May 22, 2006

Dr. Melinda Krahenbuhl
Director of CENTER
122 S. Central Campus Drive, Room 104
University of Utah
Salt Lake City, UT 84112

SUBJECT: NRC INSPECTION REPORT NO. 50-407/2006-201

Dear Dr. Krahenbuhl:

On April 27, 2006, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your University of Utah TRIGA Reactor facility. The enclosed report documents the inspection results, which were discussed on April 27, 2006, with Dr. Ray Gesteland, Vice President of Research, you, and another member 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 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 "Rules of Practice," 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).

Sincerely,

/RA/
Brian E. Thomas, Branch Chief
Research and Test Reactors Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-407
License No. R-126

Enclosure: NRC Inspection Report No. 50-407/2006-201

cc w/enclosure:
Please see next page

University of Utah Docket No. 50-407

cc:

Karen Langley
Radiation Safety Officer
100 OSH, University of Utah
Salt Lake City, UT 84112

Dr. Ronald J. Pugmire
Assoc. Vice President for Research
210 Park, University of Utah
Salt Lake City, UT 84112

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

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

Docket No:	50-407
License No:	R-126
Report No:	50-407/2006-201
Licensee:	University of Utah
Facility:	Center for Excellence in Nuclear Technology, Engineering, and Research TRIGA Reactor Facility
Location:	Salt Lake City, Utah
Dates:	April 24-27, 2006
Inspector:	Craig Bassett
Approved by:	Brian E. Thomas, Branch Chief Research and Test Reactors Branch Division of Policy and Rulemaking Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

University of Utah
Center for Excellence in Nuclear Technology, Engineering, and Research
Report No. 50-407/2006-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the licensee's Class II research reactor safety programs including: organizational structure and staffing, review and audit and design change functions, procedures, radiation protection, effluent and environmental monitoring, and transportation of radioactive materials since the last NRC inspection of these areas. The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

Organization and Staffing

- The licensee's organization and staffing were in compliance with requirements specified in the Technical Specifications.

Review and Audit Functions

- Audits and reviews were being conducted by designated individuals and reviewed by the Reactor Safety Committee in accordance with the requirements specified in Technical Specification Section 6.5.

- Based on the records reviewed, the inspector determined that the licensee's design change program was being implemented as required.

Procedures

- Facility procedural review, revision, control, and implementation satisfied Technical Specification requirements.

Radiation Protection Program

- Surveys were being completed and documented acceptably to permit evaluation of the radiation hazards present.

- Postings met regulatory requirements.

- Personnel dosimetry was being worn as required and doses were well within the licensee's procedural action levels and NRC regulatory limits.

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

- The radiation protection and ALARA programs satisfied regulatory requirements.

- Training was being provided to staff members in the area of radiation protection in accordance with regulatory requirements.

Effluent and Environmental Monitoring

- Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and Technical Specification limits.

Transportation of Radioactive Materials

- The licensee transferred radioactive waste material to the campus Radiological Health Department as required and shipped other radioactive material from the facility under the reactor license in accordance with procedures.

REPORT DETAILS

Summary of Plant Status

The licensee's one hundred kilowatt (100 kW) research and test reactor continued to be operated in support of research, reactor operator training, educational demonstrations, and preventive maintenance and operational surveillance required by the Technical Specifications. During the inspection, the reactor was not operated but typically operates one or two days a week at various power levels up to 90 kW.

1. Organizational Structure and Staffing

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

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of Sections 6.1-6.3, of the Technical Specifications (TS), were being met:

- management responsibilities
- organizational structure and staffing requirements for the facility
- organizational guidance contained in "Description of Operations," Section I, Organization and Responsibilities, undated
- Amendment Number (No.) 7 to Facility Operating License No. R-126, dated December 3, 1998, which amended the TS to provide clarifications

b. Observations and Findings

Through discussions with licensee representatives, the inspector determined that management responsibilities and the organizational structure at the facility had not changed since the last NRC inspection in the area of radiation protection conducted in July 2004 (Inspection Report No. 50-407/2004-201). The organizational structure and staffing observed at the Center for Excellence in Nuclear Technology, Engineering, and Research (CENTER) TRIGA Reactor facility and reported in the Annual Report met the requirements of the TS.

Through review of records and logs and through discussions with licensee personnel, the inspector determined that the staffing at the facility was acceptable to support the current workload and ongoing activities. Each member of the facility staff listed in Figure 1 of the TS met or exceeded the minimum qualifications of ANS 15.4, "Standard for the Selection and Training of Personnel for Research Reactors," as required by TS Section 6.3.

c. Conclusions

The organizational structure and staffing were consistent with TS requirements.

2. Review and Audit and Design Change Functions

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the reviews and audits stipulated in the requirements of the TS Section 6.5 were being completed:

- Reactor Safety Committee (RSC) meeting minutes from December 2004 to the present
- Radiation Safety and ALARA Audits completed during the past two years and licensee responses to the safety reviews and audits
- guidance contained in “Description of Operations,” Section I, Organization and Responsibilities, undated
- The University of Utah TRIGA Reactor Annual Operating Reports for the periods: July 2003 - June 2004, and July 2004 - June 2005
- Form CENTER-035 R2, “Audit and Review Program Checklist,” RSC approval dated October 5, 2005, which documented the audits that had been completed
- “University of Utah CENTER Audit and Review Plan for NRC License R-126: TRIGA Nuclear Reactor (Docket No. 50-407),” Revision (Rev.) 1, dated February 28, 1996

b. Observations and Findings

(1) Review and Audit

The inspector verified that RSC membership satisfied TS requirements and that the RSC and/or a subcommittee had quarterly meetings as required. Review of the committee meeting minutes indicated that the RSC provided appropriate guidance and direction for reactor operations, and ensured acceptable use and oversight of the reactor.

Since the last inspection, all required audits of reactor facility activities and reviews of programs, procedures, equipment changes, and proposed tests or experiments, had been completed and documented as required. The audits were completed by designated individuals and reviewed by the RSC. Additionally, the annual review of the Radiation Protection Program and the biennial reviews of the emergency and security plans had been conducted and acceptably documented. The inspector noted that the safety reviews and audits and the associated findings were acceptably detailed and that the licensee responded and took corrective actions as needed.

(2) Design Change Functions

The inspector verified with the licensee that there had been no facility changes and consequently no 10 CFR 50.59 evaluations initiated or completed in 2005. From past reviews, the inspector determined that facility design change evaluations contained the required supporting documentation and information and that the 10 CFR 50.59 reviews and approvals were focused on safety and met TS requirements.

c. Conclusions

Audits and reviews were being conducted as required and reviewed by the RSC in accordance with the requirements specified in TS Section 6.5. Based on past records reviewed, the inspector determined that the licensee's design change program was being implemented as required.

3. Procedures

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify that the licensee was complying with the requirements of TS Sections 6.5.4 and 6.8:

- records for procedure changes
- selected administrative and health physics procedures
- RSC meeting minutes from December 2004 to the present
- related logs and records documenting procedure implementation
- administrative controls as outlined in "Description of Operations," Section I, Organization and Responsibilities, undated
- Form CENTER-035 R2, "Audit and Review Program Checklist," RSC approval dated October 5, 2005, which documented the audits that had been completed

b. Observations and Findings

The inspector noted that the licensee typically used checklists or forms in place of specific procedures to operate the facility. These forms were available for those tasks and items required by the TS. Written changes were reviewed and approved by the RSC as required. The facility forms or procedures were reviewed biennially as required by TS Section 6.5.4 with the last review being completed March 25, 2005. Training of personnel on procedures and the applicable changes was acceptable.

c. Conclusions

Procedural review, revision, control, and implementation satisfied TS requirements.

4. Radiation Protection Program

a. Inspection Scope (IP 69001)

To verify compliance with 10 CFR Parts 19 and 20 and TS Sections 4.3.3, 5.4, and 6.10, the inspector reviewed selected aspects of:

- radiological signs and postings at the facility
- dosimetry records for 2004, 2005, and through March 2006
- routine surveys and monitoring documented on Form CENTER-020
- As Low As Reasonably Achievable (ALARA) reviews for the past two years
- maintenance and calibration of radiation monitoring equipment documented on Form CENTER-023
- The University of Utah TRIGA Reactor Annual Operating Reports for the periods: July 2003 - June 2004, and July 2004 - June 2005
- University of Utah Radiation Procedures and Records (RPR), "Radiation User Personal Data," dated September 2005
- RPR No. 12, "Bioassays for Internal Radioactivity," dated September 2005

- RPR No. 44, “Radiation User’s Safety Training,” dated March 1999
- RPR No. 45, “Radiological Emergency Notification and Responses,” dated December 2005
- RPR No. 46, “Personnel Exposure Investigation and Reporting,” dated March 2005
- RPR No. 50, “Radioisotope Laboratory Evaluations,” dated December 2003 and associated forms
- RPR No. 52, “Portable Radiation Survey Instruments Use and Calibration,” dated June 2001
- Form CENTER-020 R12, “Monthly Inspection Checklist,” RSC approval dated April 2, 2004
- Form CENTER-023 R4, “Annual Maintenance and Calibration of the Area Radiation Monitors (ARMS) and Continuous Air Monitor (CAM),” RSC approval dated December 17, 1997
- Form RPR 50A, “Laboratory Evaluation Checklist,” form dated December 2003
- Form RPR 50B, “Total Contamination Survey,” form dated December 2003
- Form RPR 50C, “Removable Contamination Survey,” form dated December 2003
- Form RPR 50D, “Exposure Rate Survey,” form dated December 2003
- Form RPR 50D, “Radioisotope Laboratory Evaluation Report” form dated March 2003
- Form RPR 52A, “Exposure Rate Meter Calibration Record,” form dated June 2001
- Form RPR 52B, “Contamination Survey Meter Efficiency Calibration Record,” form dated June 2001

b. Observations and Findings

(1) Surveys

The inspector reviewed monthly radiation and contamination surveys of licensee controlled areas conducted by campus Radiological Health Department staff personnel. The inspector also reviewed monthly general area radiation surveys of the Reactor Room and support areas from 2005 to date. These latter surveys had been completed by the licensee personnel as required by Form CENTER-020 R12, “Monthly Inspection Checklist.” The results of all the surveys were documented and evaluated as required, and corrective actions were taken when readings or results exceeded set action levels. During the inspection, the inspector conducted a radiation survey of the Reactor Room and compared the readings detected with those found by a campus Radiological Analyst. The two sets of results were comparable and no anomalies were noted.

(2) Postings and Notices

The inspector reviewed the postings at the entrances to various controlled areas including the Control Room, the Reactor Room, and various laboratories in the CENTER. The postings were acceptable and indicated the radiation and contamination hazards present. Other postings also showed the industrial hygiene hazards present in the areas. The facility’s radioactive material storage areas were noted to be properly posted. No unmarked radioactive material was detected in the facility. Copies of current notices to workers required by 10 CFR Part 19 were posted on various bulletin boards in the facility, as well as one posted in the Control Room on the door leading to the Reactor Room.

(3) Dosimetry

The licensee used a National Voluntary Laboratory Accreditation Program accredited vendor (Landauer) to process personnel dosimetry. Through direct observation, the inspector determined that dosimetry was acceptably used by facility personnel.

An examination of the records for the past two years through March 2006 showed that all exposures were well within NRC limits and licensee action levels. The inspector determined that the licensee used optically stimulated luminescent (OSL) dosimeters for whole body monitoring of beta and gamma radiation exposure with an additional component to measure fast/thermal neutron radiation. The licensee used thermoluminescent dosimeters (TLD) finger rings for extremity monitoring as needed. An examination of the OSL and TLD results for the past two years showed that the highest annual whole body exposure received by a single individual for 2004 was 14 millirem (mrem) deep dose equivalent (DDE). The highest annual extremity exposure for that year was 18 mrem shallow dose equivalent (SDE). For 2005, the highest annual whole body exposure received by a single individual was 9 mrem DDE and the highest annual extremity exposure was 15 mrem SDE.

(4) Radiation Monitoring Equipment

The use and calibration of radiation monitoring equipment was reviewed by the inspector. Portable survey meters and friskers were calibrated by Radiological Health Department personnel. Fixed radiation detectors and the continuous air monitor were typically calibrated by licensee personnel. The calibration records showed that calibration frequency met the requirements established in the applicable surveillance procedures and records were being maintained as required. Through observation the inspector determined that the equipment was being used and maintained acceptably. It was noted that instruments awaiting repair, calibration, or those that were in storage and not calibrated, were labeled with a red tag to preclude inadvertent use.

(5) Radiation Protection Program and ALARA Policy

The licensee's Radiation Protection Program was established in various University of Utah campus documents including, "Radiation Safety Policy Manual," dated June 1996, "The University of Utah Radiation Protection Program," undated, and "Radiation Procedures and Records," last updated December 13, 2005. The program required that all personnel who have unescorted access to work in a radiation area or who work with radioactive material receive training in radiation protection, policies, procedures, requirements, and facilities prior to entry. The inspector also confirmed that the campus radiation protection program was being reviewed annually as required.

The ALARA Policy was also outlined and established in the aforementioned "Radiation Safety Policy Manual." The ALARA program provided guidance for keeping doses as low as reasonably achievable and was consistent with the guidance in 10 CFR Part 20.

(6) Radiation Worker Training

As noted above, people who handled radioactive material, including licensee personnel, were required to receive training in radiation protection. This was accomplished by staff members completing a web based course entitled "General Radiation Safety Training," which lasted about two hours and then taking a quiz on the material covered. A person then attended a class and was required to successfully pass a written examination. The class, entitled "Radioactive Materials Safety Class," was an interactive/practical session which lasted between two and three hours and consisted of lecture, demonstration, and practical applications. Those who successfully completed the course were given a certificate. Completion of this training was verified by Radiological Health Department personnel as well as by the Reactor Administrator and/or the Reactor Supervisor. Upon completion of the course, the worker was then issued a dosimeter and allowed to work with a Responsible User.

The inspector reviewed documentation of the training provided to licensee staff members, including the certificates of completion. The documents indicated that all current staff members had received the required training. The inspector determined that the personnel training program satisfied requirements in 10 CFR 19.12. The training materials appeared to be very useful in helping people understand the various concepts of radiation protection. The content and periodicity of training were acceptable.

(7) Facility Tours

The inspector toured the Control Room, Reactor Room, and selected support laboratories and offices. Control of radioactive material and control of access to radiation and high radiation areas were acceptable. As noted earlier, the postings and signs for these areas were appropriate.

c. Conclusions

Based on the observations made and the records reviewed, it was determined that, the Radiation Protection Program being implemented by the licensee satisfied regulatory requirements because: 1) surveys were being completed and documented acceptably; 2) postings met regulatory requirements; 3) personnel dosimetry was being worn as required and doses were well within the NRC's regulatory limits; 4) radiation monitoring equipment was being maintained and calibrated as required; and, 5) training was being conducted as required.

5. Effluent and Environmental Monitoring

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with the requirements of 10 CFR Part 20 and TS Sections 3.4, 3.7, 4.3.3, 4.3.4, 5.4, 5.6, and 6.10:

- The University of Utah TRIGA Reactor Annual Operating Reports for the periods: July 2003 - June 2004, and July 2004 - June 2005
- Data Summary forms provided to the RSC indicating the environmental TLD results
- CENTER Area Environmental Monitor Results provided to the RSC indicating other environmental TLD results
- Neutron Monitoring within CENTER - Exposure in mrem/gamma-beta in mrem
- maintenance and calibration of radiation monitoring equipment documented on Form CENTER-023 R4, "Annual Maintenance and Calibration of the Area Radiation Monitors (ARMS) and Continuous Air Monitor (CAM)," RSC approval dated December 17, 1997
- Form CENTER-032, R0, "Liquid Effluent Discharge Authorization," RSC approval dated March 19, 1992

b. Observation and Findings

The inspector reviewed the ARM and CAM calibration records. These systems had been calibrated annually according to procedure. The monthly setpoint and high radiation warning verification records for the monitoring equipment were also reviewed. Corrective actions, including recalibration, were completed if the setpoint values were exceeded.

The inspector determined that gaseous releases continued to be monitored as required, continued to be calculated according to established protocol, and were acceptably documented in the annual reports. Airborne concentrations of gaseous releases were well within the concentrations stipulated in 10 CFR 20, Appendix B, Table 2, and TS limits. 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 mrem per year. COMPLY code results indicated an annual dose to the public of 1.1 E-1 mrem for 2004 for the entire campus. Data for 2005 was not yet available.

The inspector verified that there had been no liquid releases from the facility to the sanitary sewer within the past two years. It was noted that the last liquid release occurred in 2000.

On-site and off-site gamma radiation monitoring was completed using environmental TLDs in accordance with the applicable procedures. The data indicated that there were no measurable doses above any regulatory limits. These results were also acceptably reported in the Reactor Operations Annual Report for 2004 and 2005. Through observation of the facility, the inspector did not identify any new potential release paths.

c. Conclusions

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

6. Transportation

a. Inspection Scope (IP 86740)

The inspector reviewed selected aspects of:

- radioactive material transfers documented on Form CENTER-027
- RPR No. 14, "Shipment of Limited Quantity of Radioisotopes," dated December 2001
- RPR No. 55, "Transportation of Radioactive Materials," dated December 2004
- Form CENTER-027 R4, "TRIGA Reactor Irradiation Request and Performance," RSC approval dated March 26, 1996
- Form RPR 13A, "Radioisotope Package Arrival Report," form dated September 2004
- Form RPR 13B, "Radioisotope Receipt and Verification," form dated September 2004, documenting receipt of radioactive material
- Form RPR 13E, "Radioactive Waste Tag," form dated March 2003

b. Observations and Findings

Records indicated that radioactive waste designated for disposal was transferred to the University of Utah's broad scope license, Utah Department of Environmental Quality, License Number 1800001, Amendment No. 49, dated March 29, 2006, in accordance with Radiological Health Department requirements. The last material transferred from the CENTER to the broad scope license was 5 containers of resin. It was noted that the proper Radioactive Waste Tags were completed and attached to the containers as required.

The inspector also reviewed the documentation of a recent shipment of radioactive material completed under the auspices of the reactor license. The records indicated that the shipping containers were properly packaged and surveyed. The applicable labels were filled out with the required information and attached to the shipping containers. The required shipping paperwork was completed in accordance with the regulatory requirements. No problems or deficiencies were noted.

The program for receipt, shipment, and/or transfer of other radioactive material was in conformance with the facility procedures and consistent with TS requirements. The inspector also verified that licensee personnel had been trained to ship radioactive material as required by the Department of Transportation.

c. Conclusions

The licensee transferred radioactive waste material to the campus Radiological Health Department as required and shipped other radioactive material from the facility under the reactor license in accordance with the applicable regulations and procedures.

7. Exit Meeting Summary

The inspection scope and results were summarized on April 27, 2006, with licensee representatives. The inspector discussed the findings for each area reviewed. The licensee did identify as proprietary some of the material provided to or reviewed by the inspector during this inspection. However, this report does not contain any proprietary material.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

D. Choe, Reactor Supervisor and Senior Reactor Operator
R. Gesteland, Vice President for Research, University of Utah
M. Krahenbuhl, Reactor Administrator and Senior Reactor Operator

Campus Radiation Safety Office Personnel

T. Holt, Radiological Analyst, Radiological Health Department, University of Utah
K. Langley, Director, Radiological Health Department and Radiation Safety Officer, University of Utah

INSPECTION PROCEDURE (IP) USED

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

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

PARTIAL LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access and Management System
ALARA	As Low As Reasonably Achievable
ARM	Area Radiation Monitor
CAM	Continuous Air Monitor
CENTER	Center for Excellence in Nuclear Technology, Engineering, and Research
CFR	Code of Federal Regulations
DDE	Deep dose equivalent
kW	kilowatt
mrem	millirem
NRC	Nuclear Regulatory Commission
OSL	Optically stimulated luminescent (dosimeter)
PARS	Publicly Available Records
RPR	Radiation Procedures and Records
RSC	Reactor Safety Committee
SDE	Shallow dose equivalent
TLD	Thermoluminescent dosimeter
TS	Technical Specifications