



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 15, 2019

Dr. Steven R. Reese, Director
Oregon State University
100 Radiation Center
Corvallis, OR 97331-5903

SUBJECT: OREGON STATE UNIVERSITY – U.S. NUCLEAR REGULATORY
COMMISSION INSPECTION REPORT NO. 50-243/2019-201

Dear Dr. Reese:

From January 14-17, 2019, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at the Oregon State University Radiation Center TRIGA [Training, Research, Isotopes, General Atomics] Mark-II reactor facility. The enclosed report documents the inspection results, which were discussed on January 17, 2019, with you and various members of your staff, as well as Daniel Harlan, campus Radiation Safety Office and Chair of the Reactor Operations Committee.

This 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, 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, 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 (240) 535-1842 or by electronic mail at Craig.Bassett@nrc.gov.

Sincerely,

/RA/

Anthony J. Mendiola, Chief
Research and Test Reactors Oversight Branch
Division of Licensing Projects
Office of Nuclear Reactor Regulation

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

Enclosure:
As stated

cc: See next page

Oregon State University

Docket No. 50-243

cc:

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Mr. Daniel Harlan, Chairman
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Test, Research and Training
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Attention: Amber Johnson
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SUBJECT: OREGON STATE UNIVERSITY – U.S. NUCLEAR REGULATORY
 COMMISSION INSPECTION REPORT NO. 50-243/2019-201 DATE:
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**U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION**

Docket No.: 50-243

License No.: R-106

Report No.: 50-243/2019-201

Licensee: Oregon State University

Facility: TRIGA Mark-II Reactor Facility

Location: Corvallis, OR

Dates: January 14-17, 2019

Inspector: Craig Bassett

Approved by: Anthony J. Mendiola, Chief
Research and Test Reactors Oversight Branch
Division of Licensing Projects
Office of Nuclear Reactor Regulation

Enclosure

EXECUTIVE SUMMARY

Oregon State University
TRIGA Mark II Reactor Facility
NRC Report No. 50-243/2019-201

The primary focus of this routine, announced inspection included onsite review of selected aspects of the Oregon State University (the licensee) Class II research reactor safety program including: (1) organizational structure and staffing; (2) procedures; (3) health physics; (4) design changes; (5) committees, audits, and reviews, and (6) transportation of radioactive materials since the last U.S. Nuclear Regulatory Commission (NRC) inspection of these areas. The licensee's safety program was acceptably directed toward the protection of public health and safety. No violations or deviations were identified.

Organization and Staffing

- Organization and staffing were consistent with the requirements outlined in Section 6 of the facility technical specifications (TSs).

Procedures

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

Health Physics

- 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 (ALARA) programs satisfied regulatory requirements.
- Effluent monitoring satisfied license and regulatory requirements and releases were within the specified TS levels and regulatory.

- The environmental protection program satisfied NRC requirements.

Design Changes

- 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* (10 CFR) Section 50.59, "Changes, tests and experiments," safety evaluation process and had been reviewed and approved by the Reactor Operations Committee (ROC) as required.

Committees, Audits and Review

- The review and audit program was being conducted acceptably and completed by the ROC Committee as stipulated in TS 6.2.

Transportation of Radioactive Material

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

REPORT DETAILS

Summary of Facility Status

Oregon State University (OSU or the licensee) continued to operate their 1.1 megawatt Training, Research, Isotopes, General Atomics (TRIGA) Mark-II research reactor as needed in support of sample irradiations, laboratory testing, reactor system testing, and surveillance. During this inspection the licensee's reactor was operated several hours per day at varying power levels for experiments and sample irradiations.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure [IP] 69001, Section 02.01)

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of Section 6 of TSs, revised through Amendment No. 24 of the Facility Operating License No. R-106, dated March 8, 2017, 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," Revision (Rev.) LEU-6
- OSU Radiation Center and TRIGA Reactor Annual Report for the period from July 1, 2016, through June 30, 2017, submitted to the NRC on October 30, 2017
- OSU Radiation Center and TRIGA Reactor Annual Report for the period from July 1, 2017, through June 30, 2018, submitted to the NRC on October 19, 2018

b. Observations and Findings

The licensee's health physics organizational structure had not changed since the last inspection in the area of radiation protection (refer to NRC Inspection Report No. 50-243/2017-201). There was one Senior Health Physicist (SHP) position and an unspecified number of Health Physicist (HP) staff positions listed on the licensee's organization chart. The SHP position was being filled by a qualified individual as required. There was one full-time HP on staff as well. Four students also worked at the facility part-time as work study assistants/HP monitors completing routine surveys and other such tasks.

The reactor operations organizational structure remained unchanged as well. It was noted that there were six senior reactor operators (SROs) and four reactor operators (ROs). The SROs were full-time staff members while the ROs were students employed on a part-time basis at the reactor facility.

The organizational structure and staffing were consistent with the requirements of the TS. Review of records indicated that management responsibilities were administered as required by the TS and applicable procedures.

c. Conclusion

The organization and staffing were consistent with TS requirements.

2. Procedures

a. Inspection Scope (IP 69001, Section 02.03)

The inspector reviewed selected aspects of the following to verify compliance with TS Section 6.4:

- Procedural implementation
- Selected Radiation Center Health Physics Procedure (RCHPP) procedures
- Records of changes to RCHPP procedures
- Records of ROC review and approval of procedures documented in the ROC meeting minutes for 2017 and 2018
- RCHPP No. 1, "Guidelines for the Radiation Protection Program at the OSU Radiation Center," Rev. 10
- OSTROP 6, "Administrative and Personnel Procedures," Rev. LEU-6

b. Observations and Findings

Administrative controls of changes to procedures and the associated review and approval processes were as stipulated by the TSs and procedure. The inspector verified that the substantive procedure changes were being reviewed and approved by the ROC as required by TS Section 6.4. In addition, unsubstantive changes to radiation protection procedures were approved by the SHP prior to implementation as required. Training of personnel on procedures and changes was acceptable.

The inspector observed work in progress and verified that licensee personnel conducted activities in accordance with applicable procedures. Records showed that procedures for handling incidents due to potential malfunctions (e.g., radioactive material ingestion and contaminations) were available for use as needed. The inspector also determined that all RCHPP procedures were being reviewed annually by the ROC 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.

3. Health Physics

a. Inspection Scope (IP 69001, Section 02.07)

The inspector reviewed selected aspects of the following to verify compliance with TS Sections 6.3 and 6.7.1.e, 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations and 10 CFR Part 20,

“Standards for Protection against Radiation,” and licensee procedural requirements:

- OSU Radiation Center radiation protection program
- ALARA Program reviews
- Radiological signs and postings in various areas of the facility
- Maintenance and calibration of radiation survey and monitoring equipment
- Dosimetry/exposure records for January 2017 through November 2018
- Training records for Radiation Center staff, 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 2016 and 2017 (forms for 2018 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 VI, “Work Surveillance Reports”
 - HP Notebook - Environmental Monitoring, Volume I, “Airborne Gamma Emitters, TLD Reports, Ion Chamber and TE & 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”
- Routine periodic surveys documented on the following forms:
 - Form RCHPP-24A, “Daily Routine Radiation Survey Record”
 - Form RCHPP-24B, “Weekly Routine Radiation Survey Record”
 - Form RCHPP-24C, “Monthly Routine Radiation Survey Record”
 - Form RCHPP-24D, “Non-Routine (Special) Radiation Survey Record”
 - Form RCHPP-27, Attachment 1, “Semi-Annual Floor Survey For Fixed and Removable Radiation Contamination - Part I Direct and Gross Floor Smear” and “Semi-Annual Floor Survey For Fixed and Removable Radiation Contamination - Part II Worksheet,” and Form RCHPP-27, Attachment 2, “Floor Survey Map”
- 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”
 - Results of Calibration of various portable instruments conducted by the Development Engineer
- Various RCHPP Procedures including:

- No. 1, "Guidelines for the Radiation Protection Program at the OSU Radiation Center," Rev. 10
- No. 8, "Water Analysis," Rev. 6
- No. 13, "Procedures for Collection and Biological Analysis of Environmental Soil, Water, and Vegetation Samples," Rev. 5
- No. 15, "Operating Procedures for the Environmental Thermoluminescent Dosimetry (TLD) Program," Rev. 4
- 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. 11
- No. 20, "Radiation Survey Procedures for the Release of Items for Unrestricted Use," Rev. 3
- No. 24, "Procedures for Performing Routine (Daily, Weekly, Monthly, and Annual) Radiation Surveys and Non-Routine (Special) Radiation Surveys," Rev. 10
- No. 27, "Procedure for Performing the Semi-Annual Floor Survey for Fixed and Removable Radioactive Contamination," Rev. 7
- RCHPP No. 31, "Procedure for Sampling and Pumping the Liquid Waste Hold-up Tank," Rev. 8
- No. 32, "Stack Gas Effluent Analysis," Rev. 2
- No. 34, "Orientation and Training Programs for the OSU Radiation Center," Rev. 20
- No. 37, "Dosimetry," Rev. 3
- Selected forms documenting environmental data and analysis results completed in 2017 and 2018, 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
- OSU TRIGA Reactor Annual Reports for the last two reporting periods
- American National Standards Institute/American Nuclear Society (ANSI/ANS)-15-11-1993; R2004, "Radiation Protection at Research Reactor Facilities."

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 student assistant HP monitors who had received the appropriate training to conduct surveys. Any contamination detected in concentrations above established action levels was noted and the area or item was decontaminated. Following

decontamination, the area or material was again surveyed to ensure that it was radiologically clean. Results of the surveys were acceptably documented by HP staff personnel and reviewed by the SHP. During the inspection the inspector accompanied the facility HP during completion of a routine daily radiation and contamination survey. Areas surveyed at the facility included the reactor bay and associated laboratories, hallways, and the heat exchanger room. Various items in these areas were also surveyed. The techniques used during the survey were adequate and the survey was conducted and documented in accordance with the guidance specified by procedure. During the survey, an area was found to be contaminated. The area was decontaminated and resurveyed. No further contamination was noted. The inspector conducted a radiation survey along with the facility HP. 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, "Posting of notices to workers." 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 and Completed Nuclear Regulatory Commission Form 5

The inspector determined that the licensee used thermoluminescent dosimeters (TLDs) for whole body monitoring of beta and gamma radiation exposure. The TLDs also had a separate component to measure neutron radiation. (On occasion the licensee also used pocket ion chambers for monitoring dose.) The licensee also used TLD finger rings for extremity monitoring. The TLD 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 3 years showed that the highest occupational doses, as well as doses to the public, were within 10 CFR Part 20 limitations.

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 procedural requirements.

Individual copies of the NRC Form 5 that had been issued to the appropriate staff members in 2016 and 2017 were also reviewed. (Forms for 2018 were not yet available.) No problems were noted.

(4) Calibration of Radiation Survey and Monitoring Equipment

Examination of selected meters in the Reactor Bay and adjacent areas which were used for radiation monitoring indicated that the instruments had the acceptable up-to-date calibration sticker attached. Review of the instrument calibration records for various meters and monitors indicated the calibration of portable survey meters was typically completed on-site by the facility Development Engineer. However, some instruments were shipped off-site 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, the Continuous Air Monitor, and the stack monitors were also being calibrated annually as required. These various 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 2017 or 2018. It was noted that WSRs were similar to radiation work permits used at other facilities, but were used by the licensee mainly in situations involving non-routine maintenance or other work being performed at the facility on highly contaminated structures, systems, and 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 and orientation 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, to student assistants working as part-time HP monitors, to visitors, and to students taking classes at the facility. 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. It was noted that 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. The inspector reviewed the completed forms of various staff members and verified that they had completed the appropriate training. The training program was acceptable and consistent with the requirements outlined in 10 CFR Part 19 as well.

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 last radiation worker refresher training for the Radiation Center personnel was completed during January and February 2017.

(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. The radiation protection program contained instructions concerning organization, training, monitoring, personnel responsibilities, audits, record keeping, reports, and maintaining doses ALARA. The ALARA program provided guidance for keeping doses ALARA which was consistent with the requirements in 10 CFR Part 20 and ANSI/ANS-15.1-1993. The programs, as established, appeared to be acceptable. The inspector verified that the radiation protection program was being reviewed annually as required by 10 CFR 20.1101, "Radiation Protection Programs," paragraph (c).

The inspector noted that 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) Effluent and Environmental Monitoring

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 (mrem) per year. This was acceptably demonstrated by the licensee through COMPLY code calculations. These calculations indicated an effective dose equivalent to the public of 6.6 mrem per year for 2017 and 5.2 mrem per year in 2018. 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 inspector reviewed the liquid effluent releases discharged from the facility Hold Up Tank to the sanitary sewer in 2017 and 2018. Analyses of the various samples of the effluent indicated that the releases were well within the monthly average concentration limits established in 10 CFR Part 20, Appendix B, Table 3.

The licensee's program for monitoring, storing, and/or transferring radioactive liquid and solid waste was consistent with applicable procedural requirements. 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. It was noted that no liquid radioactive waste was transferred to the OSU waste processing facility during the 2017 - 2018 time period.

(9) 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 were also posted as required.

c. Conclusion

The inspector determined that the radiation protection and ALARA programs, as implemented by the licensee, satisfied regulatory requirements. Specifically, (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, (5) the radiation protection training program was being implemented as stipulated by procedure, (6) gaseous and liquid effluent releases were within the specified TS levels and regulatory limits, and, (7) the environmental protection program satisfied NRC requirements.

4. Design Changes

a. Inspection Scope (IP 69001, Section 02.08)

In order to ensure that changes to SSCs, experiments, and procedures were reviewed and evaluated prior to implementation as required TS Section 6.2, the inspector reviewed the following:

- ROC meeting minutes and records from February 2017 to the present
- ROC safety review and audit records from February 2017 to the present
- OSTROP 6, "Administrative and Personnel Procedures," Rev. LEU-6
- Various changes completed during 2017 and 2018 and 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” (3 pages)
- RCHPP No. 1, “Guidelines for the Radiation Protection Program at the OSU Radiation Center,” Rev. 10

b. Observations and Findings

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 10 CFR 50.59 screen forms numbered 17-15 through 17-30 and 18-01 through 18-18 and the licensee’s 10 CFR 50.59 evaluation forms numbered 17-01 and 18-01 through 18-06. It was noted that one of the screenings that had been completed in 2018 dealing with a new fuel temperature channel required that an evaluation be conducted based on the criteria in 10 CFR 50.59. The other evaluations that were conducted in 2017 and 2018 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. The screen forms had been reviewed and signed by all the SROs, the SHP, the Reactor Administrator, and the Director. The evaluation forms had been reviewed and signed by members and the Chair of the ROC as required. It was also noted that none of the changes required NRC review and approval prior to implementation.

c. Conclusion

Changes made at the facility since the last NRC inspection had been reviewed using the facility’s 10 CFR 50.59 safety screening and evaluation process as required.

5. Committees, Audits, and Reviews

a. Inspection Scope (IP 69001, Section 02.09)

To verify that the licensee had established and conducted reviews and audits as required in TS Section 6.2, the inspector reviewed:

- ROC meeting minutes and records from February 2017 to the present
- ROC safety review and audit records from February 2017 to the present
- ALARA Program reviews
- Annual evaluation of the OSU Radiation Center Health Physics Program conducted by the SHP for 2016 and 2017
- Audit of the OSU Radiation Center Radiation Protection conducted by the Oregon State University Radiation Safety Officer for 2016 and 2017
- RCHPP No. 1, “Guidelines for the Radiation Protection Program at the OSU Radiation Center,” Rev. 10
- OSTROP 6, “Administrative and Personnel Procedures,” Rev. LEU-6

b. Observations and Findings

ROC meeting minutes and associated records from February 2017 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 in accordance with written procedures as required by the TSs. Topics of these reviews and audits were consistent with TS and procedural 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.

Also as noted above, the SHP performed an evaluation of the Health Physics Program and the ALARA Program annually. The results of this evaluation or review were reported to the Facility Director as required. The OSU Radiation Safety Officer also conducted an independent audit of the facility Radiation Protection Program which was submitted to the ROC for review.

c. Conclusion

Review and oversight functions required by TS Section 6.2 were acceptably completed by the ROC.

6. Transportation of Radioactive Material

a. Inspection Scope (IP 86740)

The inspector reviewed the following documents to determine compliance with NRC and DOT regulations governing the transport of radioactive material as specified in 10 CFR Part 20 and 10 CFR Part 71, "Packaging and Transportation of Radioactive Material," as well as 49 CFR Parts 171–178:

- Selected records of various types of radioactive material shipments completed in 2017 and 2018
- 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 solid radioactive 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"
- Radioactive material transfer records documented in various notebooks including:
 - HP Notebook - Radioactive Material Transfer, Volume I, "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”
- Various RCHPP Procedures including:
 - No. 1, “Guidelines for the Radiation Protection Program at the OSU Radiation Center,” Rev. 10
 - No. 5, “Procedures for Receipt Radiation Surveys and Unpacking of Packages Containing Radioactive Material,” Rev. 6
 - No. 6, “OSU Procedures for Transfer, Packaging, and Transport of Radioactive Materials Other Than Radioactive Waste,” Rev. 16
 - No. 11, “Procedures for Testing and Certification of OSU Radioactive Materials Shipping Containers,” Rev. 4
- OSU TRIGA Reactor Annual Report for the last two reporting periods

b. Observations and Findings

As noted previously, 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 generally been completed in accordance with RCHPP No. 6 procedural requirements, and DOT, and NRC regulatory requirements. A few minor discrepancies were noted but these were promptly corrected by the licensee.

The training of the staff members responsible for shipping the material was reviewed. Annual training had been conducted in accordance with licensee procedure. This training frequency ensured that the “shippers” were cognizant of the latest shipping regulations and exceeded the requirements specified in the regulations.

The inspector verified that the licensee maintained copies of the licenses which authorized the recipients to possess radioactive material. The recipients’ licenses were verified to be current by OSU staff prior to initiating a shipment.

During the inspection, the inspector observed the preparation of pellets of radioactive material (Antimony) for shipment to a consignee in Utah. The material, which had been irradiated in the research reactor, had been removed from the reactor and placed in a lead shielded storage container. The pellets were then loaded into the appropriate shielded shipping containers (Type A

packages) and the containers were surveyed. The radiation levels for the shipment were measured on contact and at one meter from the containers. The survey results allowed the licensee to determine the activity present and the category of label that should be applied (determined to be a Yellow - III shipment) to the containers. The survey information also provided the licensee with the data needed to determine the proper Transport Index. The applicable labels were filled out with the required information and these were attached to the shipping containers. Other labels were applied which indicated the type of package used, the proper shipping name and U.N. identification number. The shipping paperwork was completed in accordance with the regulatory requirements specified in DOT regulations. No problems or deficiencies were noted.

c. Conclusion

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

7. Exit Interview

The inspection scope and results were summarized with licensee representatives at the conclusion of the inspection on January 17, 2019. The inspector discussed the findings for each area reviewed. The licensee acknowledged the inspection findings and did not identify any material reviewed by the inspector as proprietary.

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

K. Combs	Health Physicist
C. Kulah	Senior Reactor Operator
S. Menn	Senior Health Physicist
C. Olney	Reactor Supervisor
S. Reese	Director, Radiation Center
R. Schickler	Reactor Administrator
R. Smith	Development Engineer

Other Personnel

D. Harlan	Chair, Reactor Operations Committee, and OSU Radiation Safety Officer
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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

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
DOT	Department of Transportation
HP	Health Physics/Health Physicist
IP	Inspection Procedure
mrem	millirem
NRC	U.S. Nuclear Regulatory Commission
OSU	Oregon State University
OSTROP	Oregon State University TRIGA Reactor Operating Procedure
RCHPP	Radiation Center Health Physics Procedure
Rev.	Revision
RO	Reactor Operator
ROC	Reactor Operations Committee
SHP	Senior Health Physicist

SRO	Senior Reactor Operator
SSCs	Structures, Systems, and Components
TLD	Thermoluminescent Dosimeter
TSs	Technical Specifications
TRIGA	Training, Research, Isotopes, General Atomics
WSR	Work Surveillance Report