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

Docket No:	50-602
License No:	R-129
Report No:	50-602/99-201
Licensee:	University of Texas
Facility:	University of Texas TRIGA Mark-II Reactor
Location:	Pickle Research Campus, Bldg. 159 10100 Burnet Road Austin, TX 78758
Dates:	September 28 to October 1, 1999
Inspector:	Stephen W. Holmes, Reactor Inspector
Approved by:	Ledyard B. Marsh, Chief Events Assessment, Generic Communications and Non-Power Reactors Branch Division of Regulatory Improvement Programs Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

This routine, announced inspection included onsite review of selected aspects of the following: Organizational Structure and Functions Program, Review and Audit Program, Radiation Protection Program, Radiation Protection Postings, Radiation Protection Surveys, Personnel Dosimetry, Calibration of Radiation Monitoring and Counting Equipment, Effluent Monitoring and Release, Environmental Protection Program, Procedures Program, Emergency Preparedness Program, Safeguards Program, Transportation Program, Calorimetric Power Calibration Interval Lapse, and Rotary Specimen Rack (Lazy Susan) Deflagration Event since the last NRC inspection in these areas.

The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

ORGANIZATIONAL STRUCTURE AND FUNCTIONS

The organizational structure and functions were consistent with Technical Specification (TS) requirements.

REVIEW AND AUDIT

The review and audit program satisfied TS requirements.

RADIATION PROTECTION PROGRAM

The radiation protection program (RPP) satisfied the requirements of 10 CFR 19.12, 10 CFR 20.1101, and other applicable requirements.

RADIATION PROTECTION POSTINGS

Radiological postings satisfied regulatory requirements.

RADIATION PROTECTION SURVEYS

Surveys were performed and documented as required by 10 CFR Part 20, TS, and licensee administrative controls.

PERSONNEL DOSIMETRY

The personnel dosimetry program was acceptably implemented and doses were in conformance with licensee and 10 CFR Part 20 limits.

CALIBRATION OF RADIATION MONITORING EQUIPMENT

Portable survey meters, radiation monitoring, and counting lab instruments were being maintained according to TS and industry/equipment manufacturer standards and, with one exception (portable neutron meter), according to licensee procedures.

EFFLUENT MONITORING AND RELEASE

The effluent monitoring and release program satisfied NRC requirements.

ENVIRONMENTAL PROTECTION

Environmental monitoring satisfied the RPP requirements.

PROCEDURES

The procedural control and implementation program satisfied TS requirements.

EMERGENCY PREPAREDNESS

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

SAFEGUARDS

The licensee was in compliance with the possession and use limits of the research reactor and had acceptably controlled and inventoried special nuclear material (SNM) as required.

TRANSPORTATION

Radioactive material was transferred and disposed of in accordance with licensee procedures and TS requirements.

CALORIMETRIC POWER CALIBRATION INTERVAL LAPSE

The licensee's reporting, performance and subsequent corrective actions regarding the power calibration interval error are acceptable.

ROTARY SPECIMEN RACK (LAZY SUSAN) DEFLAGRATION EVENT

The licensee's actions in regards to the rotary specimen rack unusual loading event were acceptable.

REPORT DETAILS

Summary of Plant Status

During the inspection the reactor was operated several days a week to support education, operator training, surveillance, service work, and experiments.

1. ORGANIZATIONAL STRUCTURE AND FUNCTIONS

a. Inspection Scope (69001)

The inspector reviewed selected aspects of:

- organization and staffing
- qualifications
- management responsibilities
- administrative controls

b. Observations and Findings

The health physics (HP) organizational structure and staffing had not functionally changed since the last inspection. The reactor HP staff consisted of one full time and one halftime person. The campus HP staffing consisted of the Radiation Safety Officer (RSO) and three technical staff members. The RSO is also a member of the Nuclear Reactor Safety Committee (NRSC). They provided support to the reactor HP staff, in addition to having responsibility for the state license. The reactor staff performed most HP functions at the reactor. Coordination of HP activities between the staffs was acceptable. Staffing was as reported in the Annual Report and as required by TS. Qualifications of the staff met TS requirements. Review of records verified that management responsibilities were administered as required by TS and applicable procedures.

c. Conclusions

The organizational structure and functions were consistent with TS requirements.

2. REVIEW AND AUDIT

a. Inspection Scope (69001)

The inspector reviewed selected aspects of:

- NRSC minutes
- As Low As Reasonably Achievable (ALARA) Committee Minutes
- safety review records
- audit records
- responses to safety reviews and audits
- review and audit personnel qualifications

b. Observations and Findings

The NRSC and ALARA committee meeting schedule and membership satisfied TS requirements and the Committee's procedural rules. Review of the minutes indicated the committees provided guidance, direction and oversight, and ensured suitable use of the reactor. The minutes provided a record of the safety oversight of reactor operations.

Records showed that the safety reviews were conducted at the TS required frequency. Topics of these reviews were also consistent with TS requirements to provide guidance, direction, and oversight, and to ensure acceptable use of the reactor.

The audit records showed that reviews had been completed in those areas outlined in the TS and at the required frequency.

The inspector noted that the safety reviews and audits and associated findings were acceptably detailed and that the licensee responded and took corrective actions as needed. The safety review and audit personnel qualifications were consistent with licensee administrative controls.

Inspector Follow-up Item IFI 602-97-201-01 concerning written audit reports is closed.

c. Conclusions

The review and audit program satisfied TS requirements.

3. RADIATION PROTECTION PROGRAM

a. Inspection Scope (69001)

The inspector reviewed selected aspects of:

- The RPP
- ALARA reviews
- Reactor and Campus RSO Involvement/Review of the RPP
- Radiation Protection Training

b. Observations and Findings

The RPP had not changed since the last inspection. The licensee reviewed the RPP at least annually in accordance with 10 CFR 20.1101(c). This review and oversight were provided by the reactor and university staffs as required by TS and licensee procedures. The review included all areas and no weaknesses were reported.

Records confirmed that the RSO specifically reviewed and approved RPP changes, experiments, and radiation protection related events/conditions as required by TS and licencee procedures.

Training records showed that personnel were acceptably trained in radiation protection practices commensurate for the facility and their work.

c. Conclusions

The RPP satisfied the requirements of 10 CFR 19.12, 10 CFR 20.1101, and other applicable requirements.

4. RADIATION PROTECTION POSTINGS

a. Inspection Scope (69001)

The inspector reviewed selected aspects of:

- radiological signs and posting
- facility and equipment during tours

b. Observations and Findings

Caution signs, postings and controls to radiation areas at the Nuclear Reactor Teaching Laboratory (NRTL) reactor were acceptable for the hazards involved and were as required in 10 CFR Part 20, Subpart J. Licensee personnel observed the indicated precautions for access to the radiation areas. Current copies of NRC Form-3 were posted in appropriate areas in the facility as were current notices to workers required by 10 CFR Part 19.

c. Conclusions

Radiological postings satisfied regulatory requirements.

5. RADIATION PROTECTION SURVEYS

a. Inspection Scope (69001)

The inspector reviewed selected aspects of:

- routine surveys and monitoring
- survey and monitoring procedures

b. Observations and Findings

Weekly, monthly, quarterly, and other periodic contamination and radiation surveys were performed as required by TS and NRTL procedures. These were conducted by the reactor staff. All surveys were annotated on a detailed map with additional information as to time, date, and person performing the survey. Results were evaluated and corrective actions taken and documented when readings/results exceeded set action levels, prior to exceeding regulatory limits.

Surveys were more than adequate to evaluate the magnitude, concentration, quantities and potential hazard of radiation levels or radioactive materials present. Licensee procedures required some surveys (such as neutron area and building external) to be performed more frequently than normally established in the industry or needed to satisfy TS and regulatory requirements.

The licensee stated they were evaluating the frequencies for their radiological surveys.

c. Conclusions

Surveys were performed and documented as required by 10 CFR Part 20, TS, and licensee administrative controls.

6. PERSONNEL DOSIMETRY

a. Inspection Scope (69001)

The inspector reviewed selected aspects of:

- licensee procedures
- dosimetry records

b. Observations and Findings

The use of dosimeters and exit frisking practices were in accordance with radiation protection requirements. The campus program covered the NRTL.

The licensee used a National Voluntary Laboratory Accreditation Program accredited vendor to process personnel thermoluminescent dosimetry. The license investigated doses above set administrative limits. The licensee's dosimetry program for declared pregnant women satisfied 10 CFR 20.1208 requirements. Radiological exposure records showed that occupational doses and doses to the public were within 10 CFR Part 20 limitations with most indistinguishable from background.

c. Conclusions

The personnel dosimetry program was acceptably implemented and doses were in conformance with licensee and 10 CFR Part 20 limits.

7. CALIBRATION OF RADIATION MONITORING EQUIPMENT

a. Inspection Scope (69001)

The inspector reviewed selected aspects of:

- maintenance and calibration of radiation monitoring equipment
- periodic checks, quality control, and test source certification records

b. Observations and Findings

The calibration and periodic checks of the portable survey meters, radiation monitoring, and counting lab instruments were performed in-house by the licensee's staff and offsite by certified contractors. Calibration procedures were consistent with TS requirements and American National Standards Institute or the manufacturers' recommendations. With one exception calibration followed licensee procedures. Calibration and check sources were traceable to the National Institute of Standards and Technology. The sources' geometry matched those used in actual analyses

The portable neutron meter was last calibrated by a contractor using a Plutonium-Beryllium (PuBe) calibration source since the deuterium-moderated californium (D2O Cf) source, used in-house, was unavailable. Current industry calibration standards for neutron meters does not differentiate between D2O Cf and PuBe sources except for special applications. Neither does the TS nor NRC regulation prescribe any specific source. The licensee's internal calibration procedure stated that the neutron meters would be calibrated using a D2O Cf source. The inspector was informed that this was phrased in this manner because that was the source they had, not because of any special application requirements. The license stated that they would modify their procedures to conform to industry standards. This will be reviewed during a future inspection as an Inspector Follow-up Item (IFI 50-602/99-201-01).

All instruments checked were in calibration. Calibration records were in order.

c. Conclusions

Portable survey meters, radiation monitoring, and counting lab instruments were being maintained according to TS and industry/equipment manufacturer standards and, with the one exception noted above, according to licensee procedures.

8. EFFLUENT MONITORING AND RELEASE

a. Inspection Scope (69001)

The inspector reviewed selected aspects of:

- release records
- counting and analysis program
- annual reports

b. Observations and Findings

The program for the monitoring, storage and release of radioactive liquid and gases was consistent with applicable regulatory requirements. Gaseous releases were monitored and calculated using the Environmental Protection Agency COMPLY code. Records were acceptable and showed gaseous releases well within the annual dose constraint of 10 CFR 20.1101(d), Appendix B concentrations and TS limits.

Radioactive liquid releases were infrequent and were monitored and released when below acceptable limits. Records through July 1999, confirmed that releases met 10 CFR 20.2003 and Appendix B limits. ALARA principles were acceptably implemented to minimize radioactive releases. Monitoring equipment was acceptably maintained and calibrated. Records were current and acceptably maintained.

c. Conclusions

The effluent monitoring and release program satisfied NRC requirements.

9. ENVIRONMENTAL PROTECTION

a. Inspection Scope (69001)

The inspector reviewed selected aspects of:

- the environmental monitoring program
- environmental records
- procedures
- annual reports

b. Observations and Findings

The environmental monitoring program consists of direct quarterly radiation measurements at selected locations adjacent to the NRTL. Dosimetry results in unrestricted areas were not statistically different from background readings.

c. Conclusions

Environmental monitoring satisfied the radiation protection program requirements.

10. PROCEDURES

a. Inspection Scope (69001)

The inspector reviewed selected aspects of:

- administrative controls
- records for changes and temporary changes
- procedural implementation
- logs and records

b. Observations and Findings

HP procedures were available for those tasks and items required by the TS, license, and facility directives. Administrative controls of changes and temporary changes to procedures, and associated review and approval processes were as required.

Training of personnel on procedures and changes was acceptable. Personnel conducted activities in accordance with applicable procedures. Records showed that procedures for potential malfunctions (e.g., radioactive releases and contaminations, and reactor equipment problems) were implemented as required.

Some procedures were extremely detailed to the point of listing survey instruments by make and specific model number as opposed to type or use. Although not proscribed, this itemization is not required by TS, license, NRC requirements, or recommended by industry standards.

c. Conclusions

The procedural control and implementation program satisfied TS requirements.

11. EMERGENCY PREPAREDNESS

a. Inspection Scope (69001)

The inspector reviewed selected aspects of:

- the Emergency Plan (E-plan)
- implementing procedures
- emergency response facilities, supplies, equipment and instrumentation
- training records
- offsite support
- emergency drills and exercises

b. Observations and Findings

The E-Plan in use at the reactor and emergency facilities was the same as the version most recently approved by the NRC. The E-Plan was audited and reviewed as required. Implementing procedures were reviewed and revised as needed to employ the E-Plan effectively. The licensee was reminded that all posted call lists need to be kept current.

Facilities, supplies, instrumentation and equipment were being maintained, controlled and inventoried as required by the E-Plan. Through records review and interviews with licensee personnel, emergency responders were determined to be knowledgeable of the proper actions to take in case of an emergency. Agreements with outside response organizations had been updated and maintained as necessary.

Emergency drills had been conducted as required by the E-Plan. Off-site support organization participation in the last drill, as required by the E-plan, included the city of Austin's full Incident Control System. Checklists were provided to observers for use during the drills. Critiques were held following the drills to discuss the strengths and weaknesses identified during the exercise and to develop possible solutions to any problems identified. The results of these critiques were documented, evaluated, and implemented as appropriate. Emergency preparedness and response training was being completed as

required. Training for off-site and reactor staff personnel was conducted and documented as stipulated by the E-Plan.

c. Conclusions

The emergency preparedness program was conducted and implemented in accordance with the E-Plan.

12. SAFEGUARDS

a. Inspection Scope (85102)

The inspector reviewed selected aspects of:

- nuclear material accountability program
- nuclear material inventory and locations
- accountability records and reports

b. Observations and Findings

The semiannual inventory of material was reviewed and verified. The material control and accountability program tracked locations and content of fuel and other SNM under the research reactor license. Fuel burn-up related measurements and calculations were acceptably performed and documented. The possession and use of SNM were limited to the locations and purposes authorized under the license. The material control and accountability forms (DOE/NRC Forms 741 and 742) were prepared and transmitted as required. Fuel inventory and movement records were cross referenced and matched.

The facility representative located and the inspector verified randomly selected items listed on the SNM inventory.

c. Conclusions

The licensee was in compliance with the possession and use limits of the research reactor and had acceptably controlled and inventoried SNM as required.

13. TRANSPORTATION

a. Inspection Scope (86740)

The inspector reviewed selected aspects of:

- radioactive materials shipping procedures
- radioactive materials transportation and transfer records

b. Observations and Findings

Production of solid radioactive waste at the facility was minimal. The amount produced was handled under the campus waste disposal program. All transfers were recorded on the appropriate forms. Transfer documentation was kept on file as required and was acceptable.

Radioactive materials produced by the reactor for use by the university staff or outside organizations were handled and documented as required.

c. Conclusions

Radioactive material was transferred and disposed of in accordance with licensee procedures and TS requirements.

14. CALORIMETRIC POWER CALIBRATION INTERVAL LAPSE

a. Inspection Scope (92701)

The inspector reviewed selected aspects of:

- NRSC minutes
- Facility and experiment records
- August 1999 NETL report to the NRC

b. Observations and Findings

During the first week of August 1999, the NETL reported, under Section 6.6.2.2.f. of its TS, an observed inadequacy in procedural control.

TS 4.2.4., "Surveillance Requirements, Reactor Instrumentation System," requires a calorimetric calibration of the power measuring channels annually, not to exceed 15 months. The interval between the 1998 and 1999 calibrations was 16 months and 2 days (March 27, 1998, to July 29, 1999). Annual calibration is scheduled for July of each year with a 3-month grace period allowing until October for completion. Calibration dates for years 1992 to 1997 ranged from July 7 to September 24, well within TS requirements.

During 1998 the calorimetric calibration was performed early, on March 27, 1998, to allow a Fellow from the International Atomic Energy Agency the rare opportunity to participate in such a calibration. Considering the 3 month grace period, the 1999 "annual" calibration then would have been required by June 29, 1999, unless performed earlier to "catch-up" the interval.

In reviewing records, experiments, and interviewing staff, the inspector determined that the safety significance of this 7 percent increase in the surveillance interval was nil. The TS bases for annual calibration of instrument channels is "to allow adjustment for changes in reactor and instrument parameters." Review of the 1998 and 1999 calibrations, operation

checks, tests, and power level rod position configurations confirmed that there had been no significant changes in reactor and instrument parameters. Furthermore, results from a March 1999, facility power calibration experiment correlated well with the 1998 and 1999 results providing more indications that there had been no changes.

The licensee stated that, without specific rescheduling and approval by management, surveillances performed outside the "normal" schedule would be considered for training only.

c. Conclusions

The licensee's reporting, performance, and subsequent corrective actions regarding the power calibration interval error is acceptable.

15. ROTARY SPECIMEN RACK (LAZY SUSAN) DEFLAGRATION EVENT

a. Inspection Scope (92701)

The inspector reviewed selected aspects of:

- NRSC minutes
- Facility and experiment records
- Summary of Unusual Event UT-TRIGA RSR Loading 11/12/98
- HP survey, analyses, and evaluation records

b. Observations and Findings

On November 12, 1998, an unusual event occurred during the routine loading of the rotary specimen rack (RSR). The incident did not directly affect the reactor or its subsequent operation.

During loading of the RSR a loud sound was heard by the four persons on the pool deck, similar to metal on metal banging. The individual nearest the loading port operating the sample-handling device felt a brief puff of air on his cheek. Operations were stopped.

Subsequent investigation found that a small amount of flammable gas inside the RSR, probably hydrogen, had ignited, lifting the sample-handling tool and jamming it seventeen inches from the bottom of the twenty four-foot insertion tube. The licensee found no other detectable physical effect or damage as a direct result of this incident. The licensee determined that an electrical circuit short in the sample-handling tool cable ignited the gases in the RSR.

The inspector verified that no detectable doses were received, no contamination occurred, no damage was done to the reactor facilities, recovery of the sampling-tool was performed following ALARA principals, that inspection of the experimental facility and repair of the handling tool cable (with conversion to low voltage DC), and the subsequent restart was acceptable.

The license stated that besides eliminating the source of ignition, they were instituting a routine inspection of the sample-handling tool cable and a RSR procedure change requiring a ten-minute air purge prior to retrieval of samples. This will be reviewed during a future inspection as an Inspector Follow-up Item (IFI 50-602/99-201-02).

c. Conclusions

The licensee's actions in regards to the RSR unusual loading event were acceptable.

16. **EXIT MEETING SUMMARY (30703)**

The inspector presented the inspection results to members of licensee management at the conclusion of the inspection on October 1, 1999. The licensee acknowledged the findings presented 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

*T. Bauer	Assistant Director, NETL
T. Jackson	Health Physic Technician
*M. Krause	Reactor Supervisor
*S. O'Kelly	Associate Director, NETL
*A. Teachout	Reactor Health Physicist
*B. Wehring	Director, NETL
*J. White	Radiation Safety Officer, University of Texas at Austin

* Attended Exit Meeting

INSPECTION PROCEDURE (IP) USED

IP 30703	ENTRANCE, EXIT INTERVIEWS
IP 69001	CLASS II NON-POWER REACTORS
IP 85102	MATERIAL CONTROL AND ACCOUNTING
IP 86740	TRANSPORTATION ACTIVITIES
IP 92701	FOLLOWUP ON INSPECTOR IDENTIFIED PROBLEMS

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

IFI 50-602/99-201-01	The licensee would modify their neutron calibration procedures to conform to industry standards.
IFI 50-602/99-201-02	The licensee would institute a routine inspection of the sample-handling tool cable and a RSR procedure change requiring a ten-minute air purge prior to retrieval of samples.

Closed

IFI 50-602/97-201-01	Licensee to ensure that future written audit reports would be submitted at each meeting for previous audited items as required.

PARTIAL LIST OF ACRONYMS USED

ALARA	As Low As Reasonably Achievable
E-Plan	Emergency Plan
HP	Health Physics
NETL	Nuclear Engineering Teaching Laboratory
NRC	Nuclear Regulatory Commission
NRSC	Nuclear Reactor Safety Committee
RSO	Radiation Safety Officer
RPP	Radiation Protection Program
SNM	Special Nuclear Material
TS	Technical Specifications

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