April 21, 2016

Mr. Ralph Butler, Executive Director
University of Missouri-Columbia
Research Reactor Center
1513 Research Park Drive
Columbia, MO 65211

SUBJECT: UNIVERSITY OF MISSOURI – COLUMBIA RESEARCH REACTOR
U. S. NUCLEAR REGULATORY COMMISSION ROUTINE INSPECTION
REPORT NO. 50-186/2016-202 AND NOTICE OF VIOLATION

Dear Mr. Butler:

From March 22-24, 2016, the U.S. Nuclear Regulatory Commission (NRC or the Commission) completed an inspection of the University of Missouri-Columbia Research Reactor. The enclosed report documents the inspection results, which were discussed on March 24, 2016, with Mr. Nathan Hogue, Health Physics and Safety Manager, and members of your staff.

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, the NRC has determined that a Severity Level IV violation of NRC requirements occurred. The violation was evaluated in accordance with the NRC Enforcement Policy included on the NRC's Web site at www.nrc.gov; select **What We Do, Enforcement,** and then **Enforcement Policy**. The violation is cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding it are described in detail in the subject inspection report. The violation is being cited in the Notice because it constitutes a failure to meet regulatory requirements that has more than minor safety significance and the licensee failed to identify the violation.

The NRC has concluded that information regarding the reason for the violation, the corrective actions taken and planned to correct the violation and prevent recurrence were adequately addressed during the inspection and documented in this inspection report. Therefore, you are not required to respond to this letter unless the description herein does not accurately reflect your corrective actions or your position. In that case, or if you choose to provide additional information, you should follow the instructions specified in the enclosed Notice. 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 and its enclosures will be available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (Agencywide Document Access 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).

If you have any questions concerning this inspection, please contact Mr. Johnny Eads at 301-415-0136 or by electronic mail at Johnny.Eads@nrc.gov .

Sincerely,

/RA

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

Docket No. 50-186
License No. R-103

Enclosures:
1. Notice of Violation
2. NRC Inspection Report No. 50-186/2016-202

cc: See next page

cc:

Les Foyto, Associate Director
Reactor and Facilities Operations
University of Missouri – Columbia
Research Reactor Center
1513 Research Park Drive
Columbia, MO 65211

Homeland Security Coordinator
Missouri Office of Homeland Security
P.O. Box 749
Jefferson City, MO 65102

Planner, Dept of Health and Senior Services
Section for Environmental Public Health
P.O. Box 570
Jefferson City, MO 65102-0570

Deputy Director for Policy
Department of Natural Resources
1101 Riverside Drive
Fourth Floor East
Jefferson City, MO 65101

A-95 Coordinator
Division of Planning
Office of Administration
P.O. Box 809, State Capitol Building
Jefferson City, MO 65101

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

If you have any questions concerning this inspection, please contact Mr. Johnny Eads at 301-415-0136 or by electronic mail at Johnny.Eads@nrc.gov .

Sincerely,

/RA/

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NAME	JEads	NParker	AMendiola
DATE	04/20/2016	04/20/2016	04/21/2016

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NOTICE OF VIOLATION

University of Missouri – Columbia
Research Reactor

Docket No. 50-186
License No. R-103

During a U.S. Nuclear Regulatory Commission (NRC) inspection conducted March 22-24, 2016, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

The regulations Title 10 of the Code of Federal Regulations (10 CFR) paragraph 50.59(c)(1) states, in part, that "a licensee may conduct tests or experiments not described in the final safety analysis report (as updated) without obtaining a license amendment pursuant to Section 50.90 only if a change to the technical specifications incorporated in the license is not required."

Contrary to the above in 2014, the licensee conducted an experiment without obtaining a license amendment when a Technical Specification (TS) change was required. Specifically the experiment involved the production of I-131 radiochemical sodium iodine solution and TS changes were needed to impose controls necessary to allow irradiation and processing of non-fueled experiments to produce iodine-131.

This has been determined to be a Severity Level IV violation (Section 6.1.D.2).

The NRC has concluded that information regarding the reason for the violation, the corrective actions planned and taken to correct the violation and prevent recurrence were adequately addressed during the inspection and documented in this inspection report. Therefore, you are not required to respond to this letter unless the description herein does not accurately reflect your corrective actions or your position. In that case, or if you choose to respond, clearly mark your response as a "Reply to a Notice of Violation," include the violation number, and send it to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001 with a copy to the Director, Office of Nuclear Reactor Regulation, within 30 days of the date of the letter transmitting this Notice of Violation (Notice).

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001. Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390, "Public, inspections, exemptions, request for withholding, " paragraph (b), to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

In accordance with 10 CFR 19.11, “Posting of Notices to Workers,” you may be required to post this Notice within two working days.

Dated this 21st day of April, 2016

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

Docket No.	50-186
License No.	R-103
Report No.:	50-186/2016-202
Licensee:	University of Missouri – Columbia
Facility:	University of Missouri – Columbia Research Reactor
Location:	Research Park Columbia, Missouri
Dates:	March 22-24, 2016
Inspector:	Johnny Eads
Approved by:	Anthony J. Mendiola, Chief Research and Test Reactors Oversight Branch Division of Policy and Rulemaking Office of Nuclear Reactor Regulation

Enclosure 2

EXECUTIVE SUMMARY

University of Missouri – Columbia
University of Missouri – Columbia Research Reactor
Report No. 50-186/2016-202

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the University of Missouri – Columbia (the licensee's) 10 Megawatt Class I research reactor safety program, including: (1) effluent and environmental monitoring, (2) experiments, (3) review and audit and design change functions, (4) procedures, (5) radiation protection, 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 the NRC requirements.

Effluent and Environmental Monitoring

- Effluent monitoring satisfied license and regulatory requirements.

- Releases were within the specified regulatory and Technical Specifications (TSs) limits.

Experiments

- The program for reviewing and conducting experiments satisfied TSs and current procedural requirements.

- Changes/amendments to existing experiments were reviewed and approved as required.

Review and Audit and Design Change Functions

- The Reactor Advisory Committee acceptably completed the review, audit, and oversight functions required by TS 6.1.

- Design changes were reviewed and approved in accordance with TS requirements and the licensee's written procedures.

- One violation was noted for failure to request a TS amendment in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59.

Procedures

- The procedure review, revision, control, and implementation program satisfied TSs requirements.

Radiation Protection

- Surveys were completed and documented as specified by procedure and were outlined in the Annual Report.

- Postings and notices generally met regulatory requirements.

- Staff personnel were wearing dosimetry as required and recorded doses were within the regulatory limits.

- Radiation survey and monitoring equipment was being maintained and calibrated as required.

- The Radiation Protection and As Low As Reasonably Achievable Programs satisfied regulatory requirements.

- Annual reviews of the Radiation Protection Program were being completed by the licensee as required by 10 CFR Part 20.

Transportation of Radioactive Material

- Radioactive material was being shipped in accordance with the applicable regulations.

REPORT DETAILS

Summary of Facility Status

The University of Missouri – Columbia (the licensee) Research Reactor (MURR) continued to be operated in support of isotope production, silicon irradiation, reactor operator training, and various types of research. During the inspection, the reactor was operated continuously, following the weekly maintenance shutdown, to support laboratory experiments and product irradiation.

1. Effluent and Environmental Monitoring

a. Inspection Scope (Inspector Procedure [IP] 69004)

The inspector reviewed the following to verify compliance with the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for Protection Against Radiation," Technical Specification (TS) 3.7, and the environmental monitoring program outlined in various procedures:

- Quarterly reports of environmental thermoluminescent dosimeter (TLD) results
- Results of the analyses of environmental vegetation, soil, and water samples
- MURR Reactor Operations Annual Report for the period from January 1, 2015, through December 31, 2015

b. Observations and Findings

(1) Gaseous and Liquid Releases

The inspector determined that gaseous releases continued to be monitored as required, were acceptably analyzed, and were documented in the annual operating reports. Airborne concentrations of gaseous releases were noted to be within the concentrations stipulated in 10 CFR Part 20, Appendix B, Table 2 and the limits stipulated in the TS. The dose rate to the public, as a result of the gaseous releases, was below the dose constraint specified in 10 CFR 20.1101(d).

The liquid releases from the facility to the sanitary sewer also continued to be monitored as required, were acceptably analyzed, and were documented in the annual reports. The inspector reviewed the analyses of the liquid that had been released and noted that the releases were within the limits specified in 10 CFR Part 20, Appendix B, Table 3.

(2) Environmental Soil, Water, and Vegetation Samples

The inspector reviewed the results of the environmental soil, water, and vegetation samples that were collected, prepared, and analyzed during 2015. These samples had all been collected and analyzed as required

and within the time frame established by procedure. No significant issues were identified.

(3) Environmental Monitoring using TLDs

On-site and off-site gamma radiation monitoring was completed using the reactor facility stack effluent monitor and various environmental TLDs in accordance with the applicable procedures. Review of the data indicated that there were no measurable doses above any regulatory limits.

c. Conclusion

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

2. Experiments

a. Inspection Scope (IP 69005)

The inspector reviewed the licensee's program for conducting experiments and selected aspects of the following to verify compliance with TSs 3.6 and 6.1.f:

- Listing of current experiments
- Current list of reactor utilization requests (RURs)
- MURR Reactor Operations Annual Report for the period from January 1, 2015, through December 31, 2015

b. Observations and Findings

The experiments conducted at the facility were required to be evaluated and reviewed using MURR administrative procedure AP-RO-135, "Reactor Utilization Requests." The procedure required that all experiments be reviewed and approved by the Reactor Manager and the Reactor Health Physics Manager. An individual proposing a new experiment was required to evaluate the irradiation of the target material to determine that, if performed within the limitations stated in the RUR safety evaluation, the irradiation experiment would remain within the TS limits for experiments. The safety evaluation included a review of: (1) thermal effects, (2) possible sample decomposition and pressure effects, (3) experiment failure, (4) loss of coolant flow, (5) failure of other experiments, (6) corrosive effects of the sample, and (7) possible explosive potential. The evaluation was also required to address post-irradiation sample handling procedures, detection of radioactivity produced, radiation hazards, and reactivity worth. If the experiment under review did not involve a new class of experiment or a question pursuant to 10 CFR 50.59, the Reactor Manager would then approve the RUR. Any RURs involving a new class of experiment or a safety question were required to be reviewed by the Reactor Safety Subcommittee. These RURs were then reviewed and, if properly analyzed and found to be acceptable, were approved by the Reactor Advisory Committee (RAC).

The inspector noted that the RURs most commonly used at the facility were for product or sample irradiation. The inspector reviewed various recently approved RURs or amendments to previously approved RURs that had been submitted for review and approval. The experiments had been evaluated in accordance with TS requirements and the accompanying data sheets indicated that they were within reactivity limits. The safety analysis for each had been performed and the reviews and approvals completed.

The inspector noted that the experiments in progress during the inspection were conducted with the cognizance of the reactor manager and the licensed Senior Reactor Operator, and in accordance with TS requirements (e.g., reactivity limitations). The experiments reviewed by the inspector were being conducted in accordance with procedure and the materials produced were handled and transferred as required.

c. Conclusion

The program for reviewing and conducting experiments satisfied TS and procedural requirements. Changes/amendments to existing experiments were reviewed and approved as required.

3. Review and Audit and Design Change Functions

a. Inspection Scope (IP 69007)

In order to verify that the licensee had established and conducted reviews and audits as required by 10 CFR Part 20 and TS 6.1, the inspector reviewed:

- Radiation Protection Program/materials license audits for 2015
- Other selected audits and reviews completed by management and Health Physics (HPs) personnel
- Selected subcommittee meeting minutes from April 2015 to the present, including the Isotope Use Subcommittee, the Reactor Safety Subcommittee, and the Reactor Procedure Review Subcommittee
- MURR RAC meeting minutes and related documents, from April 2015 to the present
- MURR Administrative Policy, POL-3, “MURR Radiation Protection Program,” Revision (Rev) 13, issued December 9, 2013
- MURR Reactor Operations Annual Report for the period from January 1, 2015, through December 31, 2015

b. Observations and Findings

The inspector reviewed the meeting minutes of the RAC from April 2015 to the present and the meeting minutes of various subcommittees from April 2015 to the present. The minutes and associated documents indicated that the RAC met at the required frequency and that a quorum was present.

The topics considered during the committee meetings and during the subcommittee meetings were appropriate and as stipulated in the TS.

The inspector reviewed the 2015 audit of the licensee's Radiation Protection Program. No significant issues were identified during the audit, but several areas for improvement were noted. The inspector also reviewed the HP Manager's response to the audit findings to address each of the areas for improvement. The audits and responses to the audits appeared to be acceptable.

The inspector also reviewed the dose to target charts and as low as reasonably achievable (ALARA) reviews for 2015. These documents were prepared by the HP Manager for an annual review of the Radiation Protection Program. They provided an overview of the dosimetry results and exposure goals for each separate group working at MURR. The data was also used to establish new exposure goals for the various groups. The charts and reviews illustrated and documented the licensee's continued efforts to reduce personnel dose and maintain doses ALARA.

The licensee has an established design change review function implemented at the facility through MURR procedures AP-RR-003 and AR-RO-115. The procedures address changes to the facility Hazards Summary Report (HSR), modifications to the facility, changes to MURR procedures, new tests or experiments not described in the HSR, revisions to the U.S. Nuclear Regulatory Commission (NRC) approved analysis methodology, and/or proposed compensatory actions to address degraded or non-conforming conditions. It includes the screening and safety review of changes, tests, or experiments to determine if, pursuant to 10 CFR 50.59, a change required the NRC approval prior to being implemented. The inspector found procedures in place to control the review process and evidence of adherence to the procedures.

The inspector reviewed design changes completed and approved from April 2015 to the present and found that the changes were made in accordance with the licensee's procedures.

The inspector reviewed a previously identified Unresolved Item (URI) 50-186/2015-201-01 concerning various modifications related to Project Authorization (RL-76), "Production of I-131 Radiochemical Sodium Iodine Solution." As a result of this review the inspector determined that a violation of 10 CFR 50.59 had occurred.

The regulations in 10 CFR 50.59(c)(1) states, in part, "that a licensee may conduct tests or experiments not described in the final safety analysis report (as updated) without obtaining a license amendment pursuant to Section 50.90 only if a change to the technical specifications incorporated in the license is not required."

Contrary to the above in 2014, the licensee conducted an experiment without obtaining a license amendment when a TS change was required. Specifically the experiment involved the production of I-131 radiochemical sodium iodine solution and TS changes were needed to impose controls necessary to allow irradiation and processing of non-fueled experiments to produce iodine-131.

This has been determined to be a Severity Level IV violation (50-186/2016-202-01).

Subsequent to issuance of the URI (50-186/2015-201-01) in 2015, the licensee submitted a TS amendment request dated July 20, 2015 in order to produce the radiochemical sodium iodide (I-131). Following a review of the request, the NRC issued TS Amendment No. 37 dated, March 11, 2016. Specifically the amendment added the following TS requirements.

1. Revise TS 3.6, “Experiments,” to establish a specific limit on I-131 inventory for non-fueled experiments intended to produce I-131, and require that non-fueled experiments for I-131 production be processed in hot cells that are vented to the exhaust stack through carbon filters;

2. Add TS 3.11, “Iodine 131 Processing Hot Cells,” to establish limiting conditions of operation for the ventilation, radiation monitoring, and carbon filtration systems needed to process I-131 in the I-131 processing hot cells; and

3. Add TS 5.7, “Iodine 131 Processing Hot Cells,” to establish surveillance requirements for the equipment specified in TS 3.11.

The issue was identified as having low safety significance based on the fact that although the licensee failed to initially identify the need to request a change to the TS, the licensee had established and implemented the same administrative controls as part of their initial experiment approval. Although the licensee had identified and implemented these administrative controls prior to conducting the experiment, these controls lacked the formality of TS requirements. Although the licensee installed the iodine processing equipment in 2014, only limited acceptance testing of the iodine production experiment had been conducted when the NRC identified the URI related to this issue in May 2015. In May 2015, the licensee notified the NRC that it had ceased irradiations for this experiment pending full NRC review and approval of the process.

The inspector also determined that the licensee’s failure to request the TS amendment did not impede the regulatory process based on the fact that the licensee had in 2014 and 2015 communicated its intentions related to I-131 production to the NRC to allow NRC review and inspections in this area.

During the inspection, the licensee identified that the root cause of the violation was the misinterpretation by licensee management that existing TSs 3.6.a and 3.6.o encompassed the use of the required filtration and radiation monitoring equipment for this activity, and no additional TS changes were required.

This misinterpretation lead to the determination that 10 CFR 50.59 process was an acceptable mechanism for making these changes to the facility.

The licensee identified the following corrective actions to prevent recurrence, including:

1. Submitted the required TS amendment and received subsequent NRC approval.

2. Revise administrative procedure AP-RR-003, "10 CFR 50.59 Evaluations," with additional steps to ensure that the provisions of 10 CFR 50.59(c)(2) are understood and must be accomplished without mitigation features.

3. Conduct additional training to all Reactor Operations personnel on this event.

These corrective actions appeared to be appropriate and will be reviewed during a future NRC inspection. The licensee was informed that failure to request a TS amendment in accordance with 10 CFR 50.59 was a violation (VIO) of 10 CFR 50.59 (VIO 50-186/2016-202-01).

c. Conclusion

Review, oversight, audit functions required by the TS were acceptably completed by the RAC. Design changes were reviewed and approved in accordance with TSs requirements and the licensee's written procedures. One VIO was identified.

4. Procedures

a. Inspection Scope (IP 69008)

To verify compliance with TSs 6.1.b and 6.1.c, the inspector reviewed selected portions of the following procedures:

- MURR Procedure AP-RR-003, "10 CFR 50.59 Evaluations," Rev. 9, issued July 08, 2014
- MURR Procedure RP-HP-125, "Modification and Documenting a Survey," Rev. 3, issued October 22, 2015

b. Observations and Findings

Procedures can be created by any subject matter expert, making them the owner. The annual reviews were completed by the owners, as required, but changes can be made at any point during the year.

TS 6.1.b requires written procedures for the preparation and shipping of byproduct material and radiological control procedures for said shipments. The inspectors reviewed the procedures and observed them properly being used. TS 6.1.c requires review from the RAC for changes and modifications. The inspector reviewed the associated procedures as well as the RAC reviews and generally found them being implemented appropriately.

c. Conclusion

The procedure review, revision, control, and implementation program satisfied TS requirements.

5. Radiation Protection

a. Inspection Scope (IP 69012)

The inspector reviewed the following to verify compliance with 10 CFR Part 19 "Notices, Instructions and Reports to Workers: Inspection and Investigations," and 10 CFR Part 20 and the applicable licensee TS requirements and procedures:

- MURR dosimetry records for 2015 and 2016 to date
- Dose report review forms for 2015
- Selected radiation and contamination survey records for the past year
- Radiological signs and posting in various facility laboratories and in the Laboratory Building Basement area
- Calibration and periodic check records for selected radiation survey and monitoring instruments for the past 2 years
- MURR Administrative Policy, POL-3, "MURR Radiation Protection Program," Rev. 13, issued December 9, 2013
- MURR Reactor Operations Annual Report for the period from January 1, 2015, through December 31, 2015

The inspector also toured the MURR facility and observed the use of dosimetry and survey meters.

b. Observations and Findings

(1) Surveys

Daily, monthly, and other periodic contamination and radiation surveys, outlined in the licensee's Reactor Operations Annual Report for 2015, were completed by HP staff members. Any contamination detected in concentrations above established action levels was noted and the area or item was decontaminated. Results of the surveys were typically documented on survey maps and posted at the entrances to the various areas surveyed so that facility workers and visitors would be aware of the radiological conditions that existed therein.

(2) Postings and Notices

Copies of current notices to workers were posted in appropriate areas in the facility. The copies of NRC Form 3 noted at the facility were the latest issue, as required by 10 CFR Part 19, and were posted in various areas throughout the facility such as the main bulletin board, the main hallways, and at the entrance to the beam port floor area. The inspector determined that appropriate radiological signs, as well as current copies of the survey maps (as noted above), were typically posted at the entrances to controlled areas. Other postings also showed the industrial hygiene hazards that were present in the areas.

(3) Dosimetry Use and Results

Through direct observation, the inspector determined that dosimetry was acceptably used by facility and contractor personnel. The inspector determined that, last year, the licensee used optically stimulated luminescent (OSL) dosimetry for whole body monitoring and TLDs in the form of finger rings and wrist badges for extremity monitoring. An examination of the OSL and TLD results indicating radiological exposures at the facility for the past year showed that the highest occupational doses, as well as doses to the public, were within 10 CFR Part 20 limits.

(4) Radiation Monitoring Equipment

Examination of selected radiation monitoring equipment indicated that the instruments had the acceptable up-to-date calibration sticker attached. A review of selected instrument calibration records indicated that the calibration of swipe counters and portal monitors was typically completed by licensee staff personnel. Other instruments, such as portable survey meters, friskers, and neutron detectors were shipped to vendors for calibration. Calibration frequency met procedural requirements and records were maintained as required.

The inspector noted that area radiation monitors, as well as air monitors and stack monitors, were also being calibrated as required. These monitors were also typically calibrated by licensee staff personnel.

(5) Radiation Protection and ALARA Programs

The licensee's Radiation Protection and ALARA Programs continued to be established and described in the MURR Administrative Policy, POL-3, "MURR Radiation Protection Program," and implemented through the various HP procedures that had been reviewed and approved. The programs contained instructions concerning organization, training, monitoring, personnel responsibilities, and audits. The programs, as outlined and established, appeared to be acceptable. The inspector verified that annual reviews of the Radiation Protection Program were being completed by the licensee as required by 10 CFR Part 20. The MURR management ALARA efforts were well organized and continued to produce dose reduction results. ALARA goals were set and performance indicators were established. Each group in the MURR organization had an established ALARA goal for the year, and the facility dose was tracked by group, as well as for each individual.

The ALARA Program provided instructions and guidance for keeping doses ALARA and was consistent with 10 CFR Part 20 requirements. MURR management and staff continued their efforts to maintain personal doses ALARA.

(6) Radiation Work Permit Program

The inspector reviewed selected radiation work permits that had been written, used, and closed out during 2015. It was noted that the instructions specified in MURR Procedure AP-HP-105, Attachment 7.1, and those on the associated forms (e.g., Form FM-17, "Radiation Work Permit Instructions") had been followed. Appropriate review by management and HPs personnel had been completed. The controls specified in the radiation work permits were acceptable and applicable for the type of work being done.

(7) Facility Tours

On various occasions during the inspection, the inspector toured the hot cell area and selected support laboratories with licensee representatives. The inspector noted that facility radioactive material storage areas were generally properly posted. Radiation and high radiation areas were generally posted and properly controlled as required.

c. Conclusion

The inspector determined that the Radiation Protection and ALARA Programs, as implemented by the licensee, generally satisfied regulatory requirements. Specifically, (1) surveys were generally completed and documented acceptably to permit evaluation of the radiation hazards present; (2) postings generally 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 Program was acceptable and was being reviewed annually as required.

6. Transportation of Radioactive Material

a. Inspection Scope (IP 86740)

To verify compliance with regulatory and procedural requirements for transferring or shipping licensed radioactive material, the inspector reviewed the following:

- Selected records of various types of radioactive material shipments for 2015 and to date in 2016
- Selected training records for staff personnel authorized to ship radioactive material

b. Observations and Findings

During the inspection, the inspector reviewed selected records of various types of radioactive material shipments for 2015 and to date in 2016. The inspector noted adherence to procedures and attention to maintaining radiation doses ALARA. Shipping personnel reviewed the irradiation records and the contents of the packages were verified using gamma spectroscopy. Shipping papers were prepared by one person and reviewed for accuracy and completeness by a second staff member. The licensee verified consignee information (i.e., possession of a license to receive radioactive materials, address, and contact information). Throughout the shipping process, it was noted that MURR staff members were knowledgeable of their duties and conducted a thorough review of all documentation.

The inspector verified that the licensee maintained on file copies of consignees' licenses to possess radioactive material as required. As noted above, the license of each specific consignee was verified to be current prior to initiating a shipment. Some licensees had received timely renewal extensions. The amount of radioactive material being shipped was compared to that amount authorized by the license. The inspector also verified that the licensee staff members who were designated as "shippers" had received training within the last 3 years.

By letter dated March 4, 2016, the licensee submitted a written report in accordance with 10 CFR 71.1, "Communications and Records," as required by 10 CFR 71.95(b) regarding conditions in the Certificate of Compliance (CoC) that

were not met during shipment for Safkeg-HS 3977A, USA/9338/B(U)-96. Specifically, contrary to Section 5(b)(2) of the CoC, mixtures of nuclides were shipped where the sum of proportionate amounts of each nuclide with respect to quantities shown in Section 5(b)(2)(i) Table 1 exceeded unity. Follow-up on this issue was identified as an URI (50-186/2016-202-02) to allow additional time for NRC review of this reported event.

c. Conclusion

Radioactive material was generally being shipped in accordance with the applicable regulations.

7. Exit Interview

The inspection scope and results were summarized on March 24, 2016, with members of licensee management and staff. The inspector described the areas inspected and discussed in detail the inspection findings. The licensee acknowledged the results of the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

J. Cox	Shipping Manager
J. Ernst	Senior Advisor
J. Fruits	Reactor Manager
N. Hogue	Health Physics and Safety Manager
C. Schnieders	Health Physics Supervisor

INSPECTION PROCEDURES USED

IP 69004	Class 1 Research and Test Reactor Effluent and Environmental Monitoring
IP 69005	Class 1 Research and Test Experiments
IP 69007	Class 1 Research and Test Reactor Review and Audit and Design Change Functions
IP 69008	Class 1 Research and Test Reactor Procedures
IP 69012	Class 1 Research and Test Reactor Radiation Protection
IP 86740	Inspection of Transportation Activities

ITEMS OPENED, CLOSED, AND/OR DISCUSSED

Opened

50-186/2016-202-01	VIO	Failure to request a TS amendment as required by 10CFR50.59
50-186/2016-202-02	URI	Follow up on facility modifications related to production of I-131

Closed

50-186/2015-201-01	URI	Follow up on facility modifications related to production of I-131

LIST OF ACRONYMS USED

ALARA	As low as reasonably achievable
CoC	Certificate of Compliance
10 CFR	Title 10 of the *Code of Federal Regulations*
HP	Health Physics
HSR	Hazards Summary Report
I-131	Radiochemical Sodium Iodide
IP	Inspection Procedure
MURR	University of Missouri – Columbia Research Reactor
NRC	U.S. Nuclear Regulatory Commission
OSL	Optically stimulated luminescent (dosimeter)
RAC	Reactor Advisory Committee
Rev.	Revision
RUR	Reactor Utilization Requests
TLD	Thermoluminescent dosimeter
TS	Technical Specifications
URI	Unresolved Item
VIO	Violation