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NUCLEAR REGULATORY COMMISSION
REGION II
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ATLANTA, GEORGIA 30323-0199

Report No.: 50-62/94-04

Licensee: University of Virginia
Charlottesville, VA 22901

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

Facility Name: University of Virginia Reactor (UVAR)

Inspection Conducted: May 31 - June 3, 1994

Inspector: C Bassett 6/21/94
C. H. Bassett, Senior Radiation Specialist Date Signed

Approved by: D M Collins 6/23/94
E. J. McAlpine, Chief Date Signed
Radiation Safety Projects Section
Nuclear Material Safety and Safeguards Branch
Division of Radiation Safety and Safeguards

SUMMARY

Scope:

This routine, announced inspection involved onsite review of radiation protection program activities including, radiation control, environmental surveillance and monitoring, and transportation of radioactive material.

Results:

The staffing level and current organizational structure were adequate to meet Technical Specification (TS) requirements and to implement the licensee's radiation protection program. Facility contamination levels and radiation exposure to individuals were within the local administrative levels and exposures were well within federal regulatory limits. The environmental monitoring program appeared to be adequate to meet TS requirements. The radiation protection program was being conducted according to approved procedures and the environmental surveillances were being conducted as required.

Within the areas inspected, one violation (VIO) and one non-cited violation (NCV) were identified. The VIO included two examples of failure to comply with the licensee's TS 6.3: 1) for not performing a quarterly operation check of a portable survey instrument and 2) for not collecting the required water samples within two weeks of a planned release (Paragraphs 2.k and 3.b(3)). The NCV dealt with failure to adhere to TS requirements for retaining a record of the analysis of environmental water samples for the life of the facility (Paragraph 3.b(2)).

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*P. Benneche, Services Manager
*P. Farrar, Reactor Administrator
*R. Flack, Chairman, Department of Mechanical, Aerospace, and Nuclear Engineering (MANE)
*D. Krause, Senior Reactor Operator
*R. Mulder, Director, University of Virginia Reactor Facility

Other licensee employees contacted during this inspection included operators, technicians, and administrative personnel.

Other Organizations

*R. Piccolo, Radiation Safety Officer, University of Virginia Environmental Health and Safety (UVA EHS) Department
*D. Steva, Reactor Health Physicist, UVA EHS Department

*Attended Exit Interview on June 3, 1994.

2. Radiation Control (83743)

a. Organization and Staffing

Technical Specification (TS) Sections 6.1.1, 6.1.2, and 6.1.3 detail organizational structure, management responsibility, and staffing requirements for safe operation of the UVAR facility.

Through discussions with licensee representatives the inspector determined that management responsibilities at the facility had not changed since the previous NRC inspection of radiation protection activities in November 1993 (Inspection Report No. 50-62/93-04). The inspector determined that the MANE Department Chairman retained overall responsibility for management of the facility as specified in the TS.

The inspector reviewed, with cognizant licensee representatives, the current staffing available to conduct routine and nonroutine operations and radiation protection activities at the facility. The licensee currently has four licensed senior reactor operators (SROs) and one licensed reactor operator (RO) who perform various radiation protection activities at the facility. Previously, one SRO and one RO trainee were assigned the responsibility of performing the routine daily and weekly radiation level and contamination level surveys required by the licensee's Standard Operating Procedures (SOPs). The SRO and RO trainee subsequently left their positions at the facility to pursue other career

opportunities. Currently, another of the SROs at the facility has been given this responsibility and a student is being trained to help complete the routine surveys. The other SROs are responsible for assisting as necessary and for the decontamination of areas found to be contaminated during routine surveys.

The inspector noted that the UVA EHS Reactor Health Physicist (RHP) maintains responsibility for and oversight of the radiological safety program at the facility. The Radiation Safety Officer (RSO) also shares in this responsibility. The RHP and RSO are assisted by UVA EHS radiation safety technicians who have been trained in performing the other required surveys and have become familiar with reactor operations. These technicians perform the monthly surveys of the reactor facility, including the environmental surveys, and provide support for nonroutine work activities and /or shipping radioactive material as needed.

The inspector noted that the organization and staffing levels, including the UVAR operations and UVA EHS Department personnel, appeared to be adequate to conduct routine and nonroutine radiation protection activities for the facility.

b. Audits and Management Evaluations

TS 6.2 requires the Reactor Safety Committee (RSC) to review and audit reactor operations to ensure that the facility is operated in a manner consistent with public safety and within the terms of the facility license. TS 6.2.2 and 6.2.3 detail RSC membership and qualifications, and meeting and audit frequency. The RSC is required to meet, at a minimum, semiannually, to approve untried experiments, changes to the reactor, amendments and changes to the facility license, TS and SOPs, to review reportable events and operating abnormalities, and to conduct annual audits of operational records.

The inspector reviewed the composition of the RSC with the licensee. The inspector determined that the composition of the RSC was as prescribed in the TS and that the members had the appropriate technical backgrounds as required. It was noted that the chairman of the RSC was to be away from the University for an extended period. Due to this situation, another individual was named as chairman, at least until the former chairman returns on July 31, 1994. The current chairman has been a member of the RSC for several years and has previously served as Chairman of the Radiation Safety Committee.

The inspector also reviewed the minutes of the RSC meetings held since the last inspection, from July 1993 through June 1994. The inspector noted that, during this time period, the RSC met seven times. The meeting minutes indicated that the issues discussed/reviewed during RSC meetings included such issues as irradiation requests, TS changes, Standard Operating Procedures (SOP) and

Emergency Program Implementing Procedures (EPIP) changes, conversion of the reactor to the use of Low Enriched Uranium (LEU) fuel, the semi-annual RSC audit, NRC inspection results, the pilot Boron Neutron Capture Therapy (BNCT) program, the reactor pool leak problem, the implications of the new 10 CFR 20, and the 1993 Annual Report.

The inspector reviewed the audits that had been conducted by the RSC during 1993 and to date during 1994 as well. One audit, from October 1992 through March 1993, dealt with a review of the reactor logbook, the maintenance and calibration logs, the irradiation request forms, and the daily and hourly checklists used by the reactor operators. No major problems were noted but various recommendations were made. The licensee's response to this audit appeared to be adequate. Another audit was conducted during November and December 1993 in the areas of irradiation procedures, the quality assurance program, and the entire training program. The results of this audit indicated that the entire Quality Assurance/Quality Control (QA/QC) program needed to be rewritten and upgraded. The training program, including the reactor operator requalification program, was found to be satisfactory. The irradiation procedures were noted to be generally complete and accurate. In response to this audit, the licensee indicated that the QA/QC program would be reviewed and updated over the next several months.

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, in the purposes and functions of protective devices employed; also, to instruct them to observe the applicable provisions of Commission regulations, to instruct them in their responsibility to report problems, in the appropriate response to warnings in the event of problems and in the availability of radiation exposure reports which workers may request pursuant to 10 CFR 19.13.

The inspector reviewed the training provided to personnel frequenting the UVAR facility. It was noted that, excluding visitors touring the facility, persons spending any appreciable amount of time in the restricted area included reactor operators, experimenters, students, and UVA EHS personnel. Also, only those persons who had received the appropriate training provided by the licensee and who had been badged and received a dosimeter were allowed unescorted access to restricted areas of the facility. Personnel who handled radioactive material within the facility were provided training by UVA EHS personnel.

The inspector reviewed the training given to those persons who were given unescorted access to the facility. The training was given and/or renewed annually and consisted of security, emergency, implementing procedures, and health physics subjects pertinent to the facility. The inspector noted that a portion of the reactor operator requalification program also covers these areas. The inspector also reviewed the training given to those who handled radioactive materials. The training given to these groups of individuals appeared to be adequate and covered the subjects outlined in 10 CFR 19.12.

d. Posting of Notices

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

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 reactor control room. The posted documentation indicated that copies of regulations and procedures were maintained in the Reactor Supervisor's office. Copies of Form NRC-3 were also posted at various locations throughout the facility on bulletins boards and in study areas.

e. Area Posting and Radioactive Material Labeling

10 CFR 20.1902 specifies the requirements for posting radiation areas, high radiation areas, and storage areas, and for labeling containers of radioactive materials.

Posting of entrances into restricted areas and the labeling of radioactive material containers within the restricted area were observed during tours of the facility. All postings of areas appeared to be adequate. Labeling of radioactive material appeared to be generally adequate and in compliance with applicable regulations.

f. Control of Access to High Radiation Areas

10 CFR 20.1601 requires the licensee to ensure that each entrance or access point to a high radiation area (HRA) has one or more of following features: 1) a control device that, upon entry into the HRA, causes the level of radiation to be reduced below that level at which an individual might receive a deep-dose equivalent of 100 millirem (mrem) in one hour, 2) a control device that energizes a conspicuous visible or audible alarm signal, or 3) entry ways

that are locked, except during periods when access to the areas is required, with positive control over each entry.

The inspector noted that the licensee had various areas designated as high radiation areas. These areas were maintained locked by the licensee except when access to the HRAs was required. The locks and their integrity were observed and physically checked by the inspector during tours of the facility. All access points to high radiation areas were maintained locked and the locks were secured as required.

g. Surveys

10 CFR 20.1501 requires the licensee to make or cause to be made surveys that

(1) may be necessary for the licensee to comply with the regulations and,
(2) are reasonable under the circumstances to evaluate:

(a) the extent of radiation levels,
(b) concentrations or quantities of radioactive material, and
(c) the potential radiological hazards that could be present.

During a review of the various daily, weekly, and monthly survey maps that had been completed for the radiologically controlled areas and the uncontrolled areas of the facility, the inspector determined that all required surveys were being completed as required. The survey results had been reviewed by a member of UVAR staff and by the RHP as required. The inspector also accompanied and observed the individual designated to perform daily surveys as he performed a survey. The person demonstrated good survey techniques and performed an adequate survey of the areas under surveillance.

Through a review of selected UVAR restricted area radiological survey results, the inspector noted that the surface contamination and radiation level results were generally constant. Surface contamination levels were usually below the administrative limit of 50 disintegrations per minute per one hundred square centimeters (dpm/100 cm^2). When contamination levels above this limit were noted during routine surveys, an operator or student/trainee was assigned to clean the area. General area radiation levels were noted to be less than 0.5 millirem per hour (mR/hr) when the reactor was not operating and ranged from less than 0.5 to approximately 9 mR/hr in the reactor room and from 0.5 to 35 mR/hr in the ground floor reactor face area during reactor operation.

h. Air Sampling

10 CFR 20.1204 requires that the licensee take suitable and timely measurements of concentrations of radioactive material in air in work areas or quantities of radionuclides in or excreted from the body to determine compliance with the occupational dose equivalent limits specified in 10 CFR 20.1502.

Airborne particulate concentration survey results were also examined by the inspector. These levels were generally well below twenty-five percent of the Maximum Permissible Concentration (MPC) limits specified in 10 CFR Part 20, Appendix B, Table 1, Column 1. During the period of January through December 1993, the results of air samples taken in the UVAR room indicated activity from 2E-12 to 7E-12 microCuries per milliliter (uCi/ml). The MPC for the area was 3E-11 uCi/ml.

i. External Exposure Review (83743)

(1) Annual Exposure for 1993 and 1994

10 CFR 20.1201(a) requires each licensee to control the occupational dose to individual adults, except for planned special exposures under 10 CFR 20.1206, to the following dose limits:

(a) An annual limit, which is more limiting of: (i) the total effective dose equivalent (TEDE) being equal to 5 rems: or (ii) the sum of the deep-dose equivalent and the committed dose equivalent to any organ or tissue other than the lens of the eye being equal to 50 rems.

(b) The annual limits to the lens of the eye, to the skin, and to the extremities, which are: (i) an eye dose equivalent of 15 rems; and (ii) a shallow-dose equivalent of 50 rems to the skin or to any extremity.

10 CFR 20.1502(a) requires each licensee to monitor occupational exposure to radiation and to supply and require the use of individual monitoring devices for adults likely to receive an annual dose in excess of 10 percent of the limits in 20.1201(a).

The inspector reviewed and discussed with the licensee the exposure records of persons working in the UVAR restricted area during 1993 and from January 1 through March 31, 1993. Personnel exposure measurements were made using film badges provided by a vendor. Vendor specifications reported a detection limit of 10 millirem (mrem) for the dosimetry provided. The highest cumulative whole body exposure reported for 1993 was 280 mrem. This had been received by

the reactor operations services manager who was typically engaged in unloading the mineral irradiation facility and in preparing Iridium-192 seeds for shipment. The majority of the remaining annual cumulative exposures for the other UVAR operations personnel and staff totaled less than 20 mrem each.

During 1994 through the end of March (the latest data available), the highest cumulative exposure was approximately 50 mrem to the whole body, 50 mrem to the lens of the eye, and 50 mrem to the skin. This exposure was received by an SRO who was responsible for coordinating the conversion of the reactor to using low enriched uranium (LEU) fuel. And as in 1993, the majority of the remaining cumulative exposures through March 1994 for the other UVAR operations personnel and staff totaled less than 20 mrem each for the whole body, lens of the eye, and the skin.

The inspector also reviewed the licensee extremity monitoring program and the monitoring results. During 1993, the highest cumulative extremity exposure being 630 mrem and was received by the reactor services manager. Through March 1994, the highest cumulative extremity exposure was 260 mrem. This extremity exposure was received by the individual coordinating the conversion to LEU fuel. The majority of the remaining cumulative extremity exposures for the other UVAR operations personnel and staff totaled less than 20 mrem each.

During tours of the facility, the inspector also noted that the licensee appeared to be providing appropriate monitoring equipment and controlling exposure to facility personnel.

(2) Lost Film Badge Review

During the review of the exposure records the inspector noted that the results of processing one individual's film badge indicated that he had received 2400 mrem deep-dose equivalent. Through discussions with the RHP the inspector determined that this incident had been investigated by the licensee.

One of the SROs had apparently lost his film badge during work in the pool area. The following day, when other facility personnel were informed of the lost badge, a search was made. The badge was subsequently located laying in the reactor pool on the nuclear instrument well support about ten feet above the defueled core. The film badge had been in the pool for approximately 24 hours. The badge was retrieved and sent to the vendor for processing. Although the vendor indicated that they could readily determine when

a badge had been damaged by water, they indicated that no water damage had occurred with this badge and that the reading was correct.

The individual who lost the badge was questioned about his activities during the exposure period and indicated that he had not entered any high radiation areas and that he had performed basically the same work as another member of the licensee's staff. The licensee concluded that the exposure recorded on the film badge was apparently due to contact with the activated metal of the nuclear instrument well support. The licensee will request that the exposure report of the individual who lost his badge be amended to reflect the exposure received by the person with whom he worked.

j. Internal Exposure Review

10 CFR 20.1204 states that for purposes of assessing dose used to determine compliance with occupational dose equivalent limits, the licensee, when required to monitor internal exposure, shall take suitable and timely measurements of concentrations of radioactive materials in air, quantities of radionuclides in the body, quantities of radionuclides excreted from the body, or combinations of these measurements. When specific information on the behavior of the material in an individual is known that information may be used to calculate the Committed Effective Dose Equivalent (CEDE).

10 CFR 20.1502(b) requires each licensee to monitor the occupational intake of radioactive material by and assess the committed effective dose equivalent to:

(1) Adults likely to receive, in one year, an intake in excess of 10 percent of the applicable ALI in Table 1, Columns 1 and 2 of Appendix B to 10 CFR 20.1001-20.2401; and
2) Minors and declared pregnant women likely to receive, in one year, a committed effective dose equivalent in excess of 0.05 rem.

In discussing this portion of the regulation with UVA EHS representatives, they indicated that they had not had a problem with internal exposure. A bioassay program had been developed, however, and had been implemented for use with the university's broad license program. A bioassay and internal dosimetry program was also being developed for other radionuclides as well but had not been implemented as of the date of the inspection.

k. Calibration of Instruments

10 CFR 20.1501(b) requires the licensee to ensure that instruments and equipment used for quantitative radiation measurements are calibrated periodically for the radiation measured.

TS 6.3 requires radiation control procedures to be maintained and made available to all operations personnel.

Standard Operating Pro dure (SOP), Section 10, Radiation Protection Procedures, last revised in December 1993, requires in Part 10.6.A that portable radiation monitoring instruments required for reactor operations and surveys at the Facility shall be calibrated annually and operation checked quarterly by the Reactor Health Physicist (or HP Designee). It also requires that calibrations and quarterly operation checks be documented.

The inspector reviewed the calibration and quarterly operation check records of selected portable instruments used at the reactor facility. These records were maintained and the calibrations were performed by UVA EHS personnel or coordinated through the UVA EHS office. The inspector determined that the instruments were being calibrated at the required frequency and in accordance with approved procedures. In reviewing the quarterly operation check records, however, it was apparent that the checks were not performed or the records were not kept for one instrument, an Eberline ESP-1, Serial Number 2154. The records indicated that the instrument had only been operation checked once, on April 27, in 1992. No other indication was given that the instrument was checked or had been sent off for calibration during 1992. The records did indicate that the instrument had been calibrated April 22, 1992, and again on June 9, 1993.

When this problem was discussed with licensee representatives, they indicated that problems of a similar nature had been noted in other areas (i.e. tracking the completion of certain tasks). They also indicated that they would develop a computerized "tickler" system to track and ensure completion of such items when time permitted following completion of their analysis report on the conversion to LEU fuel and revision of their emergency procedures.

The licensee was informed that failure to perform the operation check of one of the portable radiation monitoring instruments on a quarterly basis was an apparent violation of TS 6.3 (50-62/94-04-01).

One violation was identified.

3. Environmental Monitoring (80745)

a. Environmental Reports

TS 6.6.2 requires a routine annual report to be submitted by March 31 of each year covering the activities of the reactor facility during the previous calendar year. Each report is required to include a summary of the nature and amount of radioactive gaseous, liquid and solid effluents released or discharged to the environs beyond the effective control of the

licensee as measured or calculated at or prior to the point of such release or discharge; environmental surveys performed outside the facility and exposures received by facility personnel and visitors; and a summary of radiation and contamination surveys performed within the facility.

The inspector verified that an annual report was prepared and issued by the licensee in accordance with applicable TS requirements. Details of the report are discussed below in subsequent sections of this paragraph.

b. Liquid Effluent Releases

(1) Liquid Releases at the Site Boundary

TS 3.4.2 requires that the activity of liquids released beyond the site boundary shall not exceed 10 CFR Part 20 limits.

The inspector reviewed the data concerning the releases made from the facility by the licensee. From January 1, 1993, through December 31, 1993, the licensee conducted 47 releases with an average radionuclide concentration of 6.3 E-9 microcuries per milliliter (uCi/ml). The total volume of liquid released was 1.28 E7 gallons. Total gross beta activity released during the year was 293 uCi, excluding tritium. Total tritium activity released was 4.327 millicuries (mCi) and the average tritium release concentration was 1.0 E-7 uCi/ml. These concentrations were within the limits specified in 10 CFR 20, Appendix B, Table 2, Column 2.

(2) Off-Site Air and Water Environmental Samples

TS 6.5.2 requires the licensee to retain records of off-site environmental monitoring surveys for the life of the facility.

TS 6.3 requires radiation control procedures to be maintained and made available to all operations personnel.

SOP 10.4.C, "Facility and Environmental Surveys", dated November 1970 (as revised), stipulates that samples of air and water shall be collected and analyzed on a monthly basis.

The inspector reviewed the analyses of monthly environmental water samples collected during 1993 and to date during 1994 at selected upstream and downstream locations relative to the UVAR facility release point. The analyses appeared

adequate and the average gross beta concentration measured at each location was less than the applicable effluent concentration limit of 3E-8 uCi/ml.

The inspector also reviewed licensee files that outlined a problem that had occurred during January 1994. During that month, the technician taking the air and water samples collected the appropriate water sample, analyzed the sample, but apparently did not record the results in the Health Physics log book. When he received the printout of the results of the analyses, he forwarded them to his supervisor for review. The printout of the results was subsequently lost and the sample results could not be located.

UVA EHS representatives became aware of the problem and initiated an investigation. It was determined that the technician performing this work should keep an extra copy of all the data and the results of the analyses obtained during collection and analysis of the samples. This would preclude the loss of data as had occurred in January.

The licensee was informed that failure to retain a record of the analysis of environmental water samples was an apparent violation of TS 6.5.2. However, this violation will not be subject to enforcement action because the licensee's efforts in identifying and correcting the violation meet the criteria specified in Section VII.B of the Enforcement Policy (50-62/94-04-02).

(3) Pond Water Releases

TS 6.3 requires radiation control procedures to be maintained and made available to all operations personnel.

SOP 10.5.B.2.c.1, "Reactor Facility Radioactive Waste Disposal/Sampling and Release of Pond Water", dated November 1970 (as revised), stipulates that samples of pond water shall be collected within two weeks prior to a planned release.

In reviewing the releases made from the pond during 1993 and to date during 1994, the inspector noted that, on various occasions, one set of sample analysis results had been used to calculate the concentration of radioactivity present in the water and make two or three releases. In referring to the procedure, it was noted that this was allowed as long as there were no changes in the pond and no discharges had been made directly from the reactor pool to the pond. The inspector noted that three releases had been made in May 1994 using the same set of sample analysis results for each. Upon examination of the forms, the inspector noted that the water samples had been collected on May 2, 1994 and the

samples were analyzed on May 3. The three releases had been made on May 5, May 10, and May 23. The last release occurred outside the two week window established by procedure. It was also noted that the RHP and the Reactor Administrator had reviewed and approved the releases.

When the licensee was made aware of this problem, they indicated that persons reviewing the release form looked more closely at the concentrations of the water to be released than at the date when the samples were taken. This had apparently lead to the oversight on the date and the release that had occurred without the samples required by procedure. Another problem had been that the individual who generally took the samples was terminating his employment at the facility and apparently was not concentrating on the details of the job as strictly as needed.

The licensee has since replaced the former individual with another full-time employee. The "new" person was reminded of the need for taking water samples within two weeks of a planned release and those reviewing the release forms were instructed to pay closer attention to the dates as well as the concentrations.

The licensee was informed that failure to collect the required water samples within two weeks of a planned release was a second apparent violation of TS 6.3 (50-62/94-04-01).

c. Airborne Effluent Releases

Gaseous effluent released during 1993 was approximately 3.8 curies (Ci) of argon-41 (Ar-41). For 1993, the licensee continued to rely on a calculated estimate of the maximum concentration of Ar-41 produced during normal operations. The inspector noted that the two monitors that licensee had purchased to be used to monitor for noble gases (specifically Ar-41) were not yet fully operational. One of the monitors has been installed in the UVAR room and the other has been installed to monitor the facility exhaust. When fully operational, the licensee's environmental monitoring program should be enhanced because these devices can directly measure the amount of Ar-41 that has been discharged to the atmosphere.

The inspector reviewed the analyses of monthly environmental air samples collected during 1993 at selected locations relative to the UVAR facility. The analyses appeared adequate and the average gross beta concentration measured at each location was less than the applicable MPC of 1E-11 uCi/ml.

One non-cited violation and a second example of a violation were identified.

4. Facility Safety/Protection Programs

a. Radiation Protection Program

10 CFR 20.1101(a) requires each licensee to develop, document, and implement a radiation protection program commensurate with the scope and extent of licensed activities and sufficient to ensure compliance with the provisions of Part 20.

The inspector reviewed the program which had been developed by the licensee. The program was briefly outlined in a document listing the licensee's organization for the reactor facility and the procedures and guide that were included in and made up the program. These included the UVAR SOP Section 10, Radiation Protection Procedures, and the University Radiation Safety Guide issued for use in all campus laboratories. The program appeared to be adequate and well documented.

In addition to this program, the licensee had assembled a Health Physics Suggested Method Manual consisting of two volumes. These volumes contained not only a copy of the Radiation Protection Program, a copy of the facility's ALARA Program, and a copy of the University of Virginia's Radiation Safety Guide, but also included the suggested methods to be used by the RHP and the HP technicians or reactor facility operators to perform various tasks. Guidance was given for such tasks as surveys, air and water sampling, sample analyses, and completing radioactive material shipments. The inspector noted that these volumes should be a valuable tool that would aid the HP technicians and operators in completing their assigned jobs.

b. ALARA Program

10 CFR 20.1101(b) requires that each licensee use, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as reasonably achievable (ALARA).

The inspector reviewed the ALARA program that the licensee had developed. The documentation of the program contained management's commitment to keep individual and collective doses as low as is reasonably achievable. The program also included a requirement for: 1) an annual review of the ALARA program, 2) a quarterly review of occupational radiation exposures, and 3) ensuring that all radiation workers received the proper training. The program outlined the involvement of the Reactor Safety Committee with ALARA goals and established investigational levels when exposures exceeded various administrative limits as well. The program appeared to be adequate and well documented.

c. Dose to the Embryo/Fetus

10 CFR 20.1208(a) requires that the dose to the embryo/fetus not exceed 500 mrem during the entire pregnancy due to occupational exposure of a declared pregnant woman.

The inspector reviewed the licensee's program to maintain the dose to the embryo/fetus low. This was to be done by using a form for a female to make a voluntary declaration of pregnancy. The form was still in draft at the time of the inspection. Review of the draft form indicated that the requirements outlined thereon were consistent 10 CFR Part 20 requirements and Regulatory Guide provisions. The licensee's form stipulated that declaration of pregnancy be provided in writing to Radiation Safety Office. With the declaration, the individual agreed to abide by the lower dose limits for protection of the embryo/fetus including: (1) limiting the dose during the entire pregnancy to 500 mrem, and (2) attempting to maintain a uniform exposure rate during each month of pregnancy. Further, any declared pregnant woman could withdraw the voluntary declaration at any time and for any reason prior to the termination of the pregnancy. The licensee's declared pregnant female policy appeared to be adequate to limit the dose to the embryo/fetus.

No violations or deviations were identified.

5. Transportation of Radioactive Material (86740)

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 10 CFR Parts 170 through 189.

The inspector reviewed the shipping paperwork and records for selected radioactive material shipments made since the last inspection. All shipment records were completed as required and the records were being maintained as required as well.

No violations or deviations were identified.

6. Licensee Event Followup (92700)

During August 1993, the licensee became aware that the facility had apparently developed a leak from the reactor pool. The magnitude of the leak was estimated at about 100 gallons per day as determined by pool level decrease. Upon further investigation of the problem, the licensee found that a small amount of the water appeared to be flowing out of a small crack in the biological shield in the ground floor reactor face area. This water flow, however, only accounted for a few gallons a day. The majority of the water was apparently leaking around penetrations in the pool wall and running beneath the facility and into an adjacent retention pond. (The retention pond is routinely sampled before any

releases are made.) On November 5, 1993, the licensee shutdown the reactor and notified the NRC and their Reactor Safety Committee (RSC) of this problem.

As a result of this leak, the licensee initiated a program of sampling the stream water below the pond and sampling the pond water for tritium. (The reactor pool water is routinely sampled for tritium.) The results of the analyses of water samples taken from the reactor pool and the retention pond indicated that the radioactivity levels were well below 10 CFR Part 20 limits for release to restricted and unrestricted areas respectively.

The licensee then contacted a contractor who specialized in repairing such breeches in concrete. The contractor attempted to repair the leak by drilling holes in the concrete near the leak area and injecting a water-activated fluid that expands to become a closed cell foam. Efforts by the contractor, Furmanite, to repair the leak during November and December were partially successful and the water loss rate dropped to around 30-50 gallons per day but the leak did not stop completely and eventually was measured at the original rate of approximately 100 gallons per day.

Due to the nature of the problem, the NRC sent the licensee a letter on November 10, 1993, requesting increased emphasis on sampling to monitor levels of radioactivity in both the pool and pond water. The letter also requested increased surveillance to note pool water level and a search for the cause of the leakage. The licensee agreed to collect water samples from the reactor pool and the retention pond on a daily basis and analyze those samples for gamma activity. Every third day, the licensee also agreed to analyze the water samples for tritium and gross beta activity as well.

On December 9, after conferring and receiving approval from their RSC and the NRC, the licensee restarted the reactor. The licensee then completed the irradiation work that they had scheduled and shutdown the reactor on December 24. They subsequently made plans to keep it shutdown until the leak was repaired.

During the week of January 17-21, 1994, the licensee used an underwater video camera in an attempt to isolate the location of the leak in the pool but without success. The licensee tried to use hydrophones to locate the leak but again were unsuccessful. They tried reducing the ambient noise level by turning off excess equipment and the demineralization system but that did not help. While the demineralization system was shutdown however, they noticed a decrease in the loss rate from about 100 gallons per day to about 30 gallons per day. The demineralization system was kept down for a period of several days so that the licensee could get accurate data on loss rate. They expected that the loss rate to go back up when they turned the demineralization system back on but it did not. (The licensee now believes that some of the un-reacted (Furmanite) grouting may have finally reacted and sealed the remaining escape path that was causing the leak.)

In late March, the licensee reported that the pool leak had dropped to approximately 10 gallons per day (when the containment is closed such as on weekends) and that this is the normal expected loss rate due to evaporation. The licensee considers the leak to have stopped.

On January 11, 1994, the licensee received 33 drums of LEU fuel. The new LEU Tech Specs were placed into effect and the licensee began efforts to ship the HEU fuel off-site.

No violations or deviations were identified.

7. Exit Interview

The inspection scope and results were summarized on June 3, 1993, with those persons indicated in Paragraph 1. The inspector described the areas inspected and discussed in detail the inspection findings, including the two non-cited violations outlined below. The staffing level appeared to be adequate to conduct the radiation protection program at the facility. The radiation exposures to individuals were maintained well within the facility administrative levels and the federal regulatory limits. No problems were noted with shipments of radioactive materials from the facility.

The licensee did not identify as proprietary any of the material provided to or reviewed by the inspector.

Item Number	Description and Discussion
50-62/94-04-01	VIO - Failure to comply with the requirements of TS 6.3 by not performing a quarterly operation check of a portable survey instrument and not collecting the required water samples within two weeks of a planned release (Paragraphs 2.k and 3.b(3)).
50-62/94-04-02	NCV - Failure to adhere to TS 6.5.2 requirements for retaining a record of the analysis of environmental water samples for the life of the facility (Paragraph 3.b(2)).