UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

JUL 30 1986

Report No.: 50-62/86-01

Licensee: University of Virginia
Charlottesville, VA 22901

Docket No.: 50-62 License No.: R-66

Facility Name: University of Virginia Research Reactor

Inspection Conducted: May 27-29, 1986

Inspector: B. K. Revsin 7/10/86
B. K. Revsin Date Signed

Accompanying Personnel: C. H. Bassett

Approved by: C. M. Hosey 7/15/86
C. M. Hosey, Section Chief Date Signed
Division of Radiation Safety and Safeguards

SUMMARY

Scope: This routine, unannounced inspection involved onsite inspection during normal duty hours in the areas of radiation control, environmental protection, transportation of radioactive materials, and followup of licensee action on previous enforcement matters.

Results: Four violations were identified: (1) failure to perform radiation and contamination surveys on a radioactive materials shipment; (2) failure to prescribe activities affecting quality in written procedures for radioactive materials shipments; (3) failure to adhere to radiation control procedures; and (4) failure to perform adequate evaluations of radiological hazards that may be present.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*R. U. Mulder, Director, Reactor Facility
*J. P. Farrar, Reactor Administrator
*B. Copcutt, Radiation Safety Officer
*J. E. Henderson, Reactor Health Physicist
*P. E. Benneche, Reactor Supervisor
*J. R. Gilchrist, Radiation Safety Specialist
J. S. Brenizer, Nuclear Engineering Department
T. Williamson, Chairman, Nuclear Engineering Department

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on May 29, 1986, with those persons indicated in Paragraph 1 above. Four apparent violations were discussed in detail: (1) failure to perform radiation and contamination surveys on a radioactive materials shipment (Paragraph 6); (2) failure to prescribe activities affecting quality in written procedures for radioactive materials shipments (Paragraph 6); (3) failure to adhere to radiation control procedures (Paragraph 4); and (4) failure to perform adequate evaluations of radiological hazards that may be present (Paragraph 2). The licensee took exception to Violation 4 but acknowledged Violations 1, 2 and 3.

A licensee representative stated that their disagreement with Violation 4 was based on the fact that federal regulations did not require the unshielded contact dose rate surveys that had been made with an uncalibrated instrument. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspector during this inspection.

3. Licensee Action on Previous Enforcement Matters

(Closed) Deviation 50-62/85-01-01 Radiation Surveys. The inspector reviewed the licensee's response dated September 12, 1985, and verified that the corrective action specified in the response had been implemented.

(Closed) Violation 50-62/85-01-02 Maintenance of Radiation Control Procedures. The inspector reviewed the licensee's response dated September 12, 1985, and verified that the corrective action specified in the response had been implemented.

(Closed) IFI 50-62/85-01-02 Release of Material and Personnel from the Reactor Room. The inspector reviewed the licensee's response dated

September 12, 1985, and verified that the corrective action specified in the response had been implemented.

4. Radiation Control (83743)

a. Technical Specification (TS) 4.8.1 requires that the amount of special nuclear material possessed at the reactor facility be determined, as a minimum, every six months, to ensure that the limits specified in the facility licenses have not been exceeded. The inspector reviewed the documented inventories for 1985 and 1986, and verified that the quantity possessed did not exceed that specified in facility licenses.

No violations or deviations were identified.

b. TS 4.4 requires that area radiation monitors be calibrated semi-annually. The calibration records for the bridge, the reactor face, the demineralizer and hot cell area radiation monitors were reviewed and the completion of the required semi-annual calibrations for 1985 and 1986, was verified.

No violations or deviations were identified.

c. TS 6.3 requires that radiation control procedures be maintained.

(1) Standard Operating Procedure (SOP) 10.4.B. states that weekly radiation and contamination level surveys shall be performed of working and material storage areas of laboratory areas, that all controlled areas of the facility shall be surveyed weekly and that uncontrolled areas of the reactor room shall be surveyed daily.

The inspector reviewed the following records of licensee surveys for the periods indicated:

Daily Contamination and Radiation Surveys, July 1, 1985, through March 31, 1986.

Weekly Contamination and Radiation Surveys, July 1, 1985, through December 31, 1985, and for May 1986.

(2) SOP 10.11.B defines noncontrolled areas as areas of the reactor building where radioactive materials are not used or areas where surveys show minimal loose contamination. SOP 10.4.B.4 requires all noncontrolled areas, including but not limited to the demineralizer room, the pump and heat exchanger room, the low background counting room, source storage rooms, and representative offices and classrooms, to be surveyed on a monthly basis by the Reactor Health Physicist or his designee.

The inspector reviewed the monthly contamination and radiation survey records for 1985. It was noted by the inspector that of the areas specifically designated by the SOP for survey,

representative offices and classrooms had not been surveyed by the licensee in 1985. Failure of the licensee to survey representative offices and classrooms as required by SOP 10.11.B was identified as an apparent violation of TS 6.3. (50-62/86-01-01).

d. 10 CFR 20.201(b) requires that each licensee make or cause to be made such surveys as may be necessary for the licensee to comply with the regulations and are reasonable under the circumstances to evaluate the extent of the radiation hazards that may be present. 10 CFR 20.201(a) defines survey as an evaluation of the radiation hazards incident to the production, use, release, disposal or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, such evaluation includes a physical survey of the location of materials and equipment, and measurements of levels of radiation or concentrations of radioactive material present.

While examining 1985 and 1986 radioactive materials shipping papers, the inspector noted that two shipping papers had recorded dose rates of 19,300 and 20,000 millirem per hour. The licensee explained that these shipments were gold seeds which had been activated to Au-198 in the reactor. Normally when experiments were to be irradiated, the vial which contained the material to be irradiated was placed inside a plastic rabbit which was placed within a second container (also called a rabbit) which was used to move the experiment through the rabbit system. When the rabbit arrived at its destination, a survey was performed to verify that the activity of the experiment was within anticipated radiation levels and that no other material had been inadvertently activated. The inside rabbit was then removed and a second survey was performed with dose rates measured at one foot from the rabbit. This measurement was used to calculate specific activity of the activated material. None of the above radiation surveys were documented. All handling of the rabbit was by hand, and was normally performed by the reactor operations staff.

After calculation of specific activity, the vial containing the Au-198 activated seeds was removed from the rabbit and a measurement of radiation levels was performed at contact with the vial and at one meter from the vial. These values were recorded. The vial was then placed in its shipping cask and given to the HP section along with the recorded radiation levels. The HP technician transferred the radiation measurements to the shipping papers.

The licensee stated that all radiation levels had been taken with one of the Keithley Model 36100 ionization chambers, of which the licensee had five such instruments. Normally, one Keithley instrument

was maintained in the control room of the facility and was used for measuring radiation levels on the rabbits. Since the specific instrument used to perform the surveys had not been documented, the inspector reviewed the calibration records for all five Keithley 36100 ionization chambers for the time period in question. None of the instruments had been calibrated for use on its highest scale, 20 Roentgens per hour, one of the radiation levels recorded on the shipping papers. The licensee stated that contact radiation surveys on materials irradiated in the reactor were not required by regulations for shipment of radioactive materials, and consequently, the use of calibrated instruments for this purpose was unnecessary. The inspector stated that the regulations require that licensees conduct surveys that are reasonable under the circumstances to evaluate the radiation hazards that may be present, and that such evaluations include measurements of levels of radiation. Surveys of activated experiments by the licensee were conducted by the licensee to provide information concerning the irradiation, and consequently were obtained for radiation control purposes. The inspector stated that the practice of performing surveys with uncalibrated instruments would not result in an adequate evaluation of the radiation hazard that may have been present and would not ensure that individuals handling the materials were adequately informed of the radiation hazard. Failure to adequately evaluate the extent of the radiation hazard that may have been present was identified as an apparent violation of 10 CFR 20.201(b) (50-062/86-01-02).

e. 10 CFR 20.202 requires that appropriate personnel monitoring devices be worn by personnel likely to receive exposures in excess of 25 percent of the limits specified by 10 CFR 20.201 or who enter a high radiation area, and to require the use of such devices.

During tours of the facility, the inspector observed personnel wearing monitoring devices as required. The inspector also verified by examination of selected exposure records for 1985 and 1986, and discussions with personnel that extremity monitoring devices were provided and were being worn by individuals handling experiments after reactor activation.

No violations or deviations were identified.

f. 10 CFR 20.101 delineates the quarterly radiation exposure limits to the whole body, skin of the whole body and the extremities.

- The inspector verified by examination of selected exposure records for 1985 and 1986, and through discussions with licensee representatives that exposures were being maintained below applicable limits. For 1985, the highest whole body exposure was 410 mrem and for 1986, the highest whole body exposure through the month of April was 300 mrem.

No violations or deviations were identified.

g. 10 CFR 19.12 requires that each employee who works in or frequents the licensee restricted area be given instruction in radiation protection commensurate with their duties and potential hazard.

The inspector reviewed the training records for 1985, and determined that the Health Physics (HP) technician for the reactor facility had not received retraining. The licensee stated that they had not considered it necessary since he was a HP and since he had taken a HP course at the University. The inspector discussed with the licensee the required frequency for training of individuals who frequent the reactor facility. The licensee stated that while there was no formal requirement for retraining, retraining was being performed and had been addressed in a memorandum to the Reactor Safety Committee (RSC). The inspector reviewed the following memoranda:

Revised Reactor Training Program, from J. E. Henderson to B. Copcutt, October 18, 1984

Reactor Radiation Safety Training, from J. E. Henderson to B. G. Copcutt, R. Mulder and A. Reynolds, November 6, 1984

Reactor Health Physics Training Program, from J. E. Henderson to A. Reynolds, November 14, 1984

The licensee stated that formalization of the requirement to require annual retraining in radiation protection was still under discussion.

No violations or deviations were identified.

h. 10 CFR 20.203 states the requirements for posting radiation areas, high radiation areas and radioactive materials areas.

During tours of the facility, the inspector noted the posting of radiological areas and materials and verified by independent survey that such areas were adequately posted. The inspector also reviewed the results of a study performed by the licensee in the vicinity of the neutron radiography beam port. Dose rates for the area had been determined using data from film badges and knowledge of the amount of time the neutron beam port had been open. This study permitted a clearer definition of the radiation hazard in the area and resulted in a reposting of the area during the periods of time the neutron beam port was being utilized.

- No violations or deviations were identified.

5. Environmental Protection (80745)

a. SOP 10.5.B.2.g. states that cooling tower water samples shall be collected and analyzed on a weekly basis to detect abnormal activity or fission products in the water. SOP 10.5.B.2.h states that the drains throughout the facility shall be surveyed quarterly. The inspector

reviewed selected results of the cooling tower water analyses and the quarterly drains surveys for 1985 and 1986, and found all requirements were met.

b. SOP 10.5.B.2.c. requires that pond water be analyzed at least once every 30 days and that three distinct samples be taken at different locations around the pond. The inspector reviewed the 30 day analysis of pond water for 1985 and verified that the samples required by SOP 10.5.B.2.c. had been obtained and processed as required.

No violations or deviations were identified.

6. Transportation (86740)

a. 10 CFR 71.5 requires that each licensee who transports licensed material outside of the confines of its plant or other place of use, or who delivers licensed material to a carrier for transport, comply with the applicable regulations appropriate to the mode of transport of the Department of Transportation (DOT) in 49 CFR Parts 170 through 189. 49 CFR 173.475(i) requires that before each shipment of any radioactive materials package, the shipper shall ensure by examination or appropriate test that external radiation and contamination levels are within the allowable limits.

The inspector reviewed the shipping papers for selected radioactive materials shipments for 1985 and 1986. It was noted that on August 20, 1985, a shipment of pond water to an offsite laboratory had been made. The total activity of the shipment was reported as 0.01 microcuries, and the proper shipping name had been listed as Radioactive Material, N.O.S. In the section of the shipping paper labeled "Radiological Surveys," the licensee had written "not required." In discussions with licensee representatives, they stated that radiation and contamination surveys had not been performed due to the activity level of the shipment. The inspector stated that all radioactive materials shipments required assurance that the radiation and contamination levels were within regulatory limits and that while the activity of the shipment was low, the potential for contamination of the package being readied for shipment was not limited to the package contents, but could arise from numerous sources within the facility. Failure to insure that the external radiation and contamination levels of the shipment were within allowable limits was identified as an apparent violation of 10 CFR 71.5 50-62/86-01-03).

b. 10 CFR 71.0(d) states that the transport of licensed material or delivery of licensed material to a carrier for transport is subject to the quality assurance requirements of 10 CFR 71, Subpart H. 10 CFR 71.111 of Subpart H, requires that the licensee prescribe activities affecting quality by documented instructions, procedures, or drawings of a type appropriate to the circumstances and that these instructions, procedures, or drawings be followed. The instructions, procedures, or drawings must include appropriate quantitative or

qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

In reviewing the radioactive materials and the radioactive waste shipments for 1985 and 1986, the inspector noted a lack of consistency and completeness in filling out the waste shipment forms, although the regulatory requirements for these shipping papers appreared to have been met. The inspector asked the licensee for procedures which specified and controlled the shipment of radioactive materials and waste from the facility and was informed that there were none. Failure to utilize written procedures which prescribed activities affecting quality in the transportation of licensed material was identified as an apparent violation of 10 CFR 71.0(d) (50-062/86-01-04).