November 16, 2007

Dr. Steven Biegalski Director, Nuclear Engineering Teaching Laboratory The University of Texas at Austin Pickle Research Campus, Building 159 Mail Code R9000 Austin, TX 78712-1024

SUBJECT: NRC INSPECTION REPORT NO. 50-602/2007-201

Dear Dr. Biegalski:

On November 8, 2007, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your University of Texas at Austin Nuclear Engineering Teaching Laboratory facility. The enclosed report documents the inspection results, which were discussed on November 8, 2007, with Dr. D. O'Kelly, Reactor Health Physicist, 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 Section 2.390 of Title 10 of the Code of Federal Regulations, "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 component of NRC's Agencywide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <a href="http://www.nrc.gov/reading-rm/adams.html">http://www.nrc.gov/reading-rm/adams.html</a> (the Public Electronic Reading Room).

Should 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. 50-602 License No. R-129

Enclosure: NRC Inspection Report No. 50-602/2007-201 cc w/enclosure: Please see next page

University of Texas at Austin

CC:

Governor's Budget and Planning Office P.O. Box 13561 Austin, TX 78711

Bureau of Radiation Control State of Texas 1100 West 49<sup>th</sup> Street Austin, TX 78756

Mr. Roger Mulder Office of the Governor P.O. Box 12428 Austin, TX 78711

Test, Research, and Training Reactor Newsletter University of Florida 202 Nuclear Sciences Center Gainesville, FL 32611 November 16, 2007

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

Docket No:	50-602
License No:	R-129
Report No:	50-602/2007-201
Licensee:	The University of Texas at Austin
Facility:	Nuclear Engineering Teaching Laboratory
Location:	Pickle Research Campus, Bldg. 159 10100 Burnet Road Austin, TX 78758
Dates:	November 5-8, 2007
Inspector:	Craig Bassett
Approved by:	Johnny H. Eads, Jr., Branch Chief Research and Test Reactors Branch B Division of Policy and Rulemaking Office of Nuclear Reactor Regulation

## **EXECUTIVE SUMMARY**

### The University of Texas at Austin Nuclear Engineering Teaching Laboratory Report No.: 50-602/2007-201

The primary focus of this routine, announced inspection included onsite review of selected aspects of the University of Texas at Austin Nuclear Engineering Teaching Laboratory TRIGA Mark II research and test reactor safety program including: organizational structure and staffing, review and audit and design change functions, radiation protection, environmental protection, health physics procedures, and transportation of radioactive material since the last NRC inspection in these areas. The licensee's program was acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements. No safety concerns or violations of regulatory requirements were identified.

## Organizational Structure and Staffing

• The organizational structure, functions, and staffing were consistent with Technical Specification requirements.

## Review and Audit and Design Change Functions

- The review and audit program satisfied Technical Specification requirements.
- No changes had made at the facility since the last NRC inspection but those completed previously had been reviewed using the 10 CFR 50.59 safety evaluation process and had been reviewed and approved by the Reactor Oversight Committee as required.

## Radiation Protection

- Periodic surveys were completed and documented as required by 10 CFR Part 20, the Technical Specifications, and licensee procedures.
- Postings and signs met regulatory requirements.
- Personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits of 10 CFR Part 20.
- Portable survey meters, radiation monitoring equipment, and laboratory counting instruments were being calibrated and maintained according to TS and industry/equipment manufacturer standards and licensee procedures.
- The Radiation Protection and ALARA Programs satisfied the requirements of 10 CFR 19.12, 10 CFR 20.1101, and licensee procedures.
- Radiation protection training was acceptable.

# Environmental Protection

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

## Procedures

• Procedural control and implementation satisfied Technical Specification requirements.

## Transportation of Radioactive Materials

• Radioactive material was being shipped in accordance with campus and licensee procedures and the applicable regulatory requirements.

## **REPORT DETAILS**

## **Summary of Plant Status**

The University of Texas at Austin Nuclear Engineering Teaching Laboratory TRIGA Mark II research and test reactor continued normal, routine operations. A review of the applicable records indicated that the reactor was operated as needed in support of operator training, experiments, and surveillance. During the inspection, the reactor was operated on several occasions to support ongoing experiments.

## 1. Organizational Structure and Staffing

#### a. Inspection Scope (Inspection Procedure (IP) 69001)

The inspector reviewed the following regarding the licensee's organizational structure and functions to ensure that the requirements of Sections 6.1 and 6.6.1 of Technical Specifications (TS), Revision 1, Amendment No. 4, dated, May 10, 2001, were being met:

- qualifications of Health Physics personnel
- management responsibilities and administrative controls
- The University of Texas at Austin (UT) Nuclear Engineering Teaching Laboratory Annual Reports for 2005 and 2006
- The UT Nuclear Engineering Teaching Laboratory (NETL) organizational structure and staffing
- administrative controls outlined in NETL Procedure Number (No.) ADMN-3, "Personnel and Operator Qualifications," Revision (Rev.) 0, approval dated January 31, 1992

#### b. Observations and Findings

Through records review and interviews with licensee personnel, the inspector noted that the health physics (HP) organizational structure had not changed since the last inspection in this area (see NRC Inspection Report No. 50-602/2005-201). The reactor HP staff continued to be comprised of one full time health physicist (the NETL reactor health physicist, who was also the NETL Laboratory Manager), and a technician position. However, the person who had filled the technician position had graduated and found other employment and a new individual had been hired. As a result, the technician position was currently filled by a student who worked part-time at the facility. The inspector verified that the people filling these positions were qualified to do so.

The UT campus HP organization and staffing remained unchanged. It consisted of the Radiation Safety Officer (RSO) and three technical staff members. The RSO was also a member of the UT Reactor Oversight Committee. It was noted that, although Campus technical staff personnel provided support to the reactor HP staff, the vast majority of HP functions at the reactor were performed by reactor HP and operations staff members. Coordination of HP activities between the two groups was acceptable. Structure, responsibilities, and staffing were as required by TS Section 6.1. Annual reports, which included the information required by TS Section 6.6.1, were being prepared and submitted each year as required.

#### c. Conclusions

The organizational structure, functions, and staffing were consistent with TS requirements.

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

#### a. Inspection Scope (IP 69001)

In order to ensure that the audits and reviews stipulated in the requirements of TS Section 6.2 were being completed, the inspector reviewed the following:

- responses to safety reviews and audits
- ALARA Committee meeting minutes for 2006 and 2007
- UT Reactor Oversight Committee (UT-ROC) meeting minutes and records for March 2006 through the present
- UT-ROC safety review and audit records from November 2006 to the present
- NETL Procedure No. ADMN-2, "Procedures for Design Features and Quality Assurance," Rev. 1, approval dated January 31, 1992
- "Reactor Oversight Committee Charter," review and approval dated February 17, 2005

## b. Observations and Findings

(1) Review and Audit Functions

UT-ROC meeting minutes and records and ALARA Committee meeting minutes from March 2006 through the present were reviewed. The committees were meeting at the required frequency and a quorum was present at each meeting. The inspector verified that the UT-ROC meetings and the ALARA Committee meetings, and the membership of each, satisfied TS Section 6.2 review and audit requirements and the ALARA Committee's procedural rules. The records showed that safety reviews and audits were conducted by various members of the UT-ROC or other designated persons and were completed at the TS required frequency. The topics covered by these reviews were consistent with the TS requirements and were sufficient to provide guidance, direction, and oversight, and to ensure acceptable use of the reactor and appropriate implementation of the radiation protection program. The inspector noted that the safety reviews and audits and the associated findings were acceptably detailed and that the licensee responded and took corrective actions as needed.

(2) Design Change Functions

Through review of applicable records and interviews with licensee personnel, the inspector determined that, during 2006, no changes had been initiated and/or completed at the facility. Prior to 2006 various evaluations had been conducted including: "Tektronix Monitor Upgrade," "Control Console Chart Recorder Upgrade," and "RACE Project Electron Linear Accelerator in Beam Port 5."

As noted in previous NRC inspection reports, the changes had been evaluated using the licensee's 10 CFR 50.59 review process outlined in NETL Procedure No. ADMN-2. The licensee evaluations were then reviewed and approved by the UT-ROC as required. It was noted that none of those past changes required NRC approval prior to implementation.

c. Conclusions

The review and audit program satisfied TS requirements. No changes had made at the facility since the last NRC inspection but those completed previously had been reviewed using the 10 CFR 50.59 safety evaluation process and had been reviewed and approved by the UT-ROC as required.

## 3. Radiation Protection Program

## a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify compliance with 10 CFR Parts 19 and 20 and TS Sections 3.3.3, 4.3.3, and 6.6.1:

- UT-NETL Annual Reports for 2005 and 2006
- dosimetry/exposure records for 2005 through 2007
- As Low As Reasonably Achievable (ALARA) reviews
- ALARA Committee meeting minutes for 2005 and 2006
- radiological signs and posting in various areas of the facility
- routine periodic surveys and monitoring documented on the appropriate survey forms and/or maps
- maintenance and calibration records of selected portable survey meters, radiation area monitoring equipment, and laboratory counting equipment
- The University of Texas at Austin "Radiation Safety Manual," effective date April 18, 2007, approved by the Texas Department of Health
- Radiation Work Permit (RWP) Log and RWP Nos. 2006-01P through 2006-08P, 2007-01P through 2007-08P, 2007-09T, 2007-10T, and 2007-12T
- NETL Procedure No. ADMN-4, "Radiation Protection Program," Rev. 0, approval dated November 2, 2006
- NETL Procedure No. HP00-1, "Radiation Monitoring Personnel," Version 2.00, approval dated November 9, 2000
- NETL Procedure No. HP00-2, "Radiation Monitoring Facility," Version 2.00, approval dated November 9, 2000
- NETL Procedure No. HP00-3, "NETL ALARA Program," Version 2.00, approval dated November 9, 2000
- NETL Procedure No. HP00-4, "Radiation Protection Training," Version 2.00, approval dated November 9, 2000
- NETL Procedure No. HP00-5, "Radiation Monitoring Equipment," Version 2.00, approval dated April 24, 2001
- NETL Procedure No. HP00-6, "Radioactive Material Control," Version 2.00, approval dated November 9, 2000
- NETL Procedure No. HP00-7, "Radiation Work Permits (RWPs)," Version 2.00, approval dated April 24, 2001

- NETL Procedure No. MAIN-4, "Area Radiation Monitor Systems," Rev 3, approval dated July 26, 2000
- NETL HP1 Form-A, "Daily Exposure Logsheet," form dated November 1, 2000
- NETL HP1 Form-B, "Visitor Dosimeter Record," form dated November 1, 2000
- NETL Staff and Personnel Training Record forms, form dated November 9, 2000
- NETL Area Monitors Weekly response check forms, form dated January 6, 2003

#### b. Observations and Findings

#### (1) Surveys

Selected weekly, monthly, quarterly, and other periodic radiation and/or contamination surveys for 2006 and 2007 were reviewed by the inspector. The inspector verified that the surveys for this time period had been completed by HP staff members as required. Surveys were generally annotated on a detailed map with additional information indicating the time, date, and person performing the survey. Results were evaluated and corrective actions taken and documented when readings/results exceeded established action levels.

During the inspection the inspector conducted a radiation survey along side a licensee representative. Areas surveyed at the facility included the Reactor Bay and associated support rooms/areas. The radiation levels noted by the inspector were comparable to those found by the licensee and no anomalies were noted.

(2) Postings and Notices

Copies of current notices to workers were posted in appropriate areas in the facility. Radiological signs and survey maps were typically posted at the entrances to controlled areas. Other postings also showed the industrial hygiene hazards that were present in the areas as well. The copies of NRC Form-3, "Notice to Employees," and NRC Form-3A, "Aviso a los Empleados," noted at the facility were the latest issue and were posted in various areas throughout the facility. These locations included the bulletin board in the hallway by the front office and in the corridor leading to the Reactor Control Room.

Caution signs, postings, and controls for radiation areas were as required in 10 CFR Part 20, Subpart J. Licensee personnel observed the precautions for access to radiation and other controlled areas.

(3) Dosimetry

The licensee used optically stimulated luminescent (OSL) dosimeters for whole body monitoring of beta and gamma radiation exposure with an additional component to measure neutron radiation. The licensee used thermoluminescent dosimeter (TLD) finger rings for extremity monitoring. Dosimetry was issued to staff and visitors as outlined in licensee procedures. The issuing criteria met or exceeded the requirements of 10 CFR 20.1502 for individual monitoring. The dosimetry was supplied and processed by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor. An examination of the OSL and TLD monitoring results indicating radiological exposures at the facility for the past two years showed that the highest occupational doses, as well as doses to the public, were within 10 CFR Part 20 limitations. The records showed that the highest annual whole body exposure received by a single facility employee for 2005 was 547 millirem (mrem) deep dose equivalent (DDE). The highest annual extremity exposure for 2005 was 548 mrem shallow dose equivalent (SDE). The highest annual whole body exposure received by a single facility employee for 2006 was 62 mrem DDE. The highest annual extremity exposure for 2006 was 710 mrem SDE. The highest annual whole body exposure received by a single facility employee for 2006 was 62 mrem DDE. The highest annual whole body exposure received by a single facility employee for 2006 was 62 mrem DDE. The highest annual extremity exposure for 2007 was 342 mrem DDE. The highest annual extremity exposure received by a facility employee to date for 2007 was 370 mrem SDE.

Through direct observation the inspector determined that dosimetry was acceptably used by facility personnel and exit frisking practices were in accordance with radiation protection requirements.

(4) Radiation Monitoring Equipment

Examination of selected radiation monitoring equipment in service at the facility indicated that the instruments generally had the acceptable up-to-date calibration sticker attached. The instrument calibration records reviewed by the inspector indicated that the calibration of portable survey meters was typically completed by licensee staff personnel. However, some instruments were shipped to vendors for calibration. When an instrument did not meet the calibration criteria, it was tagged out of service. Calibration frequency met procedural requirements and records were maintained as required. Area Radiation Monitors, Constant Air Monitors, and stack monitors were also being calibrated as required. These monitors were also typically calibrated by licensee staff personnel.

(5) Radiation Protection Program

The licensee's Radiation Protection and ALARA programs were established and described in the NETL Procedure Nos. ADMN-4 and HP00-3, as well as through The University of Texas at Austin Radiation Safety Manual. The programs contained instructions concerning organization, training, monitoring, personnel responsibilities, audits, record keeping, and reports. The programs, as established, appeared to be acceptable. The ALARA program provided guidance for keeping doses as low as reasonably achievable, which was consistent with the guidance in 10 CFR Part 20.

The inspector determined that the licensee had completed an annual review of the radiation protection program in accordance with 10 CFR 20.1101(c) for 2005 and 2006 as required. This was accomplished through the annual ALARA Committee Meetings. No program deficiencies were identified but various suggestions were made for program improvement. It was noted that, while a review by the ALARA

Committee satisfied the regulatory requirements, an independent review by someone outside the University might prove beneficial. The licensee indicated that such a review would be worthwhile and that such arrangements would be sought.

The licensee did not require or have a respiratory protection program or planned special exposure program.

(6) Radiation Work Permits (RWPs)

The inspector reviewed selected RWPs that had been written and used during 2006 and 2007 as stipulated in NETL Procedure No. HP00-7. RWPs were designated as either fixed or temporary. Fixed (or permanent) RWPs typically were in effect for an entire year and were written for an area that was permanently established or for a task that was routinely performed. Temporary RWPs were prepared for specific work evolutions of shorter duration. It was noted that the controls specified in the RWPs were acceptable and applicable for the type of work being done. During tours of the various work areas, the inspector noted that the appropriate RWPs were present and were being used and annotated as required. It was also noted that the RWPs had been initiated, reviewed, and approved as required. The RWP program was acceptable.

(7) Radiation Protection Training

The inspector reviewed the radiation worker (rad worker) training given to NETL facility faculty and staff members and to students and student assistants. The licensee indicated that initial rad worker training was given when an individual first arrived at the facility and refresher training was given every two years thereafter. Training records showed that personnel were acceptably trained in radiation protection practices. The inspector verified that the training received was in compliance with 10 CFR Part 19. The training program was acceptable.

(8) Facility Tours

The inspector toured the Reactor Bay, the Coolant Treatment room, the Auxiliary Equipment room, and selected support laboratories with licensee representatives. The inspector noted that facility radioactive material storage areas were properly posted. No unmarked radioactive material was noted.

c. Conclusions

The inspector determined that the Radiation Protection and ALARA Programs, as implemented by the licensee, satisfied regulatory requirements because: 1) surveys were completed and documented acceptably to permit evaluation of the radiation hazards present; 2) postings met regulatory requirements; 3) personnel dosimetry was being worn as required and recorded doses were within the NRC's regulatory limits; 4) radiation survey and monitoring equipment was being maintained and calibrated as

required; 5) the Radiation Protection and ALARA Programs satisfied regulatory requirements; and, 6) the radiation protection training program was acceptable.

### 4. Environmental Protection Program

#### a. Inspection Scope (IP 69001)

To determine that the licensee was complying with the requirements of the 10 CFR Part 20 regulations and TS Sections 3.3.3, 4.3.3, and 6.6.1, the inspector reviewed selected aspects of:

- NETL environmental monitoring program
- environmental monitoring release records
- UT-NETL Annual Reports for 2005 and 2006
- NETL Form C PRM AR1000 calibration forms
- NETL Form D PRM AR1000 (gas) calibration forms
- NETL Air Monitors Week-Month response check forms
- NETL Procedure No. HP00-2, "Radiation Monitoring Facility," Version 2.00, approval dated November 9, 2000
- NETL Procedure No. HP00-3, "NETL ALARA Program," Version 2.00, approval dated November 9, 2000
- NETL Procedure No. MAIN-4, "Area Radiation Monitor Systems," Rev. 3, approval dated July 26, 2000
- NETL Procedure No. NETL-2, "Liquid Radioactive Waste System," Rev. 0, approval dated January 27, 1993

#### b. Observations and Findings

The program for the monitoring, storage, and release of radioactive liquid and gases was consistent with 10 CFR Part 20. Gaseous releases were monitored by the licensee as required and calculated using a facility procedure. Records were being maintained as required and showed gaseous releases well within the annual dose constraint stipulated in 10 CFR 20.1101(d) and the 10 CFR Part 20, Appendix B concentrations, as well as TS 3.3.3 limits. One way the licensee demonstrated compliance was by using EPA COMPLY code calculations. These calculations indicated an effective dose equivalent to the public of 4.5 mr/yr for the year 2005 and 4.8 mr/yr for the year 2006. Observation of the facility by the inspector indicated no new potential release paths.

Radioactive liquid releases were infrequent and were monitored as required. Liquids were only released when below 10 CFR Part 20, Appendix B limits. Records reviewed confirmed that the facility had not released any radioactive material in 2005 or 2006. ALARA principles were acceptably implemented to minimize radioactive releases. Monitoring equipment was acceptably maintained and calibrated.

The environmental monitoring program consisted of six TLD dosimeters placed at selected locations adjacent to the NETL building and read quarterly. Dosimetry results since the last inspection were typically near or below the vendor's minimum reportable levels for x- and gamma rays and energetic beta particles.

### c. Conclusions

Based on the records reviewed, the effluent monitoring and release program satisfied NRC requirements.

### 5. Procedures

## a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify compliance with TS Section 6.3 requirements:

- procedural implementation
- records of changes to NETL procedures
- records of UT-ROC review and approval
- administrative controls documented in NETL Procedure No. ADMN-1, "NETL Procedure Outline and Control," Version 2.00, approval dated April 24, 2001
- NETL Procedure No. FUEL-1, "Movement of Fuel," Version 1.00, approval dated February 17, 2005

## b. Observations and Findings

HP procedures were available for those tasks and items required by TS Section 6.3. The licensee controlled changes and temporary changes to procedures, and associated review and approval processes, by use of administrative procedures.

Training of personnel on procedures and subsequent changes to procedures was acceptable. The inspector observed personnel conducting radiation surveys, issuing dosimetry, and conducting experiments in accordance with applicable procedures.

c. Conclusions

Based on the procedures and records reviewed and observations of staff during the inspection, the procedural control and implementation program satisfied TS requirements.

#### 6. Transportation of Radioactive Material

#### a. Inspection Scope (IP 86740)

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

- Radioactive Material Storage Log forms
- Radioactive Material Transfer Record forms
- selected records of various types of radioactive material shipments
- training records of staff members responsible for shipping licensed radioactive material

- selected licenses of consignee groups or organizations which were authorized to receive radioactive material
- NETL Procedure No. HP00-6, "Radioactive Material Control," Version 2.00, approval dated November 9, 2000

#### b. Observations and Findings

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

The inspector verified that the licensee maintained copies of the recipients' licenses to possess radioactive material as required and that the licenses were verified to be current prior to initiating a shipment. People designated as "shippers" had been properly trained to do so and the appropriate documentation was on file.

#### c. <u>Conclusions</u>

Radioactive material was shipped in accordance with the applicable regulations and licensee procedures.

#### 7. Exit Meeting

The inspector presented the inspection results to members of licensee management at the conclusion of the inspection on November 8, 2007. The licensee acknowledged the findings presented. The licensee did not identify as proprietary any material reviewed as part of this inspection.

# PARTIAL LIST OF PERSONS CONTACTED

## Licensee

D. Judson	Administrative Associate
M. Krause	Reactor Supervisor
D. O'Kelly	Reactor Health Physicist and Laboratory Manager
J. Simms	Research Associate and Health Physics Technician
L. Welch	Reactor Operator and Electronics Technician

## **Other Personnel**

J. Gabriel	Lieutenant, UT Police Department
S. Works	Supervisor, Lock & Key Service, Facility Maintenance Division, UT

## **INSPECTION PROCEDURE USED**

IP 86740 Inspection of Transportation Activities

## ITEMS OPENED, CLOSED, AND DISCUSSED

## **Opened**

None

#### **Closed**

None

## PARTIAL LIST OF ACRONYMS USED

- ALARA As Low As Reasonably Achievable
- CFR Code of Federal Regulations
- DDE Deep Dose Equivalent

HP Health Physics

- NETL Nuclear Engineering Teaching Laboratory
- NRC Nuclear Regulatory Commission
- OSL Optically stimulated luminescent (dosimeter)
- Rev. Revision
- RSO Radiation Safety Officer
- RPP Radiation Protection Program
- RWP Radiation Work Permit
- SDE Shallow Dose Equivalent
- TLD Thermoluminescent dosimeter
- TS Technical Specifications
- UT University of Texas at Austin
- UT-ROC University of Texas at Austin Reactor Oversight Committee