

APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report No. 50-128/92-01

Operating License No. R-83

Licensee: Texas Engineering Experiment Station

Facility Name: Nuclear Science Center

Inspection At: Texas A&M University

Inspection Conducted: February 24-28, 1992

Inspector: L. T. Ricketson, P.E., Senior Radiation Specialist

Approved:

Blaine Murray
Blaine Murray, Facilities Inspection Programs
Section

4/9/92
Date

Inspection Summary

Inspection Conducted February 24-28, 1992 (Report No. 50-128/92-01)

Areas Inspected: Routine, unannounced inspection of the licensee's organization, training, qualifications, operations, procedures, experiments, surveillances, physical security and safeguards, emergency plan, notifications, and reports.

Results: Within the areas inspected, two violations, possession of radioactive material not authorized by the license (paragraph 9) and failure to train members of offsite support organizations annually (paragraph 11) were identified.

- ° An adequate staff was in place to provide safe operation of the facility.
- ° Adequate requalification and worker Radiation Protection Training programs had been implemented.
- ° A large turnover of licensed operators had occurred since the previous inspection; however, the large turnover did not result in any apparent decrease in program effectiveness.
- ° An appropriate health physics staff had been established to provide good coordination and oversight of radiation protection activities.

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- ° No changes had been made in the reactor designs and the reactor operated within Technical Specification requirements.
- ° Operations procedures were adequate. Other procedures were in the process of being updated.
- ° An effective experiment review and approval program was in use.
- ° A good surveillance program had been established to ensure that limiting conditions for operation requirements were not exceeded. Two fuel elements were identified during routine surveillances that did not meet technical specification limits.
- ° Adequate radiological controls were implemented; however, licensee representatives lacked familiarity with certain conditions of NRC and agreement state licenses.
- ° An effective emergency response program was in place.
- ° Improvements were made in the guidance provided to program auditors. Comprehensive audits were performed, and responses were made to audit findings in a timely manner.
- ° Records, notifications, and reports were made as required.

DETAILS

1. PERSONS CONTACTED

NSC

- *D. Reece, Director, Nuclear Science Center
- W. Asher, Reactor Operations Manager
- #M. Brown, Assistant Director, Nuclear Science Center Laboratories, Nuclear Science Center Health Physicist
- B. Cannell, Health Physics Technician
- #B. Carlisle, Assistant Director, Nuclear Science Center Reactor
- L. Krisantis, Health Physics Supervisor

*Denotes those present at the exit meeting on February 28, 1992.

#Denotes those present at the meeting on February 27, 1992.

In addition the inspector interviewed other personnel from the Nuclear Science Center operations and health physics groups and offsite support organizations.

2. FOLLOWUP ON PREVIOUS INSPECTION FINDINGS

(Closed) Violation (128/9001-01): Failure to Implement all Provisions of the Nuclear Science Center Reactor Physical Security Plan - This item was discussed in NRC Inspection Report 50-128/90-01 and involved the failure to test reactor operators annually on the physical security plan. The violation resulted because different testing frequencies were specified in the Physical Security Plan and the Reactor Operator Requalification Program. The licensee amended both documents to reflect that training and testing would be part of the Reactor Operator Requalification Program and testing on the Physical Security Plan would be performed every 2 years. The inspector confirmed that testing had been accomplished during the current requalification cycle.

(Closed) Violation (128/9002-01): Failure to Verify that a Recipient of Byproduct Material was Properly Licensed - This item was discussed in NRC Inspection Report 50-128/90-02 and involved the transfer of byproduct material to a company without first verifying that the company had an active license to possess the specific material. The licensee changed its method of approving "Requests for Services" to include verification by a health physics representative that the requesting individual or company had an active license to possess the form and amount of byproduct material requested. The licensee also initiated an annual audit of its customer license files to identify those licenses which were no longer valid. The inspector verified that radioactive material was provided or to properly licensed customers.

(Closed) Deviation (128/9002-02): Failure to Follow Instrument Calibration Procedures Included in the Safety Analysis Report - This item was discussed in NRC Inspection Report 50-128/90-02 and involved the failure to calibrate a neutron survey instrument annually. The licensee added the calibration of this

instrument to its annual calendar of tasks. The inspector verified that the instrument had been calibrated in 1990 and 1991.

(Closed) Open Item (128/8801-06): Effectiveness of the Health Physics program at the Nuclear Science Center - This item was discussed in NRC Inspection Report 50-128/88-01 and involved the implementation of an aggressive, comprehensive health physics program. Since this item was identified, the licensee put in place a new organization as described in Amendment 12 of the license and an experienced individual was hired as the reactor health physicist. While reviewing selected logs, the inspector noted that in response to repeated contamination incidents, the health physicist ordered all experiments be stopped and all experimenters be retrained. This was accomplished before work on experiments continued. The inspector noted also that the health physicist had withheld startup approval when the licensee identified problems with part of the required radiation monitoring system. The inspector determined that these examples demonstrated that the reactor health physicist was sufficiently assertive to ensure that the health physics program was effective.

(Closed) Open Item (128/9001-02): Health Physicist Position - This item was discussed in NRC Inspection Report 50-128/90-01 and involved the vacant Nuclear Science Center health physicist position. The licensee hired an experienced individual in 1990 to fill the position.

(Closed) Open Item (128/9002-03): Contamination Controls - This item was discussed in NRC Inspection Report 50-128/90-02 and involved the need for improved contamination control techniques. The specific example discussed involved the poor control of potentially contaminated shoe covers. The inspector noted that the licensee had initiated the use of special containers which prevented individuals from inadvertently handling contaminated shoe covers. To address the more general problem, the licensee had proposed a new procedure entitled, "Contamination Control" which will be submitted to the Reactor Safety Board for approval.

(Closed) Open Item (128/9002-04): Decontamination Procedures - This item was discussed in NRC Inspection Report 50-128/90-02 and involved the lack of area decontamination procedures. The inspector verified that Standard Operating Procedure VII-C.16, "Radioactive Materials Control," had been revised to include the necessary instructions.

(Closed) Open Item (128/9002-05): Unauthorized Changes to Standard Operating Procedures - This item was discussed in NRC Inspection Report 50-128/90-05 and involved the handwritten changes to some procedures. The licensee had reviewed procedures annually to identify, in part, such unauthorized changes, and it had advised workers that it was unacceptable to follow handwritten changes.

3. ORGANIZATION (40750)

The inspectors reviewed the Nuclear Science Center's organization to determine agreement with Technical Specification 6.1.

A new director and assistant director have been hired since the previous inspection. Four licensed senior reactor operators and one licensed reactor operator were assigned to the Nuclear Science Center. The number of licensed operators was fewer than during the previous inspection, and the licensee was actively seeking replacement personnel. No safety related problems were identified as a result of facility staffing. Reactor operations were supported by electrical technicians and maintenance personnel.

A reactor health physicist supervised the health physics group which consisted of a supervisor and five (full and part-time) health physics technicians. Additionally, the reactor health physicist had the title of Assistant Director, Nuclear Science Center Laboratories, and supervised the laboratory operations group (six positions) and the commercial services group (seven positions). The laboratory positions were not prescribed by the Technical Specifications. The reactor health physicist reported directly to the Deputy Director of the Texas Engineering Experiment Station on matters concerning radiation protection.

No violations or deviations were identified.

Conclusion

An adequate staff was in place to provide safe operation of the facility.

4. TRAINING AND QUALIFICATIONS (40750)

The inspector reviewed the training program to determine agreement with Technical Specification 6.1.4, 10 CFR Part 19.12, and the operator requalification program dated March 1, 1991.

The licensee experienced a large turnover of licensed operators since the previous inspection. Only one of the current operators was employed during the previous inspection of this area; however, the manager of reactor operations had twice previously worked at the Nuclear Science Center. The inspector reviewed attendance records for requalification lectures, written examination tests results and console manipulations. The inspector verified that all licensed operators completed the requirement contained in the requalification program.

The inspector verified that radiological training provided to all personnel satisfied the requirement of 10 CFR Part 19.12. The inspector verified that written examination results were on file. Licensee representatives stated that personnel contaminations events had been a persistent problem. As part of

corrective actions, all experiments were stopped and experimenters were retrained with emphasis on contamination controls.

No violations or deviations were identified.

Conclusion

- ° Adequate requalification and worker Radiation Protection Training programs had been implemented.
- ° A large turnover of licensed operators had occurred since the previous inspection; however, it did not result in a degradation of safety.
- ° An appropriate health physics staff had been established to provide good coordination and oversight of radiation protection activities.

5. REACTOR OPERATIONS (40750)

The inspector reviewed logs and records to determine agreement with Technical Specifications 2.0, 3.0, and 5.0.

5.1 Facility Status

The reactor was not operating at the time of the inspection. Licensee representatives were performing surveillance inspections and replacing the cooling tower. The reactor normally operated 5 days per week with double shifts, 3 days a week. The reactor operated at 1 megawatt steady-state and was used to support research, neutron beam activities, the production of radioisotopes, and the irradiation of gemstones.

The inspector noted that there were no changes to reactor or fuel design since the previous inspection of this area (NRC Inspection Report 50-128/90-01), hence, no deviations from the descriptions in the Safety Analysis Report or need for 10 CFR Part 50.59 evaluations. No additional fuel had been received.

5.2 Operations Logs and Records

The inspector reviewed the following logs and records:

<u>Name</u>	<u>Date</u>
Supervisor/Shift Change Log	10/90 - 2/92
Reactor Operations Log	9/91 - 2/92
Reactor Scram Log	1/90 - 2/92
Reactor Maintenance Records	1/90 - 2/92

Since the previous inspection of this area, there had been no additional entries in the Modification Authorization Log and no unusual repair or maintenance activities had been performed. The inspector noted that most scrams were caused by loss of facility power. None of the scrams had safety significance.

5.3 Core Conditions

The inspector determined that core temperature and the power levels did not exceed Technical Specification during 1990-1991.

No violations or deviations were identified.

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Conclusions

No changes had been made in the reactor designs and the licensee operated the reactor with Technical Specification requirements.

6. PROCEDURES (40750)

The inspector reviewed selected procedures to determine compliance with Technical Specification 6.3.

The inspector reviewed Standard Operating Procedure II. H, "Fuel Element Surveillance Inspection," and observed as licensee representatives performed the surveillance, and interviewed licensee personnel concerning the procedure. The inspector determined that the procedure provided sufficient guidance to conduct the operation.

The inspector found that there had been little revision of procedures since the previous inspection; however, major revisions and additions were forthcoming. Licensee representatives identified 7 new procedures which were being prepared and 15 existing procedures which were being revised to provide better guidance. The procedures were primarily in the area of radiological controls. No procedural revision or addition was identified in the operations area.

No violations or deviations were identified.

Conclusion

Operations procedures were adequate for operation. The licensee was upgrading other procedures.

7. EXPERIMENTS (40750)

The inspector examined the licensee's evaluations, conduct, and documentation of experiments to determine agreement with Technical Specifications 3.6, 4.6, and 6.4.

The inspector determined that there had been 25 new experiment approved since the previous inspection. All of these new experiments fit into the 22 general experiment classification categories already approved. The inspector confirmed that reactivity of each experiment was calculated prior to placing it into the reactor. All reactivity values were below the Technical Specifications limits. The inspector verified that all experiments were within the conditions contained in the Safety Analysis Report and that none of the experiment involved an unreviewed safety question as defined in 10 CFR Part 50.59.

No violations or deviations were identified.

Conclusion

An effective experiment review and approval program was in use.

8. LIMITING CONDITIONS AND SURVEILLANCES (40750)

The inspector reviewed records and logs and interviewed personnel to determine agreement with the limiting conditions and surveillance requirements in Technical Specifications 3.0 and 4.0.

The core contained 90 FLIP elements and was assembled as required by Technical Specification. The inspector noted that the shutdown margin was \$3.02. The maximum reactivity was \$6.44. The measuring channels and safety circuits were as required and were checked for operability prior to each startup. The results were recorded on a pre cart checklist. Scrams times were less than the Technical Specification limit of 1.2 seconds. The licensee performed weekly surveillances to determine that the pool water conductivity was below the Technical Specification limit and that the pH of the water was within the acceptable range.

The licensee had performed surveillances as required, including: calibration of power level monitoring channels by the calorimetric method, pulsing the reactor and comparing the fuel temperature measurements and core pulse energy with those of previous pulses to evaluate changes in core characteristics, determination of the reactivity worth of each control rod and the shutdown margin, visual inspection of the control rods and service of the transient rod drive mechanism, determination of scram times, daily channel checks, annual calibration of the radiation monitoring system, and the visual inspection of the fuel elements.

The inspector noted that the licensee found two fuel elements in January 1991 and two in February 1992 which showed transverse bending in excess of the Technical Specification limit. Based on identification of the two elements in 1992, the licensee was in the process of inspecting the entire core to demonstrate compliance with Technical Specification 4.2.4.b.

No violations or deviations were identified.

Conclusion

A good surveillance program had been established to ensure that limiting conditions for operation were not exceeded. Two fuel elements did not meet technical specification limits.

9. RADIOLOGICAL CONTROLS (40750)

The inspector reviewed portions of the radiological controls to determine agreement with Technical Specification 6.1 and 10 CFR Part 20. Radiological controls will be reviewed further during a future inspection.

Radiological controls were overseen by the reactor health physicist. The licensee provided health physics coverage whenever the reactor was operating.

The inspector noted that the licensee had initiated the use of radiation work permits for work in specific areas. Licensee representatives stated that they plan to expand the use of radiation work permits in the future.

The license was still in possession of the 2.5 curie americium-beryllium source discussed in NRC Inspection Report 50-128/90-01. However, the inspector found that the licensee also possessed a number of other sealed radioactive sources in various locations at the Nuclear Science Center. These included:

- 45 curies - cobalt-60
- 6.36 curies - cesium-137
- 567 millicuries - cesium-137
- 83.6 millicuries - cesium-137
- 40 millicuries - cobalt-60
- 38 millicuries - cobalt-60
- 2.47 millicuries - americium-241
- 2.18 millicuries - cesium-137

Some of these sources were calibration sources owned by the university radiation safety office and had been stored at the Nuclear Science Center for years. Others belonged to individuals listed on the university's agreement state license and were transferred to the Nuclear Science Center in late 1991.

Additionally, in the chemistry laboratory the licensee had stored two barrels labeled in accordance with U.S. Department of Transportation regulations. The labels listed the contents of one barrel as 127 millicuries of a combination of cobalt-60, cerium-144, cesium-137, and strontium-90. The second barrel contained 50 millicuries of the same isotopes. Licensee representatives stated that the barrels contained hot particles which were used for research and were also transferred to the Nuclear Science Center in late 1991.

License Condition II.B(3) states that Pursuant to the Act and 10 CFR, Chapter I, Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," the licensee may receive, possess, and use in connection with operation of the reactor a 20 curie encapsulated plutonium-beryllium neutron source and a 3 curie encapsulated americium-beryllium neutron source and to possess but not to separate such byproduct material as may be produced by operation of the reactor.

The inspector determined that the university's agreement state broad license specifically stated that the Nuclear Science Center was not an authorized storage location for the radioactive sources. The inspector identified this as violation of License Condition II. B (128/9201-01).

The inspector noted the use of a rope barricade indicating a radiation area around the two barrels containing hot particles in the chemistry laboratory. The inspector performed confirmatory measurements and verified the proper placement of the barricade. The chemistry laboratory was locked.

The licensee reported to Region IV by telephone of an exposure of 3.9 rems to the thermoluminescent dosimeter of one of the licensee's employees. Licensee

representatives informed the inspector on February 27, 1992, that the vendor of the thermoluminescent dosimeter confirmed that the dose, as reported, resulted from exposure to neutrons only, with no contribution from gamma or beta radiation. Licensee representatives further stated that the badge belonged to the receptionist and, therefore, was unlikely to be a true exposure. The licensee was reviewing the matter and the inspector will review the results of the licensee's investigation during a future inspection.

No deviations were identified.

Conclusion

Adequate radiological controls were implemented; however, licensee representatives lacked familiarity with certain conditions of NRC and agreement state licenses.

10. PHYSICAL SECURITY/SAFEGUARDS AND MATERIAL CONTROL AND ACCOUNTING (81401, 81810, 81431, and 85102)

The inspector reviewed the physical security and safeguards program to determine compliance with the requirements of License Condition II.C of the facility operating license, Section 5.8 of the Technical Specifications, the requirements of 10 CFR 50.54(n) and Part 73, and the Physical Security Plan, dated January 21, 1981.

In accordance with 10 CFR Part 2.790(d), the material in this paragraph is exempt from disclosure. Therefore, this material is discussed in the Attachment to this Appendix and will not be placed in the Public Document Room.

11. EMERGENCY PREPAREDNESS 40750)

The inspector reviewed the implementation of the emergency preparedness program for agreement with the Emergency Plan dated November 1982.

The inspector determined that there had been no changes to the Emergency Plan since the previous inspection of this area.

The inspector noted that the facilities were still as described in the Emergency Plan and that calibrated emergency instrumentation was available. The inspector reviewed the contents of an emergency kit and determined that the contents matched the inventory in the kit.

Current letters of agreement with offsite support organizations, such as fire department/ambulance service, and a local hospital were on file.

10 CFR Part 50.54(q) requires that a licensee authorized to possess and operate a research reactor shall follow and maintain in effect emergency plans.

Section 3 of the Emergency Plan requires that offsite support organizations be trained annually in the basic principles of radiation protection and Nuclear Science Center emergency procedures. Section 3.1.11 requires that firemen be

trained annually. Through a review of training records, the inspector found that training was provided to the local police during the summer of 1991; however, training in the emergency plan had not been provided to the fire department during the period August 1990 to February 27, 1992. The inspector identified this as a violation of 10 CFR 50.54(q) (128/9201-02).

Annual emergency drills was conducted as required. Drill critiques were presented to the Reactor Safety Board. Offsite support organizations to participated every 2 years, as required. The hospital and ambulance service participated in 1991.

The inspector visited the offsite communications center and determined that an emergency telephone list of the appropriate personnel was available.

No deviations were identified.

Conclusion

An effective emergency response program was in place.

12. COMMITTEES, AUDITS, AND REVIEWS (40750)

The inspector reviewed the minutes of the Reactor Safety Board to determine agreement with the requirements of Technical Specification 6.2.

The inspector noted that the board consisted of the required members and met as required. The inspector also noted that detailed checklists were provided to individuals performing audits at the Nuclear Science Center. Audits were performed as required. Areas audited included facility operations, reactor operator requalification program security plan, emergency plan, and health physics activities. Audit findings and responses were discussed at the following Reactor Safety Board meeting.

No violations or deviations were identified.

Conclusion

Improvements were made in the guidance provided to program auditors. Comprehensive audits were performed and responses were made to audit findings in a timely manner.

13. RECORDS, NOTIFICATIONS, AND REPORTS (40750)

The inspector reviewed the Annual Operations Report for 1990 and facility records to determine agreement with Technical Specifications 6.6 and 6.7. Reportable occurrences were reported to the NRC and included in the annual report.

No violations or deviations were identified.

Conclusion

Records, notifications, and reports were made as required.

14. INDEPENDENT INSPECTION EFFORT (40750)

The inspector observed licensee representatives perform fuel element inspections and collected a liquid reactor pool sample for the purpose of comparing radiological results with the licensee. NRC results of the liquid samples confirmed the licensee's measurements which indicated that levels of manganese-54 and cobalt-60 were below $10E-7$ microcuries/milliliter.

No violations or deviations were identified.

15. EXIT MEETING

The inspector met with the Director of the Nuclear Science Center at the conclusion of the inspection on February 28, 1992, and summarized the scope and findings of the inspection as presented in this report. A preliminary briefing was given on the afternoon of February 27.