UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
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Report No.: 50-83/90-01

Licensee: University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32601

Docket No.: 50-83 License No.: R-56

Facility Name: University of Florida Training Reactor

Inspection Conducted: February 20-23, 1990

Inspector: C Bassett 3/19/90
C. H. Bassett Date Signed

Approved by: E J McAlpine 3/19/90
E. J. McAlpine, Chief Date Signed
Radiation Safety Project Section
Nuclear Materials Safety and Safeguards Branch
Division of Radiation Safety and Safeguards

SUMMARY

Scope:

This routine, unannounced inspection involved onsite review of radiation protection program activities, including radiation controls, environmental surveillance and monitoring, transportation, and review of licensee actions concerning NRC Information Notices and previously identified enforcement actions.

Results:

Staffing and current organizational structure met Technical Specification (TS) requirements and were adequate to implement the licensee's radiation protection program. Strengths in the radiation protection program were noted in the areas of management involvement in facility operations, low facility radioactive contamination levels, and low radiation dose received by personnel. The licensee demonstrated timely and thorough response to an NRC identified problem concerning TS required surveillance frequencies. No apparent violations were identified during this inspection although a program weakness was identified in the area of monitoring the reactor cell environment for radioactive particulate airborne contamination.

REPORT DETAILS

1. Persons Contacted

   Licensee Employees

   *D. Munroe, Radiation Control Officer, Environmental Health and Safety (EHS) Division
   *J. Tulenko, Chairman, Nuclear Engineering Sciences Department
   *W. Vernetson, Facility Director, University of Florida Training Reactor (UFTR)
   *P. Whaley, Acting Reactor Manager, UFTR

   Other licensee employees contacted included operators, Radiation Control (RC) student assistants, and office personnel.

   *Attended exit interview

2. Radiation Control (83743)

   a. Organization and Staffing

      Technical Specifications (TS) 6.2.1, 6.2.2, and 6.2.3 detail organizational structure and management responsibility for safe operation of the UFTR facility.

      The inspector reviewed and discussed with cognizant licensee personnel the current staffing associated with operating the UFTR and providing radiation protection coverage for daily work. Certain weekly contamination surveys and limited job coverage is provided by a part-time RC student assistant assigned to the UFTR. The majority of radiation protection coverage, however, is provided by two RC technicians and two part-time RC student assistants working for the Radiation Control Officer (RCO) in the University of Florida's EHS Division. These individuals perform monthly and quarterly radiation level and contamination surveys in the restricted and unrestricted areas of the facility and ensure that adequate dosimetry is available for use. They also perform other environmental monitoring functions for the facility including preparation of liquid radioactive waste tank releases. In addition, they calibrate certain radiation protection equipment used in the UFTR cell and provide job coverage for non-routine and unusual jobs such as fuel movement and maintenance activities.

      Additional assistance to conduct the radiation protection program is provided by the licensed reactor operators. Currently, there are three senior reactor operators, including the Facility Director, and two reactor operators. These individuals have received training in survey techniques, calibration of selected UFTR area radiation protection equipment, and monitoring or coverage during operations

such as routine irradiation experiments and radiography. Certain other student assistants have also received training in and perform radiation protection coverage during operation of the pneumatic rapid sample transfer (rabbit) system. This coverage is limited to ensuring that radiation and contaminations levels are not above certain limits as specified by procedure. If levels above those specified are encountered, the UFTR EHS Division is notified to provide further coverage (or the sample is transferred back to the reactor).

During the inspection and tours of the facility, the inspector noted that the current staffing level, composed of both UFTR and EHS Division personnel, appeared adequate to conduct radiation protection activities at the facility.

b. Safety Committee Meetings and Audits

TS 6.2.5 requires that the Radiation Safety Review Subcommittee (RSRS) conduct quarterly meetings at intervals not to exceed four months.

The inspector reviewed the minutes of the RSRS meetings conducted from November 1, 1988 through February 22, 1990. During that time period, the RSRS and Executive RSRS met approximately 15 times thus meeting the TS requirement. Items reviewed included unscheduled shutdowns of the reactor, 10 CFR 50.59 safety reviews, facility status and operating reports, procedure violations, revisions to plans and Standard Operating Procedures (SOPs), the high enriched uranium (HEU) to low enriched uranium (LEU) fuel conversion program and progress, and apparent elevated dose anomalies.

TS 6.2.5 also requires an independent review and audit of safety aspects of reactor facility operations to advise management. The review and audit functions are to be performed by the RSRS.

The inspector reviewed the last audit conducted by the RSRS on February 20, 1989. The audit covered the facility emergency plan, fire protection system records, the security plan, special nuclear material records, the requalification training program, health physics records, TS surveillance requirements, documentation of experiments, correspondence/commitments made to the NRC, the Quality Assurance program, and a review of maintenance records, procurement, and process control documents. The audit did not identify any serious deficiencies but some problems were noted. The licensee addressed these problems by initiating corrective actions for each. The inspector also reviewed the actions taken by the licensee to correct the problem areas noted by the RSRS. From this review, the inspector determined that the RSRS was providing adequate oversight of the UFTR operations and that management was committed to and involved in proper operation of the facility and maintaining an adequate radiation protection program.

c. Training

10 CFR 19.12 requires the licensee to instruct all individuals working in or frequenting any portion of the restricted area in health physics protection problems associated with exposure to radioactive material or radiation, in precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed, applicable provisions of Commission regulations, individuals' responsibilities and the availability of radiation exposure reports which workers may request pursuant to 10 CFR 19.13.

The inspector discussed the training provided to those individuals who provide the radiation protection coverage for daily operation of the UFTR facility. Applicable radiation protection training is given to the operators during their initial qualification training or biennial requalification. Initial and subsequent annual training is provided to all the RC student assistants by one of the qualified RC technicians in the EHS Division. Personnel authorized to use the "rabbit" transfer system are trained by others who have previously qualified on the system, typically reactor operators.

The inspector reviewed the training records of the operators, the RC student assistants and selected personnel authorized to use the transfer system. The training records were complete and subjects outlined as having been presented appeared to be appropriate and adequate for radiation protection and control.

d. Posting and Labeling

10 CFR 19.11 requires each licensee to conspicuously post current copies of (1) 10 CFR Parts 19 and 20; (2) the license; (3) the operating procedures; and (4) Form NRC-3, in sufficient places to permit individuals engaged in licensed activity to observe them on the way to and form any licensed activity location. If posting of the documents specified in (1), (2), and (3) is not practicable, the licensee may post a notice which describes the documents and states where they may be examined.

All routine entries into the UFTR restricted area are made through the reactor control room. During tours of the facility, the inspector noted that the applicable documents and/or references to their location were posted at the entrance to the control room. The posted documentation indicated that copies of the license and procedures were maintained in the control room and in the Facility Director's office.

10 CFR 20.203 specifies the requirements for posting radiation areas, high radiation areas, and labeling containers of radioactive materials.

During tours of the facility, the inspector noted that entrances into the restricted area were posted appropriately and that containers of radioactive material were labeled as required.

e. Restricted Area Surveys

10 CFR 20.201(b) requires the licensee to make or cause to be made such surveys as (1) may be necessary for the licensee to comply with regulations in this part and (2) are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present.

TS 6.3 requires the facility to be operated and maintained in accordance with approved, written procedures for personnel radiation protection, consistent with applicable regulations.

TS 3.9.2(2)(a) requires weekly measurements of surface contamination in the restricted area. Surface contamination greater than 100 disintegrations per minute per 100 square centimeters (dpm/100 cm^2) beta-gamma and 50 dpm/100 cm^2 alpha are limiting conditions for operation requiring review and possible radiological safety actions.

TS 3.9.2(2)(b) requires airborne particulate contamination to be measured using a high volume air sampler during the weekly checkout. Measured airborne contamination 25 percent (%) above mean normal levels are limiting conditions for operation requiring review and possible radiological safety control actions.

TS 3.9.2(3)(a) requires surveys measuring the radiation doses in the restricted area to be conducted quarterly, at intervals not to exceed four months, and at any time a change in the normal radiation levels is noticed or expected.

The following procedures outlining radiological surveys to be conducted in and around the UFTR restricted area were reviewed by the inspector:

- Standard Operating Procedure (SOP) D.1, UFTR Radiation Protection and Control, Rev. 3, dated April 1983.
- SOP D.3, Primary Equipment Pit Entry, Rev. 2, dated May 1985.
- SOP D.4, Removing Irradiated Samples From UFTR Experimental Ports, Rev. 5, dated October 1989.
- SOP A.8, Pneumatic Rapid Sample Transfer (Rabbit) System, Rev. 0, dated December 1988.
- Radiation Control Technique (RCT) No. 1, Instructions for Performing Swipe Samples, dated April 1987.
- RCT No. 4, Instructions for Performing Radiation Surveys, dated April 1987.
- RCT No. 6, Instructions for Obtaining and Preparing Air Samples for Analysis, no date.

- RCT No. 8, Instructions for Analysis of Swipe, Air and Liquid Samples, dated January 1989.
- RCT No. 31, Instructions for Performing UFTR Environmental Radiation Surveys, dated May 1989.

The inspector reviewed selected UFTR restricted area weekly and quarterly radiological survey results conducted from January 1989 to February 1990. Surface contamination within the restricted area was found to be low. Survey data indicated that beta-gamma contamination levels were maintained below 100 dpm/100 cm^2. Anytime surface contamination levels above that figure were encountered, the area or item was immediately decontaminated or the item was bagged and stored in a storage area. Airborne radioactive particulate concentration levels were also low. Survey data indicated that airborne particulate beta-gamma activity concentrations were generally on the order of 1.0 E-12 microcuries per milliliter (uCi/ml). Survey results in the UFTR cell indicated general area radiation levels from 1 to 10 milliRoentgen per hour (mR/hr) around the reactor and from 10 to 50 mR/hr on top of the reactor at 100% power. The survey results also indicated the existence of "hot spots" (at contact with the reactor shielding or shielded beam ports) with radiation levels from 25 to 80 mR/hr.

f. External Exposure Reviews

10 CFR 20.101 delineates the quarterly radiation exposure limits to the whole body, the skin of the whole body, and the extremities for individuals in restricted areas.

The inspector reviewed and discussed the exposure records of and the dose received by persons working in or frequenting the UFTR facility from January 1, 1989, through December 31, 1989. Personnel exposure measurements were obtained using film badges and thermoluminescent dosimeters (TLDs) provided by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor. Vendor specifications reported a detection limit of 10 millirem (mrem) for the dosimetry provided to the licensee. The highest reported dose for the period was 140 mrem and was assigned to a reactor operator. The exposure resulted from activities associated with neutron radiography, experiments, and maintenance activities. All other annual cumulative doses assigned to personnel working in or frequenting the UFTR facility were less than 100 mrem per individual for the period.

g. Continuous Air Monitoring

TS 3.4.4 requires the reactor cell environment to be monitored by at least one air particulate monitor, capable of audibly warning personnel of radioactive particulate airborne contamination in the cell atmosphere.

During a previous inspection, as documented in Inspection Report 50-83/89-04, the inspector reviewed the operations logs of the licensee which detailed that the air particulate detector (APD) or continuous air monitor in the reactor cell was checked to verify that it was operational prior to reactor startup. The inspector also reviewed the quarterly calibration log for the APD and determined that the calibrations were being performed. When asked about the APD alarm set point and detection capabilities however, the licensee indicated that the APD was set to alarm at 30,000 counts per minute (cpm) but that that number could not be related to any Maximum Permissible Concentration in air (MPCa). An unresolved item was established until further information could be obtained and evaluated.

During this inspection, the licensee was again asked about the APD and its detection capabilities. The licensee provided the inspector with an evaluation that had been performed. Through review of this data and discussions with the licensee the inspector determined the following:

- The APD meter indication for an airborne concentration of 3.0 E-11 uCi/ml of a particular isotope such as Cs-137 or Sr-90 would be approximately 43 cpm.
- The APD meter indication for an airborne concentration of 3.0 E-9 uCi/ml of these isotopes would be approximately 4300 cpm.
- Using the above values, if the APD were to alarm due to the presence of airborne radioactivity (at approximately ten times MPCa), an individual would not be likely to receive an overexposure (greater than 520 MPC-hours) due to inhalation of the airborne contaminants.
- If airborne contamination is suspected or anticipated due to maintenance or other activities, grab samples are taken and analyzed immediately to keep the licensee informed of the the current airborne conditions.
- The APD is set to alarm at 30,000 cpm due to the unusually high levels of Radon found in the area, particularly during inversions caused by storms or other weather disturbances moving through the area.
- The APD meter is routinely monitored during reactor operation by the operators to ensure that the airborne level in the reactor cell is not reaching or exceeding the alarm set point.
- An APD alarm requires the evacuation of the UFTR and the UFTR Annex.
- The licensee acknowledges the fact that the sensitivity of the present APD is not what they would like and have included the purchase of a replacement continuous air monitor as a priority item should they receive any funds from the Department of Energy for upgrading the facility.

The inspector determined that, even though the TS requirement was apparently being met, the licensee agreed that a new or different APD or continuous air monitor with greater sensitivity would improve the radiation protection program of the facility.

No violations or deviations were identified.

3. Environmental Protection Program (80745)

a. Effluents

10 CFR 20.303 details liquid effluent release limits to the sanitary sewerage system.

TS 3.4.5 requires liquid waste from the radioactive liquid waste holding tanks to be sampled and the activity to be measured, with the results to be within limits specified in 10 CFR 20, Appendix B, Table 1, Column 2, before release to the sanitary sewer.

The inspector reviewed the following procedures which the licensee uses to conduct radioactive liquid releases to the sanitary sewer:

- SOP D.1, UFTR Radiation Protection and Control, Rev. 3, dated April 1983.
- RCT No. 7, Instructions for Obtaining and Preparing Liquid Samples for Analysis, no date.
- RCT No. 8, Instructions for Analysis of Swipe, Air, and Liquid Samples, dated January 1989.
- RCT No. 21, Instructions for Utilizing, Sampling, and Discharging Liquid Waste Holdup Tanks, dated June 1988.

The inspector reviewed the data from the four reported discharges that had been made from the facility from September 1, 1988 through August 31, 1989. The average radionuclide concentrations ranged from less than 1.20 E-10 to 3.03 E-8 uCi/ml. A total of 305,700 liters of liquid were released containing a total of approximately 2.928 uCi during the reporting period. These data reflect a reduction in the amount of radioactivity discharged compared to previous years.

TS 4.2.4(2) requires that the Argon-41 (Ar-41) concentration in stack effluents be measured semiannually at intervals not to exceed eight months.

TS 3.4.2 requires the average Ar-41 concentration averaged over a consecutive 30-day period to be less than 4.0 E-8 uCi/ml.

Through discussions with licensee representatives and review of release data, the inspector determined that calculation of the licensee's total releases and average monthly concentrations are based upon semiannual Ar-41 release concentration measurements made at equilibrium full power (100 Kw) conditions. Monthly average concentrations of gaseous releases ranged from 1.082 E-9 uCi/ml to 7.459 E-9 uCi/ml. Total Ar-41 activity released per month ranged from 3.576 E+6 to 23.32 E+6 uCi with a cumulative total release of 140.14 Ci for the period from September 1, 1988 through August 31, 1989.

b. Environmental Surveys

TS 3.9.2(1) requires monthly environmental radioactivity surveillance outside the restricted area to be conducted by measuring the gamma doses at selected fixed locations surrounding the UFTR facility.

Environmental radiation exposure as a result of UFTR operations was considered minimal. The total yearly exposure reported during the period from September 1, 1988 through August 31, 1989 ranged from less than 10 to 60 mrem as measured by film badge and less than 10 mrem as measured by TLD. There were two measurements of 80 and 90 mrem, as recorded by film badge and TLD respectively, but these were at the top of the UFTR stack and were considered atypical.

TS 3.9.2(3)(b) requires quarterly radiation exposure surveys to be conducted in unrestricted areas surrounding the UFTR complex.

The inspector reviewed the quarterly radiation level surveys conducted during January 1989 through February 1990, in the unrestricted areas surrounding the UFTR facility. Areas immediately outside the reactor cell had radiation levels between 0.1 and 0.3 mR/hr. Radiation surveys outside the UFTR building indicated levels ranging from 10 to 65 micro-R per hour (uR/hr). No problem areas were noted.

c. Environmental Reports

TS 6.6.1(5) requires the licensee to issue a routine annual report covering the activities of the reactor facility during the previous calendar year which ends August 31 for the UFTR. The annual report is to include a summary of the nature and amount of radioactive effluents released or discharges to the environment, the environmental surveys performed outside the facility, and exposures received by facility personnel and visitors where exposures are greater than 25% of the allowable limits.

The inspector verified that the annual report had been compiled and reviewed the most recent issue. The report was found to be in compliance with applicable TS requirements.

No violations or deviations were identified.

4. Transportation

10 CFR 71.5 requires each licensee who transports licensed material outside the confines of its plant or other place of use to comply with the applicable requirements of the Department of Transportation (DOT) in 49 CFR 170 through 189.

The inspector discussed the processing, storage, and shipping of radioactive material with licensee representatives. The inspector also

reviewed the following licensee procedures which provide guidance for shipping radioactive material:

- SOP D.5, UFTR Reactor Waste Shipments: Preparation and Transfer, Rev. 0, dated May 1987.
- SOP D.6, Control of UFTR Radioactive Material Transfers, Rev. 0, dated December 1988.
- RCT No. 12, Instructions for Labeling and Shipping Radioactive Material, dated October 1980.

The licensee indicated that radioactive materials are generally transferred to the State of Florida License, UF 356-1, for further processing or disposal. Only radioactive waste material generated in the UFTR facility is not transferred to the State License. Such radioactive waste is shipped directly from the UFTR to a processor or a waste disposal site. Through discussions with the licensee and review of the shipping records, the inspector verified that no radioactive waste has been shipped from the UFTR since 1985. However, a review of SOP D.5 and RCT No. 12 indicated that these procedures were apparently out of date and needed to be revised to reflect current conditions. The licensee agreed to review the procedures and revise them as necessary.

The inspector reviewed the "shipping" actions or transfer of radioactive material of the UFTR to other campus and research facilities. Such transfers are governed by licensee procedure SOP D.6 which outlines responsibilities for transfer and storage of such material and provides forms for tracking the transfers. The inspector reviewed SOP D.6 forms, Form D.6A, D.6B, D.6C, D.6D, and D.6E for the current year. All transfers had been made in accordance with the established procedures.

No violations or deviations were identified.

5. Followup on Information Notices (92717)

The inspector determined that the following NRC Information Notices (INs) had been received by the licensee, reviewed for applicability, and distributed to the appropriate personnel.

- IN 89-46: Confidentiality of Exercise Scenarios, dated May 11, 1989
- IN 89-47: Potential Problems with Worn or Distorted Hose Clamps on Self-Contained Breathing Apparatus, dated May 18, 1989
- IN 89-68: Evaluation of Instrument Setpoints During Modifications, dated September 25, 1989
- IN 89-70: Possible Indications of Misrepresented Vendor Products, dated October 11, 1989
- IN 89-81: Inadequate Control of Temporary Modifications to Safety-Related Systems, dated December 6, 1989
- IN 90-01: Importance of Proper Response to Self-Identified Violations by Licensee, dated January 12, 1990.

No violations or deviations were identified.

6. Licensee Action of Previous Enforcement Matters (92701, 92702)

a. (Closed) Violation (50-83/89-04-01): The Allowable Surveillance Intervals for Blade Drop Time Checks and for Quarterly Scram Checks Were Exceeded.

The inspector reviewed and verified implementation of the corrective actions stated in the licensee's response dated January 12, 1990. The licensee has begun to track the required surveillances on the status board in the control room, as well as in the monthly report, in a different format. The old system required simply a month-to-month tracking of the surveillance dates. The new system requires tracking the surveillance dates in an elapsed-time format which indicates that a given surveillance must be performed by a specific date as opposed to a month. The inspector reviewed the status board in the control room and the monthly report and verified that the dates were being tracked in the new format which specified a specific date by which the surveillance needed to be completed.

b. (Closed) Unresolved Item (50-83/89-04-02): APD Setpoint and Performance Capability.

The inspector reviewed the data supplied by the licensee and discussed the matter with licensee representatives. No apparent violations or deviations were identified. (Refer to Paragraph 2.g for a full discussion of this item.)

7. Exit Interview (30703)

The inspection scope and findings were summarized on February 23, 1990, with those persons indicated in Paragraph 1. The inspector discussed and detailed the findings for each area reviewed. The licensee's organization and staffing were adequate to implement the radiation protection program at the facility. The involvement of management with the operation and adequacy of the radiation protection program was evident. The facility continues to maintain low facility radioactive contamination levels and low radiation doses for personnel. No violations were identified but one weakness was noted in the area of monitoring the reactor cell for airborne radioactivity. The possible need to revise the procedures for shipping radioactive material was also discussed. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspector during the inspection. The licensee was informed that the items outlined in Paragraph 6 are considered closed.