

U.S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

Report No. 50-156/79-06

Docket No. 50-186

License No. R-103

Licensee: University of Missouri  
Research Park  
Columbia, MO @5201

Facility Name: Research Reactor Facility

Inspection At: Research Reactor Site, Columbia, MO

Inspection Conducted: September 11-13, 1979

Inspector: J. W. Hiatt *J. W. Hiatt* 10/4/79

Approved By: *L. R. Greger*  
L. R. Greger, Acting Chief 10/4/79  
Fuel Facility Projects and  
Radiation Support Section

Inspection Summary

Inspection on September 11-13, 1979 (Report No. 50-186/79-06)

Areas Inspected: Routine, unannounced inspection of radiation protection and radwaste management programs, including: qualifications; training; procedures; instruments and equipment; audits; posting, labeling, and control; exposure control; surveys; notifications and reports; effluent releases; effluent control instrumentation; records of effluents; reactor coolant water quality; receipt and transfer of radioactive material; and previous items of noncompliance and commitments. The inspection involved 21 inspector-hours onsite by one NRC inspector.

Results: Of the fifteen areas inspected, no items of noncompliance or deviations were found in fourteen areas; one apparent item of noncompliance was found in one area (deficiency - failure to maintain records required by 10 CFR 71.62(a)(10) - Paragraph 15).

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## DETAILS

### 1. Persons Contacted

- \*D. Alger, Associate Director, Research Reactor Facility
- \*K. Armbruster, Research Laboratory Technician
- R. Brugger, Director, Research Reactor Facility
- \*C. Edwards, Reactor Plant Engineer
- \*P. Keenan, Assistant to the Vice President - Research
- \*J. Naylor, Health Physics Technician
- \*O. Olson, Manager, Reactor Health Physics
- \*N. Sunderland, Assistant Campus Radiation Safety Officer
- \*C. Thompson, Chairman, Reactor Advisory Committee
- \*M. Vonk, Operations Engineer
- V. Zager, Chief Research Electronics Technician

The inspector also interviewed other licensee employees, including chemistry technicians, licensed operators, and facility researchers.

\*Denotes those present at the exit interview.

### 2. General

This inspection, which began with visual observation of facilities and equipment, posting, labeling, and access controls at 8:30 a.m. on September 11, 1979, was conducted to examine the routine operational radiation protection and radwaste management programs. During the initial tour of the facility, the inspector used a licensee survey meter to perform surveys at selected locations. Posting and labeling of the areas conformed with regulatory requirements. Areas visited during this and other tours included the reactor control room, the Medi-Physics hot cell area, the beam port floor, and laboratories in the reactor building.

On September 13, 1979, the inspector observed the transfer of several molybdenum-99 samples from the reactor flux trap to the Medi-Physics hot cell. A non-routine transfer route was required because the elevator in the reactor containment was broken. Self reader dosimetry data indicates that a Medi-Physics employee received the highest dose (160 mrems) during the transfer.

### 3. Licensee Action on Previous Inspection Findings

(Closed) Noncompliance (50-186/78-01): Inadequate development of health physics procedures. The licensee has completed the development of the procedures (See Paragraph 7).

(Open) Commitment (50-186/77-04): Evaluation of the collection efficiency of the charcoal sampler due to high flow rate. A student research project to determine the efficiency at various flow rates continues.

4. Organization

A full time health physics technician was hired in June 1979. The health physics organization now consists of the Manager, Reactor Health Physics, three full time technicians, and three part time laboratory assistants. With this increased staffing it appears that the problem areas identified in a previous inspection report are being addressed.<sup>1/</sup>

No items of noncompliance were identified.

5. Licensee Audits

Minutes of the Reactor Advisory Committee meeting held in June 1979 were reviewed. The Committee's membership and meeting frequencies were as required. Health physics related items were discussed at the meeting (e.g. addition of the new health physics technician, results of May 1979 NRC inspection).

No items of noncompliance were identified.

6. Training

The Manager, Reactor Health Physics, continues to provide and document radiation protection orientation for experimenters and other personnel new to the facility. A review of records indicates that since May 1979 about 60 people have been trained.

In August 1979 facility operators were briefed on the newly issued Health Physics Standard Operating Procedures (See Paragraph 7). The Manager, Reactor Health Physics, plans to brief other employees during meetings with their respective work groups (e.g. reactor services, electronics technicians and mechanics, research and applications, etc.).

Health physics technicians have met about weekly with the Manager, Reactor Health Physics for training courses. Topics covered include air sampling, advantages and disadvantages of film dosimetry, spent fuel shipment procedures, and instrument sensitivity.

No items of noncompliance were identified.

7. Procedures

In response to a previous item of noncompliance,<sup>2/</sup> the licensee stated that eight health physics procedures would be in use by

<sup>1/</sup> IE Inspection Report No. 50-186/79-03.

<sup>2/</sup> IE Inspection Report No. 78-01 and licensee letter dated July 20, 1978.

August 31, 1979. The licensee completed development of these procedures in July 1979, bringing the total number of Health Physics Standard Operating Procedures in use to sixteen. Additional procedures will be developed as needed.

The inspector reviewed the following procedures:

HP-7	"Response to Medi-Physics Hot Cell Gamma Alarm"
HP-17	"H-3 Air Samples"
HP-18	"Calibration of G.M. Survey Instruments"
HP-19	"Self Reading Dosimeter Calibration"
HP-20	"Report of Personnel Contamination"

The inspector noted that HP-18 requires only a one point per scale calibration and discussed the desirability of two points per scale calibrations for certain survey meters.<sup>3/</sup> The licensee stated that it would be considered. This item will be reviewed further during a future inspection.

No items of noncompliance were identified.

8. Exposure Control

a. External

The vendor's film badge reports for the period May through August 1979 were reviewed. The greatest whole body dose recorded for CY 1979 to date was about 2000 mrems. Records showed that this individual, a Medi-Physics employee, did not receive above 1250 mrems in any calendar quarter in 1979 (the highest being 1000 mrems in the first quarter). The highest extremity dose for the year to date was about 5000 mrems.

Self reading pocket dosimeters are issued to individuals with the greatest exposure potential. The inspector compared film badge and dosimeter data for two individuals and noted that the doses estimated on dosimeter results were about 10-15% less than that actually assigned based on film badge results. The licensee stated that this discrepancy will be evaluated. This item will be reviewed during a future inspection.

b. Internal

The licensee routinely performs tritium analysis on urine samples collected from one reactor operator per shift each month. Results of these samples from May 1979 to date were reviewed; no problems were noted. The health physics and

3/ ANSI N323-1978 "Radiation Protection Instrumentation Test and Calibration."

radiochemistry departments independently analyze the samples. Results were compared; no major discrepancies were noted. Continuous air samples, daily tritium air samples, and smear surveys are also used to define any problem areas. Records of these indicators were reviewed; no problems were noted.

No items of noncompliance were identified.

9. Posting, Labeling, and Control

During facility tours the inspector reviewed the licensee's compliance with posting and labeling requirements specified in 10 CFR 19.11 and 10 CFR 20.203. No problems were noted.

Four radiation work permits (RWP's) were written since May 1979. The preface to the Health Physics Standard Operating Procedures<sup>4/</sup> specifies conditions and jobs which require issuance of an RWP.

No items of noncompliance were identified.

10. Surveys

The inspector selectively reviewed records of direct radiation, swipe, and air sample surveys conducted since the last radiation protection inspection. Observed results were comparable to those obtained during the inspector's tours of the facility.

Containment air samples are taken and analyzed for tritium daily by the health physics and radiochemistry departments. Results of samples taken from May 1979 to date were reviewed. Concentrations normally ranged from  $7.0 \text{ E-}8$  to  $1.0 \text{ E-}7$   $\mu\text{Ci/cc}$ . The highest concentration noted was  $3 \text{ E-}7$   $\mu\text{Ci/cc}$ .

No items of noncompliance were identified.

11. Instruments and Equipment

a. Portable Survey Instruments

Records of instruments calibrated since May 1979 were reviewed. The licensee logs the calibration dates on file cards maintained for each instrument and status charts posted in the health physics office. The inspector noted that the transfer of data between the status charts and file cards was not timely (e.g. the latest calibration data was logged on the status

<sup>4/</sup> IE Inspection Report No. 50-186/78-01.

board but not on the file cards). The licensee stated that the file cards would be updated. Calibration frequencies were the same as noted during a previous inspection.<sup>5/</sup>

b. Area Radiation Monitoring System (ARMS)

The seven area monitors were last calibrated in June 1979 and were checked for operability and alarm response before reactor startups. No problems were noted during a review of logs and startup checklists since May 1979.

c. Stack Monitor System

The particulate, gaseous, and iodine monitors were calibrated in August 1979. However, the radiochemist who has the records was not available during this inspection. The calibration data will be reviewed during a future inspection.

Gaseous monitor alarm setpoint calculations were reviewed. The inspector noted that the setpoint was about 200 cpm greater than the calculated monitor response at the instantaneous technical specification limit for Ar-41 (based on the instantaneous gaseous technical specification limit, 3500 times MPC for Ar-41, and the February 1979 calibration data). The licensee stated that the setpoint would be evaluated. This item and the alarm setpoints of the particulate and iodine monitors will be reviewed further during future inspections.

No items of noncompliance were identified.

12. Primary Coolant Activity

Records of primary coolant water sampling and analyses were reviewed from May 1979 to date. The technical specification requirements for sampling frequency and maximum permissible I-131 concentration were met.

No items of noncompliance were identified.

13. Reactor Building Isolation Functional Testing

Verification of ventilation isolation is made during reactor startups by exposing the reactor bridge monitor, building exhaust plenum monitor and backup building exhaust plenum monitor to check sources and observing closure of valves A16A and A16B (indicated by lights on the control panel). Startup check sheets were reviewed from May 1979 to date; no problems were noted.

No items of noncompliance were identified.

5/ IE Inspection Report No. 50-186/79-03.

14. Radwaste Management

a. Liquid Radwaste

Isotopic analysis is made on each sample of liquid radwaste before discharge to either the sanitary sewer or the cooling tower basin. Since May 1979 there have been twenty-one releases to the sanitary sewer, totaling 0.04 curies, and three releases to the cooling tower, totaling 0.04 curies. Liquids containing radioactive material other than tritium are not discharged to the cooling tower basin.

The licensee calculated the amount of tritium that could have been discharged to the sanitary sewer during blowdowns of the cooling tower basin.<sup>6/</sup> For reporting period 1977-1978, 2.7 mCi were discharged; for 1978-1979, 1.8 mCi. The inspector reviewed the licensee's calculation and concurred with the results.

b. Gaseous Radwaste

Daily grab samples are taken from the stack and analyzed for Ar-41. Graphs of the daily sample results were reviewed for May 1979 to date; none exceeded the instantaneous technical specification limit. The licensee stated that the gaseous effluent monitor's strip chart would indicate any sudden increases in Ar-41.

A review of the licensee's annual report, covering the period from July 1, 1978, to June 30, 1979, indicated that the average annual concentration of Ar-41 discharged to the environment was 97% of the technical specification limit (250 times MPC). The inspector reviewed the licensee's calculations and noted that the method used to calculate the average concentration was different from that used in the FY 1977-1978 Annual Report.<sup>7/</sup> For FY 1978-1979 the licensee multiplied the average daily Ar-41 concentration by the total volume of air discharged from the facility (based on a measured exhaust flow rate and continuous reactor operation). This method appears conservative because the reactor does not operate continuously (maintenance shutdowns occur at least biweekly), and the licensee used a conservative estimate of the average daily Ar-41 concentration. At the inspector's request the licensee calculated the 1978-1979 annual average using the 1977-1978 method; the recalculated number was slightly less than that obtained using the above method (about 95% of the technical specification limit).

6/ IE Inspection Report No. 50-186/78-05.

7/ Described in IE Inspection Report No. 50-186/79-03.

Facility License Amendment No. 12, issued in July 1979, increased the maximum allowable instantaneous and annual discharge limits for gaseous effluents.

No items of noncompliance were identified.

c. Solid Radwaste

The licensee has made two shipments of barrels and boxes of solid waste since May 1979. A total of about 1200 cubic feet containing about 200 mCi's was shipped to a licensed facility for disposal.

During a tour of the Medi-Physics hot cell, the inspector noted radiation levels of 60-80 mR/hr near radwaste drums stored in the area. Postings were as required; however, Medi-Physics personnel, who are in the area at least twice weekly, work near and are exposed to the radiation from the drums. Radioactive waste storage problems contributed to a previous item of noncompliance.<sup>8/</sup> The licensee stated that arrangements have been made with a licensed disposal agency for routine pickup and disposal of solid waste. This lack of radwaste storage space will be reviewed during future inspections.

15. Receipt and Transfer of Radioactive Material

The licensee stated that the only radioactive material received under the reactor license since the previous inspection was new fuel. According to the licensee, contamination surveys were made on the fuel and no contamination was detected.

The inspector reviewed the licensee's records of transfer of licensed byproduct material from May 1979 to date. Material is transferred to both on and off campus users at a rate of at least one shipment per day. A review of shipment records indicated that records required by 10 CFR 71.62(a)(10) were not maintained for several Type B shipments, including shipments 17252, 17237, and 17144, in August 1979. This is an item of noncompliance.

Three shipments of spent reactor fuel were made since May 1979. Records of the shipments were reviewed for compliance with 10 CFR 71 requirements. No problems were noted.

16. Notifications and Reports

A review of records and discussions with licensee representatives indicated that the licensee has complied with 10 CFR 19 and 10 CFR 20 reporting requirements. The inspector reviewed the licensee's FY

8/ IE Inspection Report No. 50-186/78-01.

1978-1979 Reactor Operations Annual Report. No problems concerning technical specification requirements for frequency or content were noted.

17. Exit Interview

The inspector met with licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on September 13, 1979, and further discussed the inspection findings with Mr. Olson on September 17, 1979. The following matters were discussed:

- a. The purpose and scope of the inspection.
- b. The item of noncompliance (Paragraph 15).
- c. The status of a previous item of noncompliance and a commitment (Paragraph 3).
- d. The solid waste storage problem (Paragraph 14.c). The licensee stated that a contract with a licensed disposal firm was being negotiated.
- e. Minor discrepancies in instrument calibration records (Paragraph 11). The licensee stated that the logs would be updated.
- f. The setpoint of the gaseous effluent monitor (Paragraph 14.b). The licensee stated that the setpoint would be evaluated.
- g. The discrepancy between dosimeter and film badge results (Paragraph 8.a). The licensee stated that the discrepancies would be evaluated.