseous Waste Discharge Summary"
- Selected forms documenting environmental data and analysis results completed in 2011 and 2012, including:
  - "Environmental Soil, Water, and Vegetation Sample Report"

- “Monthly TRIGA Reactor Gaseous Waste Discharges and Analysis”
- Records of waste transferred from the reactor facility’s NRC license to the State license for the past 2 years, documented on forms issued by the OSU Radiation Safety Office and entitled:
  - “Oregon State University, Radiation Safety Radioactive Waste Tag” for liquid radioactive waste
  - “Oregon State University, Radiation Safety Radioactive Waste Tag” for solid radioactive waste
- RCHPP No. 1, “Guidelines for the Radiation Protection Program at the OSU Radiation Center,” Rev. 9, dated November 2012
- RCHPP No. 8, “Water Analysis,” Rev. 6, dated November 2012
- RCHPP No. 13, “Procedures for Collection and Biological Analysis of Environmental Soil, Water, and Vegetation Samples,” Rev. 5, January 2007
- RCHPP No. 15, “Operating Procedures for the Environmental Thermoluminescent Dosimetry (TLD) Program,” Rev. 4, February 2004
- RCHPP No. 31, “Procedure for Sampling and Pumping the Liquid Waste Hold-up Tank,” Rev. 8, dated November 2012
- RCHPP No. 32, “Stack Gas Effluent Analysis,” Rev. 2, dated June 2000
- OSU TRIGA Reactor Annual Report for the period of July 1, 2010 through June 30, 2011, submitted to the NRC on October 26, 2011
- OSU TRIGA Reactor Annual Report for the period of July 1, 2011 through June 30, 2012, submitted to the NRC on October 26, 2012

b. Observations and Findings

Soil, water, and vegetation environmental samples were collected, prepared, and analyzed annually in accordance with procedural requirements. On-site and off-site gamma radiation monitoring was completed using the reactor stack effluent monitor and various environmental monitoring station TLDs as required by the applicable procedures as well. Data indicated that there were no measurable doses above natural background radiation.

The inspector determined that gaseous releases continued to be monitored as required, were calculated according to procedure, and were acceptably documented in the annual reports. The airborne concentrations of the gaseous releases were within the concentrations stipulated in 10 CFR Part 20, Appendix B, Table 2. Also, the dose rate to the public as a result of the gaseous releases was well below the dose constraint specified in 10 CFR 20.1101(d) of 10 millirem per year (mr/yr). This was acceptably demonstrated by the licensee through COMPLY code calculations. These calculations indicated an effective dose equivalent to the public of 3.5 mr/yr for the year 2011 and 3.2 mr/yr for the year 2012. The principles of ALARA were acceptably implemented to minimize radioactive releases. Monitoring equipment was acceptably maintained and calibrated. Records were current and acceptably maintained. Observation of the facility by the inspector indicated no new potential release paths.

The licensee's program for monitoring, storing, and/or transferring radioactive liquid and solid waste was consistent with applicable procedural requirements. Liquid and solid radioactive waste was transferred to the OSU waste processing facility under the State of Oregon broad-scope license (ORE-90005) for processing and disposal. This process was acceptably documented on the appropriate OSU Radiation Safety Office forms in accordance with the requirements of RCHPP No. 1.

A review of the liquid effluent releases from the facility to the sanitary sewer indicated that a total of 1.39E-1 Curies (Ci) was released in 2011; 1.03 Ci was released in 2012. The majority of this activity was in the form of tritium. The releases were well within the monthly average concentration limits established in 10 CFR Part 20, Appendix B, Table 3.

c. Conclusion

Effluent releases were within the specified regulatory and TS limits. The environmental protection program satisfied NRC requirements.

**5. Procedures**

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify compliance with TS 6.2.d:

- Procedural implementation
- Selected RCHPP procedures
- Records of changes to RCHPP procedures
- Records of ROC review and approval of procedures documented in the ROC meeting minutes for 2011 and 2012
- RCHPP No. 1, "Guidelines for the Radiation Protection Program at the OSU Radiation Center," Rev. 9, dated November 2012

b. Observations and Findings

Administrative controls of changes to procedures and the associated review and approval processes were as stipulated by procedure. The inspector verified that procedure changes were being reviewed and approved by the ROC as required by TS 6.2.d. Training of personnel on procedures and changes was acceptable. The inspector verified that licensee personnel conducted activities in accordance with applicable procedures. Records showed that procedures for potential malfunctions (e.g., radioactive material ingestion and contaminations) were available for implementation as needed. The inspector also determined that all RCHPP procedures were being reviewed annually as required.

c. Conclusion

The procedural change and control program satisfied the applicable TS and procedure requirements. Activities were conducted in accordance with the applicable procedures as required.

**6. Transportation**

a. Inspection Scope (IP 86740)

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

- Selected records of various types of radioactive material shipments in 2011 and 2012
- Radioactive waste records documented in HP Notebook - Environmental Monitoring, Volume III, "Solid and Liquid Waste, Hold-up Tank"
- Training records of staff members responsible for shipping licensed radioactive material
- Records of waste transferred from the reactor facility's NRC license to the State license for the past 2 years documented on forms issued by the OSU Radiation Safety Office and entitled:
  - "Oregon State University, Radiation Safety Radioactive Waste Tag" for liquid radioactive waste
  - "Oregon State University, Radiation Safety Radioactive Waste Tag" for solid radioactive waste
- Radioactive material transfer records documented in various notebooks including:
  - HP Notebook - Radioactive Material Transfer, Volume I, "Procedure - RCHPP6, General Shipping Forms, Training Records, and Audit Records"
  - HP Notebook - Radioactive Material Transfer, Volume II, "Shipping Container Tests"
  - HP Notebook - Radioactive Material Transfer, Volume III, "Radioactive Material Transfer Records"
  - HP Notebook - Radioactive Material Transfer, Volume IV, "Shipment Analysis"
- RCHPP No. 1, "Guidelines for the Radiation Protection Program at the OSU Radiation Center," Rev. 9, dated November 2012
- RCHPP No. 5, "Procedures for Receipt Radiation Surveys and Unpacking of Packages Containing Radioactive Material," Rev. 5, dated September 2008
- RCHPP No. 6, "OSU Procedures for Transfer, Packaging, and Transport of Radioactive Materials Other Than Radioactive Waste," Rev. 14, dated July 2010
- RCHPP No. 11, "Procedures for Testing and Certification of OSU Radioactive Materials Shipping Containers," Rev. 4, dated April 2006

- OSU TRIGA Reactor Annual Report for the period of July 1, 2010, through June 30, 2011, submitted to the NRC on October 26, 2011
- OSU TRIGA Reactor Annual Report for the period of July 1, 2011, through June 30, 2012, submitted to the NRC on October 26, 2012

b. Observations and Findings

As noted above, records showed that radioactive liquid and solid waste was transferred to the OSU Radiation Safety Office for packaging, shipment, and disposal in accordance with licensee requirements and the applicable procedures. This program for radioactive material transfer was consistent with the requirements specified in RCHPP No. 1.

The transport of other types of radioactive material was also reviewed. Through records reviews and various discussions with licensee personnel, the inspector determined that the licensee had shipped various types of radioactive material to a number of different consignees since the previous inspection in this area. The records indicated that the radioisotope types and quantities were calculated and dose rates measured as required. The records also indicated that the shipping containers were appropriate and had been labeled as required. All radioactive material shipment records reviewed by the inspector had been completed in accordance with Department of Transportation (DOT) and NRC regulatory requirements.

The inspector verified that the licensee maintained copies of the recipients' licenses to possess radioactive material as required and that the licenses were verified to be current prior to initiating a shipment.

On Wednesday during the week of the inspection, the inspector observed the preparation of samples of radioactive material for shipment. The material was analyzed to determine the activity present and the radiation levels were measured on contact and at one foot from the material. The material was then properly packaged and placed in the appropriate shipping container. Then the applicable labels were filled out with the required information and these were attached to the shipping container. The shipping paperwork was completed in accordance with the regulatory requirements. No problems or deficiencies were noted.

The training of the staff members responsible for shipping the material was reviewed. Training had been conducted according to licensee procedure which exceeded the requirements specified in the regulations.

c. Conclusion

The program for transportation of radioactive materials satisfied NRC and DOT requirements.

**7. Exit Interview**

The inspection scope and results were summarized with licensee representatives at the conclusion of the inspection on February 7, 2013. The inspector discussed the findings for each area reviewed. The licensee acknowledged the inspection findings and did not identify any material as proprietary.



## **PARTIAL LIST OF PERSONS CONTACTED**

### **Licensee Personnel**

J. Darrough	Health Physicist
T. Keller	Reactor Administrator
S. Menn	Senior Health Physicist
S. Reese	Director, Radiation Center
R. Schickler	Reactor Operator
S. Smith	Scientific Instrument Technician
G. Wachs	Reactor Supervisor

### **Other Personnel**

A. Klein	Chair, Reactor Operations Committee
R. Holdren	Associate Vice President for Research, Oregon State University

## **INSPECTION PROCEDURES USED**

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

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

### **Opened**

None.

### **Closed**

None.

## **LIST OF ACRONYMS USED**

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ALARA	As Low As Reasonably Achievable
ANSI/ANS	American National Standards Institute/American Nuclear Society
Curie(s)	Ci
DDE	Deep Dose Equivalent
DOT	Department of Transportation
HP	Health Physics
IP	Inspection Procedure
mr	millirem
mr/yr	millirem per year
NRC	U.S. Nuclear Regulatory Commission
OSU	Oregon State University

OSTROP	Oregon State University TRIGA Reactor Operating Procedure
RCHPP	Radiation Center Health Physics Procedure
ROC	Reactor Operations Committee
SSCs	Structures, Systems, and Components
SDE	Shallow Dose Equivalent
TLD	Thermoluminescent Dosimeter
TS	Technical Specifications
WSR	Work Surveillance Report