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

Region I

Report No. 50-98/78-01; 70-709/78-01

Docket No. 50-98; 70-709

License No. R-43; SNM-656 Priority -- Category D/F

Licensee: University of Delaware

Newark, Delaware 19711

Facility Name: AGN-201 Training Center

Inspection at: Newark, Delaware

Inspection conducted: November 1, 1978

Inspectors: K E Plumlee 12/11/78
K. E. Plumlee, Radiation Specialist date signed

date signed

date signed

Approved by: H. W. Crocker 12/11/78
H. W. Crocker Acting Chief, Radiation Support Section, FF&MS Branch date signed

Inspection Summary:
Announced Closeout Inspection of AGN-201 Training Reactor License No. R-43 (Report No. 50-98/78-01) and Unannounced Inspection of License No. SNM-656 (Report No. 70-09/78-01) Closeout inspection of License No. R-43 by a regional based inspector including confirmatory surveys; review of dosimetry practices and records; review of records of reactor defueling, dismantling, fuel transfer, and component disposal; and the conduct of activities under License No. SNM-656. This inspection involved 7 inspector-hours on site by one NRC regional based inspector.
Results: Of the four areas inspected, no items of noncompliance were identified in two areas. Two items of noncompliance were identified in two areas (infraction - failure to calibrate radiation survey instruments as due paragraph 3; and deficiency - failure to submit two annual operating reports to NRC, paragraph 4). The inspector found that the Reactor Training Center premises conform to NRC criteria for radioactivity levels in areas to be released for unrestricted use.

DETAILS

1. Persons Contacted

Dr. Chen-Ming Fou, Associate Professor of Physics
Mr. Richard Gardecki, Health Physics Technologist
*Ms. Jenny Johansen, Safety Coordinator/Radiation Safety Officer
Dr. Bruce C. Lutz, Professor of Electrical Engineering/Reactor Supervisor

*denotes those present at the exit interview, 3:30 p.m. on November 1, 1978.

2. Disposition of Special Nuclear Material (SNM) Held Previously Under License No. R-43

Part of the inspection effort was to review the licensee's disposition of the SNM held previously under License No. R-43.

Review of the licensee's material accountability reports and shipping records verified that the enriched uranium previously possessed under License No. R-43 has been transferred to an agency of the U. S. Government.

Review of the documentation showed that the 1.0 Ci plutonium-beryllium neutron source is now possessed under License No. SNM-656. Observation of the present storage location, across the corridor from the upper level of the AGN 201 Training Center, did not identify any problem with the storage of this source. Review of sealed source leak test records did not identify any problems.

No items of noncompliance were identified involving the possession or disposition of SNM.

3. Review of Activities Conducted Under License No. SNM-656

Condition 8 of License No. SNM-656 authorizes the use of SNM in accordance with statements, representations and procedures contained in letters dated September 21, 1973, and June 7, 1974. The September 21, 1973, letter states, in part, that three specified radiation protection instruments will be available, calibration of these instruments will be accomplished quarterly in accordance with instrument manufacturers instructions, and a permanent record of results will be kept.

An application dated September 29, 1978, to renew License No. SNM-656, which had an expiration date of October 31, 1978, specified three different models of survey instruments than did the September 21, 1973 letter and stated that on-site calibrations are being performed semiannually. These instruments are of the same three categories as before, i.e. alpha, beta-gamma and neutron survey instruments. This letter, as of the date of the inspection, had not been incorporated into the conditions of the license.

The inspector noted that none of the instruments had been calibrated since November, 1977.

The licensee representative stated that calibration arrangements on site were incomplete, and no provision had been made to calibrate the instruments.

The inspector noted that these three specified instruments were overdue for calibration, as listed below.

Most Recent Calibration Date	Instrument Designation	Serial Number
February 21, 1977	Victoreen 490*	2753
March 22, 1977	PNR-4	3103
August 24, 1977	Victoreen 440	2984
November 29, 1977	Victoreen 490*	3441

*Two Victoreen 490 instruments were available; only one was specified in the application.

The inspector identified this as noncompliance with the license requirements of SNM-656. (709/78-01)

4. Annual Operating Reports

Technical Specifications were incorporated into License No. R-43 effective January 8, 1975, requiring the submission of an annual operating report to the Director, NRC Regional Office I, by March 1 of each year to include eight specified topics.

The inspector noted that the annual operating reports due by March 1 of 1977 and 1978 were not submitted. The most recent annual operating report was dated February 27, 1976.

The inspector identified this as noncompliance with the above requirement. (98/78-01)

No future annual reports are required by the approved Dismantling Plan (item B, below). All of the information required to be in the two omitted annual reports can be determined by examining this inspection report and the following Public Document Room information.

a. Licensee letter dated November 11, 1976, to the Director, NRC Regional Office I, which stated that the reactor was shut down and would not be operated again.

b. Licensee letter dated July 27, 1977, to the Assistant Director for Operating Reactors, which submitted the Dismantling Plan, and an operating history. (The Dismantling Plan was authorized by an Order dated June 12, 1978)

c. Licensee letter dated January 8, 1978, to the Assistant Director for Operating Reactors, reporting the completion of reactor defueling and the transfer of the fuel offsite. This letter included survey and air sampling information.

d. Licensee letter dated October 12, 1978, addressed to the DOR (with a copy to NRC Regional Office I) reporting survey information following the completion of dismantling and removing the reactor from the site on August 26, 1978. This letter requested a closeout inspection of License No. R-43.

The inspector had no further questions on this matter at this time.

5. Facility Surveys

Part of the inspection effort was to review the licensee's survey records and to make confirmatory measurements to verify that the licensed facility conforms to the NRC criteria for radioactivity in areas to be released for unrestricted use as given in Regulatory Guide 1.86 "Termination of Operating Licenses of Operating Reactors." The applicable limits for the materials other than a sealed plutonium source that had been possessed under this license are 5,000 dpm/100 cm^2 surface activity (alpha, beta, and gamma radioactivity) of which no more than 1,000 dpm/ 100 cm^2 may be removable by swiping.

Review of the licensee's survey records did not indicate the presence of any radioactivity remaining in the Training Center.

The inspector used swipes and a portable NRC survey instrument to confirm the licensee's survey results. The swipes were counted on the NRC Region I laboratory alpha scintillation and gamma scintillation detectors, which would detect 10 dpm per swipe (i.e. approximately 10 dpm removable activity per 100 cm^2 of area swiped). The NRC portable survey instrument was Eberline Model E-120, Serial No. 1274, equipped with a HP-190 probe. The calibration record was current. The inspector tested the survey instrument using NRC

Pu-239, enriched uranium, Cs-137, Sr-90, and Co-60 check-sources (and also licensee alpha, beta, and gamma sources) and all tests indicated that the calibration was accurate during the inspection period. The survey instrument counting efficiency appeared to be greater than 10% for surface alpha and beta activity and the detection limit was about 100 dpm per 10 cm^2, or 1,000 dpm/100 cm^2 if uniformly distributed, and about 0.01 mrem/hr for gamma activity.

The inspector obtained swipes of the Training Center floor including the area where the reactor had been, the cover sealing the floor drain, and the dry residue deep in the drain.

The inspector surveyed the two levels of the Training Center and also the corridors and a fire lane providing access to the Training Center, and each laboratory, storage area, and room adjoining the Training Center. The inspector surveyed the drains and pipes and lowered the HP-190 probe into the bend of the floor drain. No radioactivity was identified other than the following sealed or contained sources none of which were possessed under License No. R-43 or SNM-656. Some of these sources were exempt quantities or otherwise outside the purview of this inspection. The remainder were possessed under a byproduct materials license (No. 07-01579-19) which was not being inspected at this time. The licensee removed the following items from the Training Center in order that the inspector could confirm that it conforms to the above criteria:

A posted storage safe on the second floor of the Training Center contained several radioactive sources, one being a few pounds of natural uranium.

A labelled container on the second floor of the Training Center held several well-counter standards and other sealed standards or check sources, including such isotopes as Sr-90, Co-60 and C-14.

A source measured at 25 mrem/hr on contact was identified as a radium instrument check source.

Following the removal of all of these materials from the Training Center, the inspector found there was no detectable radiation therein or in any adjacent area.

The inspector surveyed the above source storage locations and reviewed the licensee's sealed source leak test records. No indication of source leaks or omissions of periodic leak tests were identified.

Based on the above information, the inspector found that the AGN-201 Reactor Training Center conforms to the NRC criteria for radioactivity levels in areas to be released for unrestricted use.

6. Review of Records of Radioactive Effluents and Radioactive Waste

a. Airborne Effluents During the Period January 1, 1975 to November 1, 1978

No ventilation of the Training Center was required during inactive periods. The "Dismantling Plan" in Section II B2 required air monitoring and operation of a room exhaust fan during the reactor disassembly procedure. Up to the date of the defueling on December 14, 1977, the core tank remained sealed and the extra pieces of fuel remained in a locked safe. Within about 5 hours of opening the core tank all of the fuel was in the shipping containers.

A licensee representative stated that no airborne radioactivity other than naturally occurring radon was identified in the Training Center at any time other than during fuel handling on December 14, 1977.

The maximum airborne concentration measured on December 14, 1977, did not exceed 5×10^{-11} uCi/ml and much of this decayed with the halflife of radon. The inspector noted that any likely rate of ventilation flow at that concentration would release far less than one microcurie of airborne radioactivity during the 5-hour time period that fuel was handled. Licensee survey results were included in a letter dated January 18, 1978 (paragraph 4.c).

Based on the above oral and recorded information, the inspector determined that less than a microcurie of airborne radioactivity appeared to be released under License No. R-43 between January 1, 1975, and November 1, 1978. The reactor remained shutdown and sealed throughout that period until it was disassembled on December 14, 1977.

b. Liquid Effluents

The licensee representative, in the letter referenced above, reported that the (nominally 8,700 lbs of) reactor shield tank water was sampled before it was released to the floor drain and the analysis for radioactive materials did not identify any detectible radioactivity. The licensee representative stated that no other liquids were released under License No. R-43.

Based on the above information, the inspector determined that no detectable concentration of radioactive liquid was released between January 1, 1975, and November 1, 1978. The licensee's minimum detectible concentration appeared to be about 100 dpm/ml and at that concentration 8,700 lbs of water would contain about 0.2 mCi which is within the 10 CFR 20 and the license limits on releases.

c. Miscellaneous Radioactive Waste

The licensee representatives stated that any suspect and identified radioactive waste was collected for transfer to a licensed radioactive waste disposal service. The inspector observed the licensee's waste receptacles and reviewed the recent shipping records. (Paragraph 8)

No items of noncompliance were identified.

7. Review of Records of Personnel Dosimetry

The inspector reviewed the records of film badge exposures during the period January 1, 1976, to September, 1978. No individual exposed in connection with License No. R-43 appeared to have received an annual dose exceeding 0.1 rem during any of these years. None of the other individuals who were badged appeared to have received in excess of 1.25 rem during any calendar quarter of these years and only one quarterly or annual exposure greater than 1 rem had occurred, during 1978 in connection with a radium source which was not under NRC regulations.

The licensee issues neutron badges to personnel who could receive or are known to receive neutron exposures. None of the neutron badges were reported to have received above the minimum detectable level.

Review of survey records indicated that the dose rate due to neutrons, if measurable, typically was no greater than 50% of the dose rate due to gamma radiation. The licensee uses a neutron rem-meter (PNR-4) and other survey instruments to measure the neutron and gamma dose rates.

Based on the above information, the inspector determined that any neutron doses to individuals to date were negligible.

No items of noncompliance involving dosimetry practices were identified.

8. Review of Records of Transfers and Shipments of Reactor Components and Radioactive Materials

The inspector reviewed the licensee's recent transfer and shipping records of radioactive materials to verify that these materials were shipped in the compliance with regulatory requirements, to authorized recipients.

No items of noncompliance were identified.

9. Exit Interview

The inspector met with the licensee representative, denoted in paragraph 1, at the conclusion of the inspection.

The inspector reviewed the scope and findings of the inspection.

The licensee representative stated that the reactor personnel dosimetry records would be retained in connection with those of other personnel and would not be discarded in the foreseeable future.