November 18, 2008

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

SUBJECT: NRC INSPECTION REPORT NO. 50-186/2008-203

Dear Mr. Butler:

This letter refers to the inspection conducted on November 3–6, 2008, at the University of Missouri Research Reactor facility. The enclosed report documents the inspection results, which were discussed on November 6, 2008, with Walt Meyer, Chief Operations Officer, Les Foyto, Reactor Manager, and other members of your staff.

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

In accordance with 10 CFR 2.390 of the NRC's, "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 Publicly Available Records (PARS) component of NRC's document 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 Craig Bassett at 404-358 6515.

Sincerely,

/RA/

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

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

Enclosure: NRC Inspection Report No. 50-186/2008-203
cc w/enclosure: Please see next page

cc:

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

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ACCESSION NO.: ML083220334 **TEMPLATE #: NRR-106**

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

Docket No.	50-186
License No.	R-103
Report No.	50-186/2008-203
Licensee:	University of Missouri-Columbia
Facility:	University of Missouri Research Reactor
Location:	Research Park Columbia, Missouri
Dates:	November 3–6, 2008
Inspector:	Craig Bassett
Accompanied by:	Jack Donohue
Approved by:	Johnny H. Eads, Branch Chief Research and Test Reactors Branch B Division of Policy and Rulemaking Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

University of Missouri - Columbia
University of Missouri Research Reactor
Report No. 50-186/2008-203

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the licensee's Class I research and test reactor safety program. This included a review of: organizational structure and functions, review and audit and design change functions, operator requalification, reactor operations, maintenance and surveillance, fuel handling, experiments, procedures, and emergency preparedness. The review covered the period of time from the last NRC inspection of these areas to the present. The licensee's program was found to be acceptably directed toward the protection of public health and safety. No violations or deviations were noted.

Organizational Structure and Functions

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

Review and Audit and Design Change Functions

- The Reactor Advisory Committee and associated subcommittees were meeting as required and were conducting reviews and audits of the topics outlined in the Technical Specifications.

- The review and evaluation of changes to facilities and procedures satisfied NRC requirements specified in 10 CFR 50.59.

Operator Requalification

- Operator requalification was conducted as required by the Requalification Program and the program was being maintained up-to-date.

- Operators were receiving their biennial physical examinations as required.

Reactor Operations

- Reactor operations were conducted in accordance with written procedure and were acceptable.

- Operations shift turnovers and operator cognizance of facility conditions were acceptable.

- Various daily and weekly meetings were being held to ensure proper planning and preparation.

- The Corrective Action Program implemented by the licensee was functioning as designed.

Maintenance and Surveillance

- The Work Control Program established and implemented by the licensee was being used to effectively complete maintenance and surveillance activities at the facility.

- The surveillance program satisfied Technical Specification requirements.

Fuel Handling

- Fuel movements and inspections were conducted in accordance with Technical Specification and procedural requirements.

Experiments

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

Procedures

- The procedure revision, control, and implementation program satisfied Technical Specifications requirements.

Emergency Preparedness

- The emergency preparedness program was conducted in accordance with the Emergency Plan.

- Training was being conducted annually as required.

- Emergency response equipment was available and being inventoried and maintained as required.

- Emergency drills were being conducted annually as required by the Emergency Plan.

REPORT DETAILS

Summary of Plant Status

The University of Missouri Research Reactor 10 megawatt research and test reactor continued to be operated in support of laboratory experiments, reactor operator training, various types of research, and irradiation of various target materials. During the inspection, the reactor was operated 24-hours per day (except during the maintenance period on Sunday night and Monday morning) to support laboratory experiments and conduct product irradiation.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedure [IP] 69006)

To verify that the licensee was complying with the requirements specified in Section 6.1 of the University of Missouri Research Reactor (MURR) Technical Specifications (TS), Revision (Rev.) 14, authorized by Amendment No. 34 to the facility license, dated October 10, 2008, the inspector reviewed selected aspects of the following:

- MURR organization and staffing
- Management and staff responsibilities outlined in the TS
- MURR Control Room Logbooks for the period from October 2007 through the present
- MURR Console Watch Logbooks for the period from October 2007 through the present

b. Observations and Findings

The inspector noted that the organizational structure had not changed since the last inspection in the area of reactor operations (refer to NRC Inspection Report No. 50-186/2007-203). However, it was noted that, during the period since the last inspection, five individuals who were qualified reactor operators had left the organization. The individuals had found other opportunities for employment in the power reactor industry. As of the date of the inspection, three people had been hired and were in training and to become operators at the facility.

Through a review of selected reactor operations logs for the period from October 2007 through October 2008, and through interviews with operations personnel, the inspector determined that the licensee continued to operate with five crews on a four-shift rotation. This allowed the “extra crew” time for additional training and procedure review on a rotating basis. Each operating crew was staffed with three or four individuals, with at least three people per shift. Operations shifts continued to be scheduled for a period of 12 hours. Staffing during the reactor operations shifts satisfied the requirements of TS Section 6.1.i.

c. Conclusions

The MURR organizational structure and staffing were consistent with the requirements of TS Section 6.1 and Figure 6.0.

2. Review and Audit and Design Change Functions

a. Inspection Scope (IP 69007)

The inspector reviewed selected aspects of the following to ensure compliance with TS Section 6.1:

- Reactor Advisory Committee Charter, last revised February 3, 2004
- Reactor Advisory Committee meeting minutes from July 2007 through the present
- Isotope Use Subcommittee meeting minutes from June 2007 through the present
- Reactor Safety Subcommittee meeting minutes from September 2007 through the present
- Reactor Procedure Review Subcommittee meeting minutes from June 2007 through the present
- Charter of the Reactor Procedure Review Subcommittee of the Reactor Advisory Committee, last revised March 22, 2007
- "2006 Independent MURR Reactor Operations Audit," conducted by staff from the University of Missouri-Rolla, dated August 29, 2006
- "2007 Reactor Operations Procedures Audit," conducted by reactor operators and managers, dated February 25, 2008
- "2007 Emergency Plan and Implementing Procedures Audit," conducted by reactor operators and managers, dated February 25, 2008
- "2007 Review of Emergency Plan Implementing Procedures," conducted by Facility Emergency Organization members, dated February 25, 2008
- "2007 Operator Requalification Audit," conducted by a designated Senior Reactor Operator, dated December 10, 2007
- "2007 Reactor Utilization Request Audit," conducted by the Reactor Manager, dated March 7, 2008
- Modification Record 08-2, "Addition of Service Catwalk to the 15-ton Overhead Crane," package completed September 3, 2008
- Modification Record 08-3, "Replacement of Graphite Reflector Elements 1, 2, 3, 4, 6, 7, 8, and 9," package completed August 25, 2008
- Modification Record 08-4, "Replacement of Demineralized Water Storage Tanks T-300 and T-301," package completed October 20, 2008
- MURR Reactor Operations Annual Report for the period from January 1, 2007 through December 31, 2007
- MURR Administrative Procedure AP-RR-003, "10 CFR 50.59 Evaluations," Rev. 4, issued July 6, 2006
- MURR Administrative Procedure AP-RO-115, "Modification Records," Rev. 4, issued October 29, 2008

b. Observations and Findings

(1) Review and Audit Functions

Records of the meetings held from July 2007 to date in 2008 by the Reactor Advisory Committee (RAC) and those of various safety subcommittees were reviewed. Through records review, the inspector determined that meetings were held each calendar quarter as required and safety reviews were conducted by the

RAC or a designated subcommittee. Topics of these reviews were as required by the TS. It was noted that the RAC provided appropriate guidance, direction, and oversight to ensure acceptable use and operation of the reactor.

The inspector reviewed selected audits that were conducted by various managers and other assigned staff and non-staff personnel. The audits covered various aspects of the reactor facility operations and programs for calendar year 2006 and 2007. The audits appeared to be thorough and complete. No significant problems or deficiencies were found in the audits but some areas for improvement were noted. Corrective actions were taken as needed.

(2) Design Change Functions

The regulatory requirements stipulated in 10 CFR 50.59 were implemented at the facility through MURR Procedures AP-RR-003 and AR-RO-115. The procedures were developed to 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 NRC approved analysis methodology, and/or proposed compensatory actions to address degraded or non-conforming conditions. The procedures adequately incorporated criteria provided by the regulations with additional requirements mandated by local conditions.

The inspector verified that all new and revised procedures generated at the facility were screened with respect to the above procedure. Also, non-routine maintenance activities and all facility modifications were identified for screening by the facility Work Control Group with input from the on-duty operations personnel, including the Lead Senior Reactor Operator (LSRO). The procedure changes were processed through and controlled by the Document Control Coordinator while the maintenance activities and modification packages were processed through and controlled by the Assistant Reactor Manager - Operations. The inspector verified that changes to procedures were reviewed by the Procedure Review Subcommittee and that the proposed non-routine maintenance activities and facility modifications were reviewed by the Reactor Manager. The changes and modifications were typically reviewed by the Reactor Safety Subcommittee as well. The changes and modifications were subsequently reviewed and approved by the Reactor Advisory Committee as required.

The inspector reviewed selected Modification Records and 50.59 Screen Forms processed during 2007 and 2008. Each completed modification (mod) package typically consisted of a description of the mod; a Hazards Summary Report Evaluation; a Reactor Safety Evaluation; Operating, Preventative Maintenance, and Compliance Procedure and Print Evaluation; Spare Parts Requirements Evaluation; and a 50.59 Screen Form. The completed packages showed that the issues were acceptably reviewed in accordance with the procedures. It was noted that none of the changes or modifications were determined to constitute a safety question or concern and none required a license or TS amendment.

c. Conclusions

The RAC and associated subcommittees were meeting as required and reviewing the topics outlined in the TS. The design change program was comprehensive and satisfied NRC requirements.

3. Operator Requalification

a. Inspection Scope (IP 69003)

The inspector reviewed selected aspects of the following to ensure compliance with the "Operator Requalification Program - University of Missouri Research Reactor (MURR)" dated January 7, 1997, and clarified by a Memorandum dated March 30, 2001:

- Current status of operator licenses
- "Change Review Sheets" for 2007 and 2008
- "Written Examination Forms" for 2007 and 2008
- "Annual Operating Test Records" for 2007 and 2008
- Medical examination records for the past three years
- "MURR Operator Active Status Log" for 2007 and 2008
- Operator training and examination records for 2007 and 2008
- "Annual On-The-Job Training Requirements/Checklists" for 2007 and 2008
- Operator Requalification Program manual documenting training of operators

b. Observations and Findings

There were eleven qualified Senior Reactor Operators (SROs) and six Reactor Operators (ROs) on staff at the facility. The licensee indicated that there were three people in training to become operators. The inspector noted that four managers were also qualified operators (three SROs and one RO). The Requalification Program was maintained up-to-date and RO and SRO licenses were current. MURR Operator Active Status Logs and records also showed that operators maintained active duty status as required.

A review of the logs and records showed that training was being conducted in accordance with the licensee's requalification and training program. Procedure reviews and examinations had been documented as required. Information regarding facility changes and other relevant information had been routed under the Crew Review process and licensed operators acknowledged their review of this information. The inspector verified that quarterly reactor operations, reactivity manipulations, other operations activities, and Reactor Supervisor activities were being completed as required and the appropriate records were being maintained. Records indicating the completion of the annual operations tests and supervisory observations were also maintained. Biennial written examinations were being completed by the operators as required. The inspector also noted that all operators were receiving biennial medical examinations within the time frame allowed as required by the program.

The inspector reviewed the biennial requalification examination administered in November of 2007. It was noted that the exam was similar in its level of difficulty as

NRC-administered examinations. The inspector verified that an individual who failed one section of the exam was promptly removed from licensed duties until completing remedial training and passing that section of a makeup examination. It was noted that the next biennial examination was scheduled for November 2009.

c. Conclusions

Operator requalification was being conducted in accordance with the Operator Requalification Program requirements. Operators were receiving their biennial physical examinations as required.

4. Reactor Operations

a. Inspection Scope (IP 69006)

To verify that the licensee was operating the reactor, communicating plant information, and implementing the Corrective Action Program in accordance with TS Section 3 and procedural requirements, the inspector reviewed selected portions of the following:

- Operations Shift Turnover sheets for June through October 2008
- MURR Control Room Logbooks for the period from April through October 2008
- MURR Console Watch Logbooks for the period from April through October 2008
- MURR Procedure AP-RO-110, "Conduct of Operations," Rev. 13, issued September 17, 2008, and the associated forms, FM-57, "Long Form Startup Checklist," and FM-58, "Short Form Startup Checklist"
- MURR Administrative Procedure AP-RR-001, "Corrective Action Program," Rev. 10, issued May 2, 2008
- MURR Procedure OP-RO-210, "Reactor Startup - Normal," Rev. 8, issued October 1, 2008
- MURR Procedure OP-RO-220, "Reactor Shutdown or Power Reduction," Rev. 5, issued July 2, 2008
- MURR Procedure OP-RO-230, "Changing Reactor Power Level," Rev. 5, issued October 1, 2008
- MURR Reactor Operations Annual Report for the period from January 1, 2006 through December 31, 2006

b. Observations and Findings

(1) Reactor Operation

The inspector observed facility activities on various occasions during the week including routine reactor operations and the handling of samples and sample manipulating tools. Written procedures and checklists were used for each activity as required. It was noted that the reactor operators followed the procedures and were knowledgeable and professional in the conduct of their duties.

(2) Staff Communication

During the inspection, the inspector attended operations crew shift turnover meetings on Tuesday and Wednesday morning. The status of the reactor and the facility was discussed on each occasion as required. All operators of the relief crews reviewed the appropriate logs and records and were briefed on the upcoming shift activities and scheduled events before assuming the operations duty. Through direct observation and records review, the inspector verified that the content of shift turnover briefings held during each shift change was appropriate and noted that shift activities and plant conditions were discussed in detail.

The inspector attended the “Plan of the Day” (POD) meeting on Tuesday, Wednesday, and Thursday morning. The meeting, chaired by the Reactor Manager, was held daily and representatives from all organizations at the facility were in attendance. Safety-significant issues, if any, were discussed and maintenance or operating needs were presented. Any concerns or schedule conflicts were resolved during the meeting. The inspector noted that the POD meeting made everyone aware of current facility conditions and the scheduled activities for that day.

The inspector attended the “Maintenance Meeting” held on Tuesday afternoon. The meeting was chaired by the Reactor Manager and typically attended by the LSRO of the operations crew in training that week, the Assistant Reactor Manager - Physics, the Assistant Reactor Manager - Engineering, the Assistant Reactor Manager - Operations, the Work Control Manager, and persons from the various facility support groups. The schedule for the maintenance activities to be conducted during the next scheduled shutdown was presented and discussed in detail. (A scheduled shutdown is conducted every Sunday night through Monday morning.) Needed materials and support group assistance was reviewed and coordinated. All routine, periodic maintenance and surveillance items were tracked through the Work Control Program.

The inspector also attended the “Operations Weekly Meeting” held on Thursday morning. The meeting was chaired by the Reactor Manager and typically attended by the operations crew in training that week, the Assistant Reactor Manager - Physics, the Assistant Reactor Manager - Engineering, the Assistant Reactor Manager - Operations, and other invited persons. The meeting was held to keep the operators informed of the facility status and ongoing and planned activities.

(3) Corrective Action Program

The inspector reviewed the licensee’s Corrective Action Program (CAP) which had been developed to provide staff members with a formal process to identify deficiencies and bring safety and other issues of concern to management’s attention for resolution. The program was designed so that anyone could identify a discrepancy, concern, or improvement opportunity and enter the issue into the CAP system via the MURR intranet. When issues were identified, each one was screened for safety significance, evaluated to determine the cause and its

contributing factors, and assigned to a responsible manager for resolution. Corrective actions were developed and implemented consistent with the significance of the issue and according to an established schedule. The status of each CAP issue was tracked and staff members could check on the issue of their concern whenever they wanted.

Events that were determined to be "safety significant" were reviewed by an Event Review Team (ERT) when such a review was deemed necessary by the Reactor Manager. If needed, an ERT was then convened to collect the facts so that complete and accurate root and contributing causes could be determined. It was also the team's responsibility to develop corrective actions to prevent occurrence and/or recurrence of the same or similar problems. This year, to date, there had been three events that were designated as safety significant. The inspector reviewed those events and found that the licensee had taken corrective actions as necessary.

c. Conclusions

MURR reactor operations, as well as shift turnovers and operator cognizance of facility conditions during startup and routine operation, were acceptable. Various daily and weekly meetings were being held to ensure proper planning and preparation for operations activities. The Corrective Action Program was functioning as required by procedure.

5. Maintenance and Surveillance

a. Inspection Scope (IP 69006, 69010)

To verify that the licensee was meeting the requirements of their Preventive Maintenance Program and complying with TS, the inspector reviewed selected aspects of:

- "Maintenance Lists" for 2007 and 2008
- Selected MURR Compliance Procedures
- Entries in the "Completed PM's Notebook"
- Various "Preventive Maintenance Requirement Cards"
- Selected Compliance Procedure data sheets and records
- Various "Weekly Worklists for Maintenance Shutdown for 2008" kept in the "Maintenance Day Book"
- MURR Procedure AP-RR-015, "Work Control Procedure," Rev. 13, issued October 22, 2008
- MURR Procedure GS-RA-100, "MURR Equipment Tag Out," Rev. 7, issued July 30, 2008
- MURR Operator Aid OA-04, "Valve Operation," Rev. 4, issued November 1, 2007
- MURR Operator Aid OA-21, "MURR Maintenance Guidelines," Rev. 4, issued July 31, 2007
- MURR Reactor Operations Annual Report for the period from January 1, 2006 through December 31, 2006

b. Observations and Findings

(1) Maintenance

The inspector reviewed the Work Control Program that the licensee had developed to handle maintenance activities. The program was designed to ensure that all maintenance activities were screened, planned, and completed as scheduled, that post maintenance testing was conducted, and that the entire process was documented appropriately. The inspector noted that periodic surveillance activities were also scheduled through the Work Control Program. As noted previously, all these activities were discussed and coordinated through the "Maintenance Meeting" held each week. The program appeared to be very effective.

(2) Surveillance

Various periodic surveillance verifications and calibration of equipment, including the testing of various reactor systems, instrumentation, auxiliary systems, and security systems and alarms, were reviewed by the inspector. The licensee used "Compliance Procedures" (CPs) to conduct these verifications and followed the same established schedule each year. The data recorded in the Logbooks and on the CP records indicated that the verifications and calibrations had been completed on schedule and in accordance with licensee procedures. The results reviewed by the inspector were noted to be within the TS and procedurally prescribed parameters.

c. Conclusions

The Work Control Program established and implemented by the licensee was being used effectively to complete maintenance and surveillance activities at the facility. The surveillance program satisfied TS requirements.

6. Fuel Handling

a. Inspection Scope (IP 69009)

To ensure that the licensee was following the requirements of TS Sections 3.8, 4.1 and 4.3, the inspector reviewed selected aspects of the following:

- Fuel Status Board located in the Control Room
- Fuel Element Inspection Guidelines, FM-152, Rev. 1
- Selected Fuel Element Inspection Sheets for 2007 and 2008
- MURR Fuel Status Maps sheets developed by the Assistant Reactor Manager - Physics
- Visual Inspection of End Plate Surfaces forms completed for fuel elements inspected in 2007 and 2008 for end-of-life anomaly inspections
- Selected Fuel Movement Sheets developed prior to fuel movements that were typically completed on the weekly scheduled Maintenance Day and for fuel inspections

- MURR Procedure OP-RO-250, "In-Pool Fuel Handling," Rev. 9, issued September 3, 2008
- MURR Procedure RP-RO-100, "Fuel Movement," Rev. 8, issued June 6, 2008

b. Observations and Findings

The inspector reviewed the fuel movement process and verified that fuel was moved according to established procedure and in conjunction with the specific fuel movement sheets developed by the Assistant Reactor Manager-Physics for each core loading. The inspector reviewed selected fuel movement sheets for 2008. They had been developed and used for core refueling, partial core refueling, loading of spent fuel into a shipping container, and transferring new unirradiated fuel from storage to the pool. The inspector noted that proper radiation control and security precautions, required by procedure, were taken. The inspector also compared the location of fuel elements in the reactor core with the information maintained on the Fuel Status Board in the Control Room, on the current MURR Fuel Status Map, and on the fuel movement sheet for the latest core, Core Number 08-49. No problems or anomalies were noted.

The inspector also reviewed selected fuel inspection sheets that had been completed for 2007 through 2008. TS Section 5.5 requires that one out of every eight spent fuel elements be inspected for anomalies. The inspection sheets showed that the licensee noted no anomalies on the spent fuel elements inspected and that there was no swelling in the water gap between the fuel plates in the elements. The inspections were completed in compliance with TS Section 5.5.

c. Conclusions

Fuel movements and inspections were conducted in accordance with TS and procedural requirements.

7. Experiments

a. Inspection Scope (IP 69005)

The inspector reviewed selected aspects of the following to verify compliance with TS Sections 3.6 and 6.1.f:

- Listing of current experiments
- Current list of Reactor Utilization Requests
- "2007 Reactor Utilization Request Audit," conducted by the Reactor Manager, dated March 7, 2008
- MURR Reactor Utilization Request Number (No.) 428, "Bismuth Oxide," approval dated May 10, 2007, along with the associated 50.59 Screen form
- MURR Reactor Utilization Request No. 429, "Krypton, Enriched Kr-78," approval dated June 22, 2007, along with the associated 50.59 Screen form
- MURR Reactor Utilization Request No. 431, "Uranium, Low Enriched Uranium Foil," approval dated June 25, 2008, along with the associated 50.59 Screen form
- MURR Reactor Operations Annual Report for the period from January 1, 2006 through December 31, 2006

- MURR Administrative Procedure AP-RO-135, "Reactor Utilization Requests," Rev. 0, issued September 27, 2007
- MURR Procedure EX-RO-105, "Reactor Irradiation Experiments," Rev. 11, issued August 27, 2008
- MURR Procedure EX-RO-120, "Beamport 'E' Operation," Rev. 7, issued August 27, 2008
- MURR Procedure EX-RO-126, "Thermal Column Door," Rev. 4, issued November 26, 2007

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 an individual proposing a new experiment to evaluate the irradiation of the target material to determine that, if performed within the limitations stated in the RUR safety analysis, the irradiation experiment would remain within the TS limits for experiments. The safety analysis 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 analysis was also required to address post irradiation sample handling procedures, detection of radioactivity produced, radiation hazards, and reactivity worth. Each RUR, or revision, was required to be reviewed by the Assistant Reactor Manager – Physics and the Health Physics Manager. 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 they were properly analyzed and acceptable, were approved by the RAC.

The inspector reviewed selected RURs that had been submitted. The experiments had been evaluated in accordance with TS requirements and data sheets indicated that they were within reactivity limits. The analysis for each had been performed and the reviews and approvals completed. The experiments were conducted with the cognizance of the reactor manager and the LSRO, 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. Conclusions

The program for reviewing and conducting experiments satisfied TS and procedural requirements.

8. Procedures

a. Inspection Scope (IP 69008)

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

- MURR Procedure AP-HP-105, "Radiation Work Permit," Rev. 8, issued July 30, 2008
- MURR Procedure AP-RR-002, "Deviation From Procedure," Rev. 0, issued September 10, 2007
- MURR Procedure AP-RR-005, "Security of "For Official Use Only" Information," Rev. 1, issued October 23, 2007
- MURR Procedure AP-RR-006, "Fingerprinting Program Required As Part Of Granting Unescorted Access," Rev. 0, issued July 13, 2007
- MURR Procedure AP-RR-007, "Signature Authorization," Rev. 0, issued December 28, 2007
- MURR Procedure FB-SH-001, "Unirradiated Fuel Shipment Using the 110-Gallon USA DOT 6M Type B Package," Rev. 0, issued July 17, 2007
- MURR Procedure RP-RO-300, "Receipt, Inspection, and Accounting of Unirradiated Fuel," Rev. 0, issued April 16, 2008
- MURR Procedure SM-RO-620, "Control Blade Leak Test," Rev. 3, issued January 4, 2008
- MURR Procedure SM-RO-661, "Pool Coolant Hold-Up Tank Welding Repair Instructions," Rev. 0, issued August 30, 2007
- MURR Reactor Operations Annual Report for the period from January 1, 2006 through December 31, 2006
- "2007 Reactor Operations Procedures Audit," conducted by reactor operators and managers, dated February 25, 2008
- "2007 Emergency Plan and Implementing Procedures Audit," conducted by reactor operators and managers, dated February 25, 2008

b. Observations and Findings

Technical Specification 6.1.b required that the Reactor Manager annually review and approve the Reactor Operations and Emergency Preparedness Procedures. The inspector verified that the various operations procedures, as well as the Emergency Plan Implementing procedures, were being reviewed annually as required and revised as needed.

Technical Specification 6.1.c required that the RAC review procedure changes with safety significance. The Reactor Procedure Review Subcommittee was chartered to fulfill this requirement. The inspector verified that the subcommittee was meeting as required to review current procedure revisions and changes.

The inspector noted that the majority of MURR procedures had been through a review and revision process. All the procedures that have been revised and/or reformatted in accordance with the MURR Procedure Writer's Guide were being tracked within an established database. Each month the Document Control Coordinator queried the database to flag all the procedures that were due for annual review. This allowed the authors/owners of the procedures, and the managers responsible for reviewing them, the opportunity of reviewing small sets of procedures throughout the year instead of requiring all the procedures to be reviewed at one time.

The inspector observed various activities during the inspection. All operations were conducted in accordance with procedures and no problems were noted. Procedure compliance was acceptable.

c. Conclusions

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

9. Emergency Preparedness

a. Inspection Scope (IP 69011)

The inspector reviewed selected aspects of the following to verify compliance with the Emergency Plan for the University of Missouri Research Reactor Facility, latest revision dated April 13, 2007:

- Assistance to be provided by offsite support groups
- Operations Shift Turnover sheets for April through October 2008
- MURR Emergency Call List, FM-104, Rev. 10, dated October 2, 2006
- Letter of Agreement with the City of Columbia dated October 21, 2005
- Operator Requalification Program manual documenting training of operators
- MURR Control Room Logbooks for the period from April through October 2008
- MURR Console Watch Logbooks for the period from April through October 2008
- Documentation of the 2006, 2007, and 2008 emergency drills including critiques
- "2007 Emergency Plan and Implementing Procedures Audit," conducted by reactor operators and managers, dated February 25, 2008
- "2007 Review of Emergency Plan Implementing Procedures," conducted by Facility Emergency Organization members, dated February 25, 2008
- MURR Emergency Procedures Manual, Rev. 47, dated October 2, 2008, containing MURR Emergency Procedures, EP-RO-001 through EP-RO-020
- MURR Emergency Procedures, REP-RO-100, "Reactor Emergency Procedures," Rev. 8, issued May 11, 2007
- "Radiation Incident: Code Orange," University of Missouri Hospital and Clinics, undated

b. Observations and Findings

The inspector reviewed the Emergency Plan (E-Plan) in use at the reactor and verified that the E-Plan was reviewed annually as required. The Emergency Procedures Manual (containing E-Plan implementing procedures) was also reviewed annually and revised as needed to ensure effective implementation of the E-Plan.

Through records review and interviews with Facility Emergency Organization (FEO) personnel (i.e., emergency responders), the inspector determined that they were knowledgeable of the proper actions to take in case of an emergency. Training for FEO staff members had been conducted annually as required and documented acceptably. Emergency training for operators was completed and tracked through the Operator Requalification Program.

The inspector verified that the Letter of Agreement with the City of Columbia had been maintained and updated as necessary. The agreement verified that the City of Columbia Fire Department would provide support for the facility and would be available

during an emergency. Communications capabilities with support groups were acceptable and had been periodically tested. Emergency Call Lists had been revised and updated as needed and were available in the Control Room, the front lobby, and in the various controlled copies of MURR Emergency Procedures Manuals as required. The inspector also verified that emergency equipment was being inventoried semiannually as required.

The documentation of the drills conducted during the past three years was reviewed. Emergency preparedness and response training was being completed typically just prior to the drills during the meetings held to prepare for the drills. Through drill scenario and record reviews, off-site emergency responders were determined to be knowledgeable of the proper actions to take in case of an emergency. Emergency drills had been conducted annually as required by the E-Plan. Critiques were written following the drills to document the strengths and weaknesses identified during the exercise. Action items were developed to correct the problems identified.

On Wednesday, the inspector visited the University of Missouri Hospital and observed the emergency response facilities that would be available at the hospital in case of an emergency. Since the hospital also served the emergency needs of the nearby Calloway Nuclear Power Plant, it was well supplied with staff and equipment relative to the needs of MURR. The hospital staff had also developed procedures that provided detailed instructions for first responders to use when dealing with contaminated/injured persons. The inspector noted that there were adequate supplies and equipment available to care for any injured and/or contaminated MURR licensee staff members if needed. There appeared to be a good working relationship between the licensee and this support group.

c. Conclusions

The emergency preparedness program was conducted in accordance with the Emergency Plan. Training was being conducted annually as required. Emergency response equipment was available and being maintained as required. Emergency drills were being conducted annually as required by the Emergency Plan with support organizations participating biennially.

10. Exit Interview

The inspection scope and results were reviewed with the licensee on November 6, 2008. The inspector discussed the findings for each area reviewed. The licensee acknowledged the findings and did not identify as proprietary any of the material provided to or reviewed by the inspector during the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

R. Dobey	Health Physics Manager
J. Ernst	Associate Director, Regulatory Assurance Group
L. Foyto	Reactor Manager
J. Fruits	Assistant Reactor Manager - Operations
C. Herbold	Assistant Reactor Manager - Engineering
R. Hudson	Operations Training Coordinator
V. Jones	Lead Senior Reactor Operator
D. Kutikad	Assistant Reactor Manager - Physics
S. McCall	Lead Senior Reactor Operator
W. Meyer	Chief Operations Officer
T. Warner	Lead Senior Reactor Operator

Other Personnel

L. Hoffsette	Facility Security Officer, Office of Research, MURR
R. Huck	Safety Coordinator, University of Missouri Health Care, University Hospital
C. Smith	Coordinator, Worker Safety and Emergency Preparedness, University of Missouri Health Care, University Hospital

INSPECTION PROCEDURES USED

IP 69003	Class I Research and Test Reactor Operator Licenses, Requalification, and Medical Activities
IP 69005	Class I Research and Test Reactor Experiments
IP 69006	Class I Research and Test Reactor Organization, Operations, and Maintenance Activities
IP 69007	Class I Research and Test Reactor Review and Audit and Design Change Functions
IP 69008	Class I Research and Test Reactor Procedures
IP 69009	Class I Research and Test Reactor Fuel Movement
IP 69010	Class I Research and Test Reactor Surveillance
IP 69011	Class I Research and Test Reactor Emergency Preparedness

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

LIST OF ACRONYMS USED

CAP	Corrective Action Program
CFR	Code of Federal Regulations
CP	Compliance Procedure
E-Plan	Emergency Plan
ERT	Event Review Team
FEO	Facility Emergency Organization
IFI	Inspector Follow-up Item
IP	Inspection Procedure
IR	Inspection Report
LSRO	Lead Senior Reactor Operator
MURR	University of Missouri-Columbia Research Reactor
NRC	Nuclear Regulatory Commission
POD	Plan of the Day (meeting)
RAC	Reactor Advisory Committee
Rev.	Revision
RO	Reactor Operator
RUR	Reactor Utilization Request
RWP	Radiation Work Permit
SRO	Senior Reactor Operator
TS	Technical Specification