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

REGION III

Report No. 50-123/79-03

Docket No. 50-123 License No. R-79

Licensee: The Curators of the University of Missouri - Rolla
Rolla, MO 65401

Facility Name: University of Missouri - Rolla Reactor

Inspection Conducted: November 5-6, 1979, and December 4-5, 1979

Inspector: for W. L. Fisher
N. E. DuBry 2/19/80

Approved By: W. L. Fisher
W. L. Fisher, Chief 2/19/80
Fuel Facility Projects and
Radiation Support Section

Inspection Summary

Inspection on November 5-6, 1979 and December 4-5, 1979 (Report No. 50-123/79-03)

Areas Inspected: Routine, unannounced inspection of radiation protection and radwaste management programs, including: qualifications; audits; training; radiation protection procedures; facilities; instruments and equipment; exposure control; posting, labeling, and control; surveys; notifications and reports; solid radwaste; radioactive effluent measurements and releases; and verification of response to IE Bulletin 79-19. The inspection involved 24 inspector-hours on site and seven hours off site by one NRC inspector.

Results: Of the sixteen areas inspected, no items of noncompliance or deviations were identified in thirteen areas. One item of noncompliance was the failure to maintain required personal exposure records (Paragraph 8). Another noncompliance item was the failure to maintain records for review (Paragraph 10). Deviations from previous commitments were found in the survey and measurements, and instruments areas (Paragraphs 10 and 11).

DETAILS

1. Persons Contacted

°Dr. J. M. Marchello, Chancellor, University of Missouri - Rolla
*Dr. T. J. Planje, Dean of School of Mines and Metallurgy
+Dr. H. W. Weart, Chairman of Department of Metallurgy and Nuclear Engineering
*Dr. D. R. Edwards, Director, Nuclear Reactor Facility
*+Dr. N. T. Tsoulfanidis, Radiation Safety Officer
+Mr. A. E. Elliott, Reactor Manager
Mr. M. Williams, Health Physics Technician, Part-time
Mr. M. Jones, Reactor Operator
Mr. R. L. Jones, Reactor Operator
+Mrs. K. Lane, Secretary, Reactor Facility

The inspector also talked with other licensee employees.

°Pre-exit interview briefings were given to the Chancellor.
*Denotes those present at the exit interview on November 6, 1979.
+Denotes those present at the exit interview on December 5, 1979.

2. Licensee Action on Previous Inspection Findings

(Closed) Infraction (50-123/78-03) Corrective actions were reviewed concerning a previous noncompliance item. Licensee records indicate that the BF_3, remote neutron monitor is being calibrated timely.

3. Facilities and Equipment

The initial inspection began at about 11:30 a.m. on November 5, 1979, with an interview of the Health Physics Technician and a tour of the Reactor Facility accompanied by the reactor operator. The reactor complex was in the process of doing power calibrations. Housekeeping appeared to be satisfactory. Radiation control appeared to be adequate, including access control and posting. However, the inspector found portable survey instruments with calibration due dates of February 1979. (Refer to Paragraph 9)

During the entry inspection tour on December 4, 1979, the reactor was not operating. Housekeeping was again found to be satisfactory. Radiation control was as before and again some meters were found with overdue calibration stickers. New meters had been received since the previous visit and were also in use at the reactor facility. A number of plastic bags containing spent filters waiting to be packaged were observed on the floor by the demineralizers, and one area on the lower level lacked lighting.

4. Qualification

Dr. N. Tsoulfanidis serves as the Campus Radiation Safety Officer (RSO). Mr. M. Williams works as a part-time Health Physics Technician. The campus Health Physicist resigned on August 31, 1979, and had not been replaced during the first visit. During the second visit a Health Physicist had been hired, but had not begun full-time work. It appeared that neither the RSO nor the part-time technician were fully aware of the areas of their responsibilities and it appeared doubtful that they could rapidly respond to unusual or emergency events without outside assistance. A review and discussion with the Research Reactor personnel revealed that they possess the expertise to handle routine matters and emergencies at the facility. However, the official responsibility for the health physics program at the reactor facility is under the Safety Office cognizance. (See final paragraph under Exit Interview.)

5. Licensee Audits

A member of the Physics Department, who has had previous responsibility for the research reactor, conducts audits of the reactor program. The audit guideline includes a review for compliance with technical specification requirements, various records, checklists, reactor logbook, and items from previous inspections. The inspector reviewed the reports for audits conducted October 13-18, 1978, and April 24, 1979. The audit is revealing and correcting a number of problems, but is failing to catch the routine events and requirements (e.g. surveys, calibrations, analyses) of the facility. This area will be reviewed further during future inspections.

Because of concerns identified by audits, a special group was selected in the summer of 1979 to review the problem of paint blisters on the inner wall of the reactor pool. Their conclusion was to leave the walls alone, as any attempt to correct the problem may only aggravate the situation. Instead, they recommended that a continued vigil be maintained of the wall surface.

The inspector also reviewed the minutes of the ten UMR Radiation Safety Committee meetings from September 22, 1977 to September 6, 1979, for items pertaining to this inspection. The meeting of February 3, 1978, reported the audit findings conducted by the central University of Missouri, Assistant Radiation Safety Officer. It appeared that items identified in this audit were addressed. A special meeting was held on October 6, 1978, to conduct a 10 CFR 50.59 review of the testing of an Instrumented TRIGA assembly in the UMR reactor; no problems were noted. The safety committee meeting notes of September 6, 1979, indicated the need to replace the resigned campus Health Physicist.

6. Training

Instructions in radiation protection principles and applicable parts of Title 10 CFR are given to students and new employees. Instruction at the reactor includes tours, tape presentations, and a formal presentation. A signed record is maintained of those listening to the tape presentation.

Retraining of the reactor staff is part of the requalification program. A review indicated that radiation protection and radwaste areas appear to be covered adequately. It was pointed out to the Reactor Facility Supervisor that applicable portions of Title 49 CFR (Radioactive Material Transport) may have to be incorporated into the requalification program because of recent regulatory changes.

During the week of December 9, 1979, the licensee planned to have a representative from the University of Missouri-Columbia give a training session on recent changes and current requirements for packaging and transporting radioactive wastes and material.

7. Radiation Protection Procedures

Radiation protection procedures are part of the Standard Operating Procedures (SOP). Discussions with licensee representatives indicated that one of the responsibilities of the new Health Physicist would be to review and upgrade these procedures.

No items of noncompliance or deviations were noted.

8. Exposure Control

The licensee uses vendor supplied beta, gamma, neutron sensitive film processed biweekly to monitor exposure of reactor facility personnel. Visitors are issued gamma dosimeters to measure whole body exposure. In special situations TLD ring badges are used to measure extremity exposures.

A review of the dosimeter logs from July 1978 to October 1979 showed no significant doses received. Film badge data show the highest individual whole body dose was 870 mrems received during the fourth quarter of 1978 and 90 mrem in the third quarter of 1979. A skin dose of 90 mrem beta plus 20 mrem gamma was recorded for one individual in late January 1979. No significant extremity doses were indicated by TLD data. The inspector noted that the licensee does not maintain Form NRC-4 information and 37 examples exist of insufficient data to complete Form NRC-5 on temporary badge issuance as required by 10 CFR 20.401(a). This is an item of noncompliance.

Personal exposure records are maintained by the Radiation Safety Office. The inspector found the records to be either spotty or unavailable. This was discussed in the exit interviews.

The licensee has requirements for neither a bioassay nor an in vivo program.

Air concentrations, based on filter analysis and noble gas activity as measured with a monitor calibrated for Ar-41 (December 1977), have shown that airborne concentrations have not approached MPC levels.

The licensee has no committee with a specific function of maintaining exposure as low as reasonably achievable (ALARA). It is the responsibility of the individual user. However, a review of policies and procedures adopted by the reactor facility staff showed that: tour groups are kept out of the facility when the reactor is operating; each request for an irradiation is thoroughly reviewed and documented; and surveys are conducted on all items as they are removed from the reactor, and precautions are taken if significant personal exposure would occur.

9. Posting, Labeling, and Control

The inspector observed labeling of containers and posting of areas that contained radioactive material. The bulletin board near the reactor facility entrance was posted according to 10 CFR 19.11.

A hand monitor is provided for use when leaving the work area; however, during the first inspection it and the two back-up portable survey devices were out of calibration. This was brought to the attention of the licensee. During the second inspection, the hand monitor was still out of calibration, although the back-up devices had been replaced by new units (Paragraph 3). All personnel leaving the facility also are to pass through a portal monitor.

No items of noncompliance were found in this area.

10. Survey and Measurements

Surveys at the reactor facility are the responsibility of the campus Health Physicist and Radiation Safety Office.

Monthly wipe survey records from August 1978 to November 1979 were reviewed by the inspector. Of the records reviewed, there appears to be no significant contamination problem except in the "rabbit" sample irradiation facility where it is easily controlled. 1/ However, records or lack of records indicate that monthly wipe surveys were not done for nine of the sixteen months reviewed. This

1/ Refer IE Inspection Report 50-123/78-03.

is a deviation from a previous commitment. [2]

Radiation area surveys are to be done at least monthly. During the review of the Health Physicist's logs for July 1978 to November 1979, the inspector found that August through October 1979 surveys had not been done. Radiation levels detected near contact with the thermal column area were as high as 2.0 R/hr gamma and 420 mrem/hr neutron dose equivalent. The norm was approximately 15 mR/hr gamma in this area. Failure to conduct monthly area radiation surveys is a deviation from a previous commitment. [3]

A review of the monthly pool water analyses for March 1978 to October 1979 found that the licensee had failed to do an analysis on four occasions and had neglected to do a timely analysis on five additional occasions. In the latter case, the samples were drawn, but the counting was not done until months later. This is a deviation from a previous commitment. [4]

After review of the available data for wipe tests of sealed sources and after discussions with licensee representatives, it was still impossible to determine if the surveys are being done in a timely manner. This failure to maintain complete records for review is in noncompliance of 10 CFR 50.71.

The inspector encountered much difficulty in compiling records and data for review, because they were scattered throughout a number of offices used by the Campus Radiation Safety Officer and Health Physicist.

11. Instruments and Equipment

The licensee has generally adequate numbers of survey, monitoring, and counting instruments and equipment having alpha, beta, gamma, and neutron radiation measurement capabilities. The instruments have the ranges required by the Technical Specifications.

The inspector reviewed the calibration records of the portable survey instruments for July 1978 to December 1979. Contrary to a previous commitment [5] by the licensee to calibrate instruments quarterly, nine of twelve instruments checked had missed calibrations during this period, primarily during the second quarter of 1979.

The emergency kit in the Physics Building was inspected during the second tour for equipment, supplies, and current calibration of the portable survey instrument. No problems were found in this area.

2/ Licensee's response letter to Commission - March 18, 1975.
3/ Ibid.
4/ Ibid.
5/ Ibid.

12. Notifications and Reports

From statements by the licensee and verified to the extent possible by records reviewed by the inspector, it appeared that the licensee has had no theft or loss of licensed material.

The inspector examined and discussed with licensee personnel records and reports of personal exposure to radiation and radioactive material.

No items of noncompliance or deviations were identified.

13. Radwaste Facilities and Equipment

Radwaste facilities and equipment have remained unchanged since the last radwaste, radiation protection inspection.

Bubbles on the painted surface on the inner reactor pool wall were reviewed with the licensee (Paragraph 5).

No items of noncompliance or deviations were identified.

14. Radioactive Effluent Measurements and Releases

The licensee's liquid effluent is the result of mixed bed resin regeneration. Liquid waste is collected in tanks, sampled, and analyzed to permit more accurate effluent determination before discharge to the sanitary sewer. Records show that from January 4, 1978, to November 28, 1979, a total of about 1.5 millicuries of activity was released from thirteen resin regenerations. The activity consisted primarily of cobalt-60 with lesser amounts of sodium-24, chromium-51, manganese-54, barium-140, and lanthanum-140.

The licensee continues to evaluate airborne releases monthly. Release of gaseous and particulate activity is determined by relating operating times of the building exhaust fans and reactor power to measured air activity at maximum reactor power. Licensee records show that about 37 millicuries were released from April 1978 through October 1979, at a maximum concentration of 1.5E-8 µCi/ml. The activity released is primarily argon-41 with traces of krypton-88, rubidium-88, xenon-133, and cesium-138.

No items of noncompliance or deviations were identified.

15. Materials and Solid Radwaste

A limited amount of solid waste is generated from this program. Most is short-lived, low-level, waste which is held for decay until no detectable activity remains. The remaining radwaste (e.g.

depleted resins) is transferred to the University of Missouri Byproduct Material Broad License, Campus Radiation Safety Office, for handling and disposal. For 1979 there were thirteen recorded transfers from the facility. One transfer on June 4, 1979, consisted of roughing filters containing about 8.26 Ci as resin and filters (europium-152, chromium-51, and cobalt-60). They were transferred to the campus Health Physicist in 55-gallon drums, 55-gallon cardboard containers, and 15-gallon cardboard containers (Paragraph 18). Discussions with the licensee representatives indicated that radioactive waste is disposed of by a licensed vendor or transferred to the University of Missouri-Columbia Campus for burial or additional processing. Records and statements by the Radiation Safety Officer indicate that shipments of radioactive waste had not been made for approximately twenty months.

[illegible]ation requests reviewed from July 1978 to November 1979 and material prepared for campus users indicated no problems. There were twenty-seven byproduct releases to users totaling approximately fifty-three millicuries. There were no transfers off the campus.

No noncompliance or deviations were noted in this area.

16. IE Bulletin 79-19

Actions taken, as stated in the licensee's letter of October 2, 1979, were reviewed. Seven of the nine items identified concerning low-level radioactive waste had not been satisfied at the time of the November inspection. It was noted that the letter to the Commission failed to meet the submission date designated by the bulletin. Following an exit briefing with the Chancellor on November 6, 1979, the inspector reviewed the action on IE Bulletin 79-19 with the Dean of the School of Mines and Metallurgy, Director of the Nuclear Reactor, and the Campus Radiation Safety Officer. The status at the time of the November and December inspections was as follows:

a. The Health Physics Office did not have a current set of DOT and NRC regulations. During the follow-up, the inspector found that current revisions to NRC regulations were on hand but had not been filed, and DOT regulations were still out of date (circa 1975).

b. The licensee did not have a set of collection contractor requirements. During the subsequent inspection the licensee had the above set.

c. The letter of October 2, 1979, designated in writing who was responsible for the safe transfer, packaging, and transport of low-level radioactive waste. No problems were found with this item.

d. The "Handbook of Radiological Operations" was not available for review in November 1979, and training of University users and Campus Health Physics Technicians appeared to be nonexistent. During the follow-up the "Handbook" was available for review. The Campus Radiation Safety Officer was made aware that rapidly changing requirements may require periodic revisions or training sessions.

e. In November there appeared to be no current training of Health Physics staff members on regulatory requirements. In December, the licensee stated that a training session was planned for the week of December 10, 1979.

f. There was no evidence that employees who generate waste were being instructed in their obligations by the Health Physics staff members receiving the waste. During the follow-up inspection "Handbooks" (see above) were being distributed and training sessions were being planned.

g. Audit records show they were being performed approximately semiannually at the Rolla campus.

h. A management controlled audit at the Rolla campus was being planned in November but had not been accomplished when the inspector returned in December. The inspector emphasized the importance of this requirement.

i. The Rolla Reactor Facility did not address item nine of the bulletin. During the second trip the inspector determined that waste from the reactor was transferred to the University of Missouri (Rolla) Byproduct Material Broad license for packaging and transport. A review of material records and statements by the licensee representatives indicate that neither shipments for burial nor to the University of Missouri at Columbia have been made for approximately twenty months.

At this review the inspector indicated that before the Director of the Nuclear Reactor submitted his response to IE Bulletin 79-19, letter of October 2, 1979, he should have reviewed the University of Missouri's Campus-wide Radiation Safety Officer's September 18, 1979 letter to the Commission, to insure the Rolla reactor complied with the points listed.

In that letter, the Radiation Safety Officer stated a separate submittal was required for operations conducted under the University of Missouri-Rolla R-79 license.

17. License Renewal (R-79)

During the first phase of the inspection, the licensee representatives were informed the R-79 Reactor License would expire on November 20, 1979. Statements by the licensee indicated renewal applications were being handled.

On December 4, 1979, during the second phase of the inspection, the inspector reviewed the licensee's actions on R-79 license renewal. It appeared that the licensee had been operating the reactor without a current license, or written authorization from Division of Operating Reactors, USNRC, to continue operating under the old license. The licensee representative produced a copy of his letter dated October 8, 1979, to the Commission for license renewal. This letter did not appear to satisfy the criteria of 10 CFR 2.101 or 10 CFR 50.33 and did not give a specific date when complete renewal documentation would follow. Another letter dated November 27, 1979, a week after the expiration date, was taken to Washington, D. C., by the Director, Nuclear Reactor, but was not delivered to the Commission at the time. This letter stated full documentation would follow by December 17, 1979.

The inspector was unable to contact responsible NRC Regional or Headquarter's personnel immediately. However, findings concerning this matter were presented to the Chancellor. The Chancellor provided the inspector a notarized copy of a renewal application letter dated October 15, 1979, to the Commission. This letter contains the information required by 10 CFR 50.33. The Chancellor stated this letter had not been mailed from the University until the week of November 26-30, 1979, (6-10 days after the previous license had expired). The inspector indicated he would continue to pursue this matter.

After contacting Regional and Headquarters personnel, the inspector was told by a representative of Division of Operating Reactors, USNRC, that the licensee's October 18, 1979, letter would be considered a timely submittal if the licensee's formal application and full documentation were forthcoming.

The inspector also learned that the technical specifications were still being reviewed by the Director, Nuclear Reactor, and that the financial liability statement was being composed by the licensee.

This area will be followed during a future inspection.

18. Exit Interview

The inspector met with licensee representatives (Paragraph 1) and conducted exit interviews on November 6, 1979, and December 5, 1979. Each interview was preceded by a briefing to the Chancellor,

who was unable to attend the meetings, outlining the highlights of the inspection findings. The Chancellor requested a copy of this inspection report.

The first exit interview covered the following areas:

a. The licensee's failure to provide timely training to personnel.

b. The failure by the licensee to provide indications that monthly swipe tests, building surveys, and pool water tests and quarterly HP instruments calibration had been done. These appear to be deviations.

c. The following items of IE Bulletin 79-19 were covered in detail:

(1) The licensee's failure to have a current set of DOT and NRC Regulations on hand.

(2) The failure to have a current set of "collection contractor" requirements.

(3) The lack of the "Handbook of Radiological Operations," and training of University users and Health Physics Technicians on radioactive waste handling.

(4) Evidence that health physics staff members had had training or had an understanding of current regulatory requirements.

(5) No evidence that employees who generate wastes were being instructed in their obligations.

(6) The need to complete an audit before December 24, 1979.

(7) That the attachment submitted to the Commission referred to a materials license and not the reactor facility.

d. The inspector informed the licensee representatives that the reactor license would expire on November 20, 1979, and that renewal application would have to be made to continue reactor operation.

The licensee representatives acknowledged the comments of the inspector and stated the items would receive their attention. The inspector also told the licensee that he would be returning in approximately one month to follow up on their actions and to finish the inspection.

At the second exit interview the inspector met with the licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection. The inspector summarized the scope and findings of the inspection.

e. The inspector described the noncompliance items and deviations that had been identified.

f. The inspector noted that some of the items from IE Bulletin No. 79-19 had not been accomplished and would be reviewed for timely completion during a future inspection. The inspector also pointed out the licensee's failure to specifically address the reactor facility in the reply to IE Bulletin 79-19. (Paragraph 16)

g. The inspector commented on the facility conditions observed during the tours. (Paragraph 3)

h. The inspector expressed concern about the lack of training received by the health physics staff.

i. The inspector reviewed the items of noncompliance and deviations with the licensee representatives.

   (1) The inspector indicated the difficulty in reviewing records and reports. (Paragraph 8 and 10)

   (2) The inspector stated that the licensee had failed to conduct wipe surveys monthly. (Paragraph 10)

   (3) Area radiation surveys had not been done monthly. (Paragraph 10)

   (4) The licensee had failed to do pool water analyses timely. (Paragraph 10)

   (5) The licensee failed to calibrate portable survey instruments quarterly. (Paragraph 11)

j. The inspector reviewed the information he had concerning the license renewal application.

k. The inspector indicated to licensee representatives that the fiberboard radwaste containers being used may no longer meet NRC and DOT shipping and storage requirements, and that an evaluation by UMR was in order.

l. The inspector requested that all information, documentation, and material related to the license renewal be retained for future inspection and review.

The licensee representative acknowledged the comments of the inspector.

The inspector contacted the Reactor Manager on January 16, 1980, and informed him of the final actions of this inspection and the noncompliance and deviation items, which will require his attention when the report is received.

The inspector contacted the Reactor Manager on February 14, 1980, to discuss the health physics coverage being provided the reactor facility by the Radiation Safety Office. The Reactor Manager indicated that the new Health Physicist appeared to be technically competent to handle the reactor facilities radiation safety program under routine and emergency conditions. (Paragraph 4)