APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-188/86-02 License: R-88

Docket: 50-188

Licensee: Kansas State University (KSU)
Department of Nuclear Engineering
Manhattan, Kansas 66505

Facility Name: Kansas State University

Inspection At: Manhattan, Kansas

Inspection Conducted: September 9-10, 1986

Inspector: Russell Wise 10/15/86
Russell Wise, Radiation Specialist, Facilities Radiological Protection Section — Date

Approved: Blaine Murray 10/15/86
Blaine Murray, Chief, Facilities Radiological Protection Section — Date

Inspection Summary

Inspection Conducted September 9-10, 1986 (Report 50-188/86-02)

Areas Inspected: Routine, unannounced inspection of the licensee's program including: (1) radiation protection, (2) emergency preparedness, (3) material accountability, and (4) physical security.

Results: Within the areas inspected, three violations were identified (see paragraphs 3.a, 3.d, and 3.e).

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DETAILS

1. Persons Contacted

*N. D. Eckhoff, Department Head, Nuclear Engineering
*R. E. Faw, Director, Nuclear Reactor Facility (NRF)
*J. F. Higginbotham, Reactor Supervisor
*F. L. Ferguson, General Manager, Physical Facilities
*J. Lambert, Radiation Safety Officer
*G. Simonis, Professor
*J. Daniels, Reactor Operator
*D. J. Whitfield, Reactor Operator
R. Tout, M.D., Director, Student Health Center
C. A. Beckom, Chief, KSU Police
G. D. Westcott, Industrial Hygienist
E. M. Hupe, Administrative Officer, Physical Facilities

*Denotes those present during the exit briefing.

2. Inspector Observation

The following are observations the NRC inspectors discussed with the licensee during the exit meeting on September 10, 1986. These observations are neither violations nor unresolved items. These items were recommended for licensee consideration for program improvement, but they have no specific regulatory requirement.

a. Documentation of Instrumentation Calibration/Response Tests - Records of portable survey instrument calibrations and alarm setpoint tests did not indicate what calibration source was used or who had performed the calibration. (See paragraph 3.a.)

b. Calibration of Area Monitor - The area radiation monitor which actuates the evacuation alarm is not currently calibrated above 100 mR/h. (See paragraph 3.b.)

c. Personnel Monitoring - Personnel monitoring devices were not approved by National Voluntary Laboratory Accreditation for Personnel Dosimetry (NVLAP). (See paragraph 3.d.)

d. Neutron Surveys - Neutron radiation levels had not been established. (See paragraph 3.f.)

e. 10 CFR Part 19.12 Training - Documentation of radiation worker training did not include all categories of instruction in 10 CFR 19.12. (See paragraph 3.g.)

f. Emergency Equipment - A high range instrument was not available in an emergency kit. (See paragraph 4.)

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g. Key Control - Documentation of personnel authorized access to the NRF was not current. (See paragraph 8.)

3. Radiation Protection

The licensee's radiation protection program was inspected to determine compliance with the requirements of Technical Specifications (TS) F and H; 10 CFR Parts 19 and 20; the KSU Emergency Plan; and the recommendations of NRC Regulatory Guide (RG) 8.4.

The NRC inspector reviewed records, interviewed personnel, made observations, and performed independent surveys.

a. Radiation Measuring Instrumentation

The NRC inspector reviewed calibration records for portable radiation survey instrumentation for 1983, 1984, 1985, and 1986. It was noted that calibration standards utilized for calibration and the person who was performing the survey instrument calibration was not recorded on the data sheet. The licensee stated at the exit briefing on September 10, 1986, that this observation would be reviewed.

The NRC inspector noted that calibration of portable survey instrumentation was required to be performed in accordance with Section 10.5 of the KSU Emergency Plan, dated October 14, 1982, which states, in part, that portable survey instruments will be calibrated semiannually. It was noted from the review of calibration records that the following five portable radiation monitoring instruments had been used to determine radiation levels, but had not been calibrated semiannually.

- Eberline Model E-120, Serial Number (S/N) 915, June 1984 - July 1985
- Eberline Model E-120, S/N 940, January - December 1985
- Eberline Model E-500B, S/N 968, January - December 1985
- Eberline Model E-500B, S/N 1021, January - September 1985
- Eberline Model E-510, S/N 153, July 1985 - June 1986

The failure to calibrate radiation monitoring instruments semiannually as required is an apparent violation of Section 10.5 of the KSU Emergency Plan. (188-8602-01)

b. Area Radiation Monitors (ARMs)

The NRC inspector reviewed the licensee's calibration programs for ARMs which are required to be function tested daily during operations, response tested quarterly, and calibrated annually.

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The NRC inspector noted that documentation regarding calibration of the ARM consists of a label placed on the readout panel of the instrument; no other documentation was utilized to indicate what sources were used, who performed the calibration, or the ranges of operation at which the instrument was calibrated.

The NRC inspector noted that an area radiation monitor identified in Section 8.3.1 of the KSU Emergency Plan, which actuates the evacuation alarm at an exposure rate of 5 R/h, is only calibrated at an upper radiation level of 100 mR/hr. The NRC inspector discussed the need to calibrate instrumentation over the ranges of operation addressed in the Emergency Plan.

c. Continuous Air Monitor (CAM)

The NRC inspector reviewed the licensee's program for monitoring airborne concentrations within the reactor bay to determine compliance with Sections F and H of the TS and Section 8.3.1 of the Emergency Plan.

Section 8.3.1 of the Emergency Plan states that the CAM is sensitive to radioiodine and alarms at maximum permissible air concentrations of Iodine-131 in restricted areas. The licensee stated that the instrument is calibrated with a Technetium-99 source, but that no direct comparison results were available from the calibration results to indicate the instruments' response to Iodine-131 levels. The NRC inspector informed the licensee that Iodine-131 concentration might be difficult to verify because of the masking effect of the noble gases that are produced in the reactor bay during operations.

The NRC inspector noted that the calibration of the CAM is documented only on the current calibration label placed on the readout meter of the instrument; no other documentation was utilized to indicate what sources were used, who performed the calibration, or what ranges of operation the instrument was calibrated.

d. Personnel Monitoring

The NRC inspector reviewed the NRF personnel radiation exposure records for 1983, 1984, 1985, and 1986.

The personnel monitoring devices are provided by the KSU radiation safety department. Two separate badges are utilized at KSU, a beta-gamma badge for researchers and a neutron-gamma badge for NRF staff. The NRC inspectors noted that the licensee had not conducted testing of dosimeters as recommended in ANSI N13.11-1983.

The NRC inspector noted that the licensee had not developed written calibration and operating procedures for use of the TLD monitoring system which is utilized for determining personnel exposures at KSU.

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TS, Section H, Administrative Requirements, paragraph 1, states "written instructions, approved by the Reactor Safeguards Committee, shall be in effect for, but not limited to:" specific areas noted in Section H. The failure to develop written procedures for calibration and operation of the TLD personnel monitoring system is an apparent violation of TS, Section H.1. (188/8602-02)

The NRC inspector noted that the licensee had not participated in the NVLAP program. The NRC inspector discussed with the licensee the forthcoming 10 CFR Part 20 requirement that personnel monitoring devices will need to be NVLAP accredited.

The NRC inspector noted that self reading dosimeters (SRD) are calibrated semiannually with a radioactive source. However, the licensee does not routinely, prior to calibration, perform testing on SRDs to determine leakage. The NRC inspector discussed with the licensee the recommendations of NRC RG 8.4 concerning testing and calibration of SRD. The licensee stated at the exit briefing on September 10, 1986, that the NRC inspector's observation would be reviewed.

e. Environmental Surveillance/Radioactive Releases

The NRC inspector reviewed records of analysis on sump drain liquid which is performed with a gamma spectroscopy system.

The NRC inspector noted that the licensee had not developed written calibration and operating procedures for use of the gamma spectroscopy system which is routinely used to analyze sump drain water prior to release to unrestricted areas.

TS, Section H, Administrative Requirements, paragraph 1, states "written instructions, approved by the Reactor Safeguards Committee, shall be in effect for, but not limited to:" specific areas noted in Section H. The failure to establish written procedures for calibration and operation of the gamma spectroscopy system is an apparent violation of TS, Section H.1. (188/8602-02)

Records indicated that all beta-gamma radioactivity concentrations were below 10 CFR 20 limits. However, liquid effluent is not monitored for alpha activity. The NRC inspector noted that the Americium/Beryllium neutron startup source located in the reactor pool was not being routinely wipe tested for leakage and the potential exists for the release of alpha activity into unrestricted areas.

10 CFR Part 20.201(b) states "each licensee shall make or cause to be made such surveys as: (1) may be necessary for the licensee to comply with the regulations in this part, and (2) are reasonable under the circumstances to evaluate the extent of radiation hazards

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that may be present." The failure to analyze liquid effluents for alpha activity is an apparent violation of 10 CFR 20.201(b). (188/8602-03)

The licensee stated that gaseous effluents are not routinely released and that the normal pathway would be through an exhaust duct which has been sealed and the fan switch disconnected to prevent operation. Air intake to the reactor bay is from the outside with exhaust to the reactor bay area. The licensee stated that elevated airborne concentrations are present in the reactor bay atmosphere during operations; however, no analyses have been performed to determine the concentrations.

The failure to analyze reactor bay atmosphere to determine if airborne concentrations exceeded 10 CFR 20 limits is an apparent violation of 10 CFR 20.201(b). (188/8602-03)

f. Surveys

The NRC inspector reviewed radiation and contamination survey records regarding surveys performed by the NRF staff to determine compliance with the requirements of 10 CFR Part 20 and the recommendations of industry standard ANSI/ANS-15.11-1977. The NRC inspector noted that smears taken routinely to determine levels of contamination were analyzed on the radiation safety department's liquid scintillation counter.

The NRC inspector noted that procedures had not been developed by the licensee for calibration and operation of the liquid scintillation counter.

TS, Section H, Administrative Requirements, paragraph 1, states, "written instructions, approved by the Reactor Safeguards Committee, shall be in effect for, but not limited to:" specific areas noted in Section H.

The failure to establish written procedures for calibration and operation of the liquid scintillation counter is an apparent violation of TS, Section H.1. (188/8602-02)

The NRC inspector performed independent contamination and direct radiation dose rate surveys in the NRF. The smears taken by the NRC inspector were analyzed on NRC Region IV laboratory counting instrumentation, with all results less than or equal to minimum detectable activities. The direct radiation survey results revealed no areas of radiation levels in excess of 10 CFR 20 limits.

The licensee's survey program had not included an evaluation of neutron levels with the reactor operating at full power. The NRC inspector stated that neutron radiation levels are not usually considered to be a problem at TRIGA facilities; however, surveys

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should be performed to establish that no significant neutron radiation levels exist. The licensee stated at the exit briefing on September 10, 1986, that the NRC inspector's observation would be reviewed.

g. Radiation Worker Training

Personnel qualifications and training were reviewed and discussed with the licensee to determine compliance with the requirements of 10 CFR Part 19.12 and the recommendations of RGs 8.13 and 8.29.

The NRC inspector noted that the licensee required all workers to attend radiation protection training. However, documentation was not available that all topics required by 10 CFR 19.12 had been covered. The licensee stated that the topics required by 10 CFR 19.12 were covered in training sessions, but they were not aware that documentation to that extent would be required, and that documentation on all future training conducted in this area would be completed.

The NRC inspector reviewed activity logs and determined that one female worked at the NRF and that instruction had not been provided to her and her co-workers concerning the recommendations in NRC RG 8.13.

4. Emergency Planning and Preparedness

The NRC inspector reviewed the implementation of the KSU Emergency Plan (EP) approved by the NRC on August 13. 1984, to determine compliance with 10 CFR 50.54(r).

The NRC inspector reviewed assignment of responsibilities, emergency facilities, and equipment (first aid and medical facilities, communications, and radiation and contamination protection equipment). The NRC inspector discussed with the KSU Student Health Center Director their roles and responsibilities in the event of a reactor accident at the NRF. The NRC inspector reviewed the placement and inventories of the emergency equipment. The NRC inspector noted that the inventory of the cabinet located in the basement of Ward Hall indicated that two survey instruments, one high range and one low range instrument, would be available for use. At the time of the inspection, only the low range instrument was available for use. The licensee stated that the high range instrument was out-of-service. The NRC inspector discussed with the licensee the need to provide a supplemental instrument to the kit to provide for adequate inventory. The NRC inspector noted that the actual number and type of instruments and equipment are not specifically identified in the KSU EP.

The licensee had conducted emergency exercises on August 16, 1984, and August 7, 1986. The critiques of emergency exercises were on file and had been reviewed by the Reactor Safeguards Committee (RSC) as required by the KSU emergency plan.

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The NRC inspector reviewed the biennial EP reviews conducted and approved by the RSC, and the annual requalification training required for the NRF staff. The NRC inspector noted that documentation of annual qualification training was lacking as to specific subject matter.

No violations or deviations were identified.

5. Nuclear Materials Safeguards

The NRC inspector reviewed the nuclear materials inventory program to determine compliance with License Conditions 2.B and 2.C.

The NRC inspector reviewed the accountability procedures and practice records and material status reports for the period January 1, 1983, through September 1, 1986. The procedures, practices, and records were found to be well implemented. Responsibilities and response requirements were defined clearly and understood.

No violations or deviations were identified.

6. Physical Security

The material discussed here contains Safeguards Information as defined by 10 CFR 73.21 and is reported in Attachment to this report.

7. Exit Briefing

The NRC inspector met with the licensee's representatives identified in paragraph 1 of this report at the conclusion of the inspection on September 10, 1986. The NRC inspector summarized the scope and inspection findings.

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