

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-116/88001(DRSS)

Docket No. 50-116

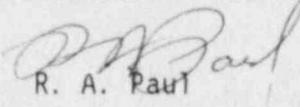
License No. R-59

Licensee: Iowa State University
Department of Nuclear Engineering
Ames, IA 50010

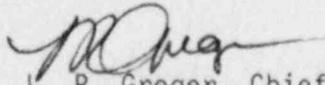
Facility Name: UTR-10 Training and Research Reactor

Inspection At: Iowa State University, Ames, Iowa

Inspection Conducted: February 9-10, 1988

Inspector:  R. A. Paul

3/17/88
Date

Approved By:  L. R. Greger, Chief
Facilities Radiation Protection
Section

3-17-88
Date

Inspection Summary

Inspection on February 9-10, 1988 (Report No. 50-116/88001(DRSS))

Areas Inspected: Routine, unannounced inspection of records, logs, and organization; review and audit functions; procedures; surveillance and maintenance; fuel handling activities; radiation protection; radwaste management control; and transportation activities (IP 40750).

Results. The licensee's program continues to be effective in assuring nuclear safety and in protecting the health and safety of workers and the public. No violations were identified in the areas inspected. One unresolved item was identified pertaining to area radiation monitor calibrations (Section 15).

DETAILS

1. Persons Contacted

Dr. R. A. Hendrickson, Reactor Manager
E. Sobotka, University Radiation Safety Officer
Dr. B. I. Spinrad, Chairman, Department of Nuclear Engineering
Dr. R. E. Williams, Reactor Supervisor
T. Zimmerman, University Health Physicist

2. General

This inspection which began on February 9, 1988, was conducted to examine the research reactor program at the Iowa State University. The facility was toured shortly after arrival. The inspector observed reactor operation and a beam hole experiment in progress during the inspection; the inspector noted that adequate radiological controls were implemented and sufficient surveys were performed to determine the radiation fields for the experiment. The general housekeeping of the facility was satisfactory.

3. Organization, Logs and Records

The facility organization was reviewed and verified to be consistent with requirements. The Radiation Safety and Reactor Use Committees appear to function as required by Technical Specification requirements. The inspector also reviewed the irradiation, preventive maintenance, modification, and control console logs. The reactor logs and records were reviewed to verify they contained required information and to determine that the facility was properly maintained and that qualified Reactor Operators and Senior Reactor Operators RO/SROs were operating the reactor.

No violations or deviations were identified.

4. Reviews and Audits

The licensee's review and audit program records were examined by the inspector to verify the following.

- a. Reviews of facility changes, operating and maintenance procedures, design changes, and unreviewed experiments had been conducted by a safety review committee as required by Technical Specifications or SAR.
- b. Required safety audits had been conducted in accordance with Technical Specification requirements and that any identified problems were resolved.

A review of the Radiation Safety Committee (RSC) and Reactor Use Committee (RUC) meeting minutes indicated the committees were meeting all requirements. Specifically reviewed were the RUC meetings held in April, May and November, 1987.

No violations or deviations were identified.

5. Procedures

The inspector reviewed the licensee's operating, refueling and maintenance procedures to determine if procedures were issued, reviewed, changed or updated, and approved in accordance with Technical Specifications and SAR requirements. The inspector determined that the required procedures were available and the contents of the procedures were adequate. The licensee had developed a guideline for format and content of written procedures.

The licensee is not required to have formalized radiation protection procedures; however, there is a "Reactor Operations Monitoring" standing order which defines the responsibilities of the health physics department for implementing radiological controls at the reactor facility. The standing order appears adequate to maintain these controls.

6. Surveillance

The inspector reviewed procedures, surveillance test schedules, and test records and discussed the surveillance program with responsible personnel to verify the following.

- a. That, when necessary, procedures were available and adequate to perform tests.
- b. That tests were completed within the required time schedules.
- c. Test records were available.

The licensee's surveillance program appeared to be satisfactory.

No violations or deviations were identified.

7. Fuel Handling

The facility fuel handling program was reviewed by the inspector. The review included the verification of approved procedures for fuel handling and their technical adequacy in the areas of radiation protection, criticality safety, Technical Specification, and security plan requirements. The most recent revision to the fuel handling procedures were made in September 1987. Between the period September 24 to November 23, 1987, the licensee performed two complete defuelings and refuelings for instrument repair. It appeared to the inspector these operations were performed in accordance with the licensee's procedures.

8. Transportation Activities

No shipments of radioactive material were made from the reactor facility since the previous inspection performed in October, 1986.

9. Training

Students authorized to work at the reactor facility are trained in accordance with 10 CFR 19.12 requirements as part of their nuclear engineering curriculum; all other persons (health physicists, operators and users) are also trained in these requirements. Persons who work within the unrestricted areas of the nuclear reactor engineering building, which houses the reactor facility, although not specifically required to receive 10 CFR 19.12 training, have in some cases received guidance in prenatal radiation exposure. All permanent employees who work in the building are trained in emergency plant procedures.

10. Radioactive Effluent Releases and Solid Radwaste

The only measurable gaseous effluent released by the licensee is argon-41. There is no specific ventilation system at the facility; releases are by diffusion throughout the building. The production and subsequent release of argon-41 is controlled by the operational pattern of the reactor. The equilibrium concentration of argon-41 at full power is estimated to be $7E-06$ microcuries per second, based on the maximum argon-41 concentration measured in the reactor room. If no dilution is assumed, a conservative estimate of the full power hours required to reach the average annual concentration limit for unrestricted areas is 476 hours. The Technical Specification states that reactor operation is to be limited to 100 kilowatt-hours per week to maintain the argon levels to an average concentration of less than 50% of the listed value for a restricted area (Table I, Appendix B of 10 CFR Part 20). For the period June 19, 1986, through July 1987, the licensee reported less than 25% of the concentration allowed was released to the environs. The inspector calculated the concentrations were about 5% of the limit.

No radioactive liquid is released from the facility. Liquid losses result from evaporation and routine sampling. A four-liter sample of reactor water is collected monthly, evaporated to dryness, and counted for gross alpha and gross beta. The concentrations for 1987 averaged about $1.5E-9$ $\mu\text{Ci/ml}$ alpha.

The licensee transfers solid radwaste to the University's broad license for disposal; very small amounts of solid wastes are generated.

No items of noncompliance or deviations were identified.

11. Review of Periodic and Special Reports

The inspector reviewed the Annual Report for the period July 1, 1986 to June 30, 1987. The annual report showed a total of 215 kilowatt-hours

of energy produced over an operating time of 307 hours. The report also discusses the unscheduled shutdowns and corrective actions taken (8 scrams during the report period). No major modifications were performed during the reporting period, nor were there any major changes in the facility, procedures, tests, or experiments.

12. Exposure Control

Monthly film badge service is obtained from R. S. Landauer, Jr. Company. Exposure records were reviewed for 1987. Monthly beta-gamma doses are generally less than 10 mrem. The maximum annual dose received for individuals associated with the reactor was less than 200 mrem beta-gamma and neutron.

To minimize personal exposure, the licensee requires a member of the health physics group to conduct surveys whenever material is inserted into or removed from the reactor. The licensee also evaluates all sample irradiation requests. No problems were found in this area.

No items of noncompliance or deviations were noted.

13. Surveys

The inspector selectively reviewed results of direct radiation and smearable contamination surveys conducted in accordance with requirements for 1987 and 1988 to date. No significant problems were noted.

14. Posting, Labeling, and Control

The inspection revealed no problems regarding posting or labeling required by 10 CFR 19.11 and 10 CFR 20.203.

15. Instruments and Equipment

The licensee has adequate numbers of operable and calibrated survey meters and monitoring equipment. Survey meters used to measure levels of gamma and neutron radiation are calibrated yearly. The radiation area monitor (RAM) system, consisting of five detectors, is alarm trip-point tested weekly and calibrated yearly.

During the inspector's review of the yearly ARM calibration results, discrepancies were noted involving the recorded source to distance dose rate values, listed in the ARM procedure, which are required for use in the calibration of the ARMs. For instance, for June 1987 the procedure indicates that at distances of 252, 173, and 72 centimeters from the cesium source, the ARM detectors should read 5 mR/hr, 10 mR/hr, and 50 mR/hr respectively, while calculations using the initial cesium source strength and isotropic spreading indicate expected values of 7.5 mR/hr, 16 mR/hr, and 90 mR/hr at these distances, respectively. This discrepancy

was brought to the attention of the licensee who stated that the values listed in the procedure were the result of actual measured dose rates; however, during the inspection, they were unable to locate the original measurements/calibration paperwork. In a letter to Region III dated February 15, 1988, the licensee submitted the calibration documentation which confirmed that the values listed in the procedure were based on NBS traceable Victoreen Condenser R-chamber measurements from a cesium-137 source; the most recent measurement of which was performed in March 1987. The measurement results indicated dose rates found over the range of measured distances (50 to 250 cm) decrease more slowly than dose rates computed using the inverse square law (isotropic spreading) due, according to licensee personnel, to contributions from scattered radiation; however, the documentation did not substantiate that the scattered radiation contribution would be similar for the source calibration location and the ARM calibration locations. The licensee was requested to review this data, describe the exposure technique and geometry used for the R-chamber measurements, and to determine if the values found as a result of the measurements are valid for use in calibrating the ARMs, given the possibility that the exposure geometries for the measurement and calibration were significantly different.

During the review of the ARM calibration data for the years 1985, 1986, and 1987, it was also noted that the as-found measurements during calibration of the ARMs indicated differences ranging from 20 to 50 percent from the previous calibration setting. According to the licensee, there are no current requirements for evaluating the operability of the instruments when differences of this, or greater, magnitude are observed. The current procedure only requires instrument setting adjustment if the pre-calibration readings considerably vary from the previous year's settings; no instructions are given to question if the instruments are defective. ANSI N323-1978 "Radiation Protection Instrumentation Test and Calibration," indicates that after calibration adjustments have been completed the instrument readings shall be within plus or minus 10 percent of the known radiation values, and within plus or minus 20 percent if a calibration chart or graph is prepared and made available with the instrument. In accordance with these standards an evaluation should be made to determine the reason for pre-calibration readings falling outside plus or minus 20 percent of the known radiation value.

The licensee's program for radiation measurements, calibrations and procedural requirements relating to the ARM calibration program requires further review and evaluation and is considered to be an unresolved item. These matters were discussed at the exit meeting and with Dr. R. E. Williams on February 24 and March 2, 1988. (Unresolved Item 50-116/88001-01)

16. Material Transfer

There have been no spent nuclear fuel shipments since June 1984. The next shipment is scheduled for August 1987. No samples are routinely shipped from the reactor facility to other licensees off-campus.

During this inspection a review was made to determine the administrative arrangement for transferring irradiated material from the research reactor to the Byproduct Material License (BPM) or others, to ensure there is a clear demarcation of authority and responsibility. The results of this review indicates there is no written policy addressing this matter. The licensee's practice concerning this matter follows: An HP representative is present during the extraction of all irradiated pool samples from the reactor and makes an entry of each sample into the health physics monitoring log book. The only material removed from the reactor which is transferred outside the reactor building are irradiated foils. The foils are transferred to the Nuclear Engineering Building by persons who work for, or are responsible to, approved users of Byproduct Material (BPM) under the University BPM license. No radioactive material produced in the reactor is transferred offsite.

Although it appears the license has adequate controls to ensure persons are authorized to receive reactor produced BPM, a written policy is needed to ensure that there is a clear demarcation of authority and responsibility for the transfer of radioactivity produced in the reactor to another license. This matter was discussed at the exit interview. (Open Item 50-116/88001-02)

17. Operator License Renewal

During an approximate three-month period in 1986, an operator allowed his license to expire. The NRC requested the licensee to determine if the individual had operated the reactor during that period. The licensee responded in a letter to the NRC dated December 8, 1986, that they had researched the reactor logs and found that the individual had not operated the reactor during that period.

During this inspection, the inspector independently reviewed the reactor logs for the period in question and found no indication the individual performed as a reactor operator. However, in discussing this matter with the licensee, it appears that no specific administration mechanism was in place during that period to prohibit the individual from operating the reactor. After the licensee became aware of this shortcoming in the program, strong corrective actions were taken to prevent a recurrence of this nature, including upgrading operator records concerning expiration.

18. Exit Meeting

The inspector met with licensee representatives noted in Section 1 on February 10, 1988, to discuss the findings and scope of the inspection. The inspector discussed the likely informational content of the inspection regarding documents or processes reviewed. The licensee did not identify such documents/processes as proprietary. In response to the inspector's comments, the licensee:

- a. Stated that a new set of condenser R-chamber measurements will be performed, agreed to review the appropriateness of using the current ARM calibration values listed in the calibration procedures, and agreed to revise the current procedure to ensure that pre-calibrated values falling plus or minus 20 percent of the known radiation value for the ARMs will be investigated.
- b. Stated that a written policy to ensure a clear demarcation of authority and responsibility for the transferring of irradiated material from the reactor will be developed.