

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 50-27/85-01
Docket No. 50-27 License No. R-76
Licensee: Washington State University
Research Reactor, Nuclear Radiation Center
Pullman, Washington 99163
Facility Name: Research Reactor, Nuclear Radiation Center
Inspection at: Pullman, Washington
Inspection conducted: July 15-17, 1985 and telephone discussions
of July 24-25, 1985

Inspector: M. Cillis 8/21/85
M. Cillis, Radiation Specialist Date Signed

Approved By: G. P. Yumas 8/21/85
G. P. Yumas, Chief, Facilities Radiological Date Signed
Protection Section

Summary:

Inspection on July 15-17, 1985 and telephone discussions on July 24-25, 1985
(Report No. 50-27/85-01)

Areas Inspected: Routine unannounced inspection by a regionally based inspector of facility operations, radiation protection program, environmental monitoring program, emergency preparedness program, review and audits, standard operating procedures, training, surveys, operating logs and records, transportation activities, reactor operator and senior reactor operator requalification program, surveillances, experiments, organization, Information Notices (INs), enforcement followup items, and a tour of the facility. During this inspection, Inspection Procedures 40750, 42745, 61745, 69745, 82745, 83743, 86740, 92702 and 92717 were performed. The inspection involved 19 hours of onsite time by one inspector.

Results: Of the sixteen areas inspected, three apparent violations were identified: failure to maintain records associated with the replacement of the reactor's ventilation system filters (paragraph 3(d)); failure to implement the NRC approved operator requalification program for Senior Reactor Operators (paragraph 4); and failure of the Radiation Safeguards Committee to perform required procedure reviews (paragraph 5).

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DETAILS

1. Persons Contacted

a. Washington State University

R. Srinivasan, Radiation Safety Officer (RSO)

*R. Filby, Director, Nuclear Radiation Center

*W. Wilson, Associate Director, Nuclear Radiation Center

*J. Neidiger, Reactor Supervisor

Cpl. R. K. Stephens, Campus Security

J. Shephard, Chairman, Reactor Safeguards Committee (RSC)

b. Puget Sound Naval Shipyard

D. Rosenberg, Shift Test Engineer

Mr. Rosenberg was contacted by telephone on July 25, 1985.

*Denotes those individuals attending the exit interview.

2. Organization

The organization of the reactor facility is essential as indicated on Figure 6.1, "Facility Organization" of the Technical Specifications. The reactor operating staff has decreased since the previous inspection. The current staff consists of two Senior Reactor Operators (SROs). This represents a decrease of two individuals who held Reactor Operators (ROs) licenses. The licensee is in the process of trying to fill one of the vacated ROs positions.

The normal health physics functions associated with reactor operations is accomplished by the reactor operating staff. The normal health physics functions accomplished by this group include the following:

- a. Routine radiation, contamination, and air sampling surveys.
- b. Environmental Monitoring
- c. Water Sampling Analysis.
- d. Portable and fixed radiation detection system calibrations.
- e. Transportation of irradiated samples.
- f. 10 CFR Part 19.12, "Instruction to Workers" training.
- g. Implementation of the reactors emergency plan.
- h. Calibration of the instrumentation required to perform (a) and (b) above.
- i. Special radiation and contamination surveys associated the handling and transfer of irradiated samples.

The inspector noted that the campus Radiation Safety Office staff is very seldom called upon to provide assistance with the health physics functions that are associated with reactor operations.

The inspector noted that the WSU Hazards Summary Report of May 1960 identified that health physics functions were performed by the Radiation Safety Office. However, NUREG-0911, Safety Evaluation Report of May 1982 states that the health physics functions are primarily performed by the reactor operating staff.

No violations or deviations were identified.

3. Reactor Operations

a. Logs and Records

Selective logs and records pertaining to plant operations since the previous inspection were reviewed and discussed with the facility staff. The following records were reviewed:

- Reactor Log
- Maintenance Log
- Reactor Startup Checkoff
- Irradiation Data Log
- Power Calibration Log
- Control Element Worth Log
- Core Change Logs
- Scram Summary
- Annual Reports for the period of July 1982 through June 1984
- Experiment Folder
- Health Physics Survey Records
- Operator Requalification Records
- Preventative Maintenance Check Lists
- Technical Specification Surveillance Records

The examination disclosed that limits related to plant operations such as the shutdown margin, excess reactivity, and individual and total rod worth of experiments were not exceeded.

Additional discussions related to the results of the above review are provided in other paragraphs of this report.

Changes to the facility since the previous inspection were as described in the licensee's annual report of July 1983 through June 1984. The changes were evaluated by the licensee's staff in accordance with the criteria prescribed in 10 CFR Part 50.59, "Changes Tests and Experiments."

b. Procedures

TS Section 6.8, "Operating Procedures" requires that operating procedures shall be adequate to ensure the safety of operation of the reactor. Section 6.8 also identifies the specific types of procedures that be in effect for reactor operations.

The following standard operating procedures (SOPs) were reviewed:

- ° SOP-1 Standard Procedure for Use of the Reactor
- ° SOP-4 Standard Procedure for Startup, Operation, and Shutdown of the Reactor
- ° SOP-5 Standard Procedure for Performing Preventive Maintenance on the Reactor and Associated Equipment
- ° SOP-10 Standard Procedure for Health Physics Surveys
- ° SOP-11 Standard Procedure for Analysis of Hold-up Tank Samples
- ° SOP-13 Standard Procedure for Performing Power Calibrations
- ° SOP-16 Standard Procedure for Control Element Calibration
- ° SOP-17 Standard Procedure for Checkout and Calibration of the Area Radiation Monitors, Continuous Air Monitor and Stack Gas Monitor
- ° SOP-18 Standard Procedure for A41 Monitor Calibration
- ° SOP-21 Standard Procedure for Environmental Monitoring
- ° SOP-22 Standard Procedure for T.L.D. Monitoring Program
- ° SOP-23 Standard Procedure for Portable Survey Instrumentation Calibration
- ° SOP-24 Standard Procedure for Pool Water Analysis

Additionally, a walk through of procedure SOP-4 was directly witnessed by the NRC inspector during the inspection.

The procedures were checked for proper revision, approvals, and use by the operators.

The following observations were made:

- (1) Discussions related to the inadequacies with procedure SOP-5 are described in paragraph 4.
- (2) Failure to perform RSC procedure reviews, see paragraph 3.
- (3) Failure to follow procedures and/or implement procedures; for example, the licensee had not implemented a portion of SOP-21, which was modified in 1982 to require the reactor pool water be sampled and analyzed on a monthly basis; SOP-11 requires that Hold-up Tank Sample volumes of 1000 milliliters (mls) be used for performing the pre-discharge analyses. The inspector noted volumes of 4.5 and 20 mls were used.

The above observations were brought to the licensee's attention at the exit interview.

No violations or deviations were identified.

c. Surveillances

The inspector selected surveillance procedures and records of completed surveillances to verify adequacy and conformance with Technical Specifications, Section 4.0, "Surveillance Requirements". The TS related parameters reviewed were: pulse reactivity, control and safety rod drop times and inspections, pulse rod drop time, excess reactivity, control and safety rod worth calibrations, power level calibrations, and primary coolant parameters.

No violations or deviations were identified.

d. Experiments

The licensee's reactor experiment program has remained essentially unchanged since the previous inspection. No new or special experiments had been performed since the previous inspection. Selected records were examined and were found to be consistent with approved experiment procedures by cognizant licensee personnel.

No violations or deviations were identified.

e. Reactor Ventilation System

Technical Specifications, Section(s) 4.0, "Surveillance Requirements" and 4.1 "General" identifies that the reactors ventilation system is a reactor safety-related system. Section 4.1 requires modifications or maintenance to the ventilation system be made and tested in accordance with the specifications to which the system was originally designed or fabricated or to the specifications approved by the RSC.

Technical Specification, Section 4.3.4, "Ventilation System" states in part: "...the absolute filter shall be changed at least every two years and whenever the pressure drop..."

Technical Specification, Section 6.8, "Operating Procedures" states in part: "...operating procedures shall be in effect for the following items:...(6) performing preventative maintenance and calibration tests on the reactor and associated equipment."

Additionally, TS 6.9, "Facility Operating Records" requires that records and logs for equipment and component surveillance activities required by the TS be retained for a period of five years.

A review of applicable records, logs, and procedures related to the above requirements was conducted. Additionally, discussions related to this matter were held with the licensee's staff.

The review and discussions revealed:

- ° Preventative maintenance procedure, SOP-5, does not provide instructions, requirements, and controls necessary for assuring the absolute filters are changed in a controlled manner every two years in accordance with Section 4.1 and Section 4.3.4 of the TS.
- ° The reactor's maintenance logs or operating logs do not indicate when the filters were last changed.
- ° The campus maintenance office stated that their computer printout data indicated that the filters were scheduled to be changed sometime during the fourth quarter of 1984. Whether they were changed and the exact date of the changeout was unknown by the TRIGA reactor operations staff. The inspection also disclosed that records were not available to indicate when the filters were changed in prior years (e.g., 1982, 1983 etc.); however, the licensee's staff indicated that filters are normally changed on an annual basis.
- ° The licensee staff were not aware if health physics surveillance was provided during the changeout of the filters. No survey (radiation or contamination) records of any filter changeout at the reactor facility were available in the licensee's files.

The above observations were brought to the licensee's attention during the exit interview. The licensee was informed that their maintenance procedure and current policies related to this matter appeared to be inadequate (50-27/85-01-04).

Additionally, the licensee was informed that failure to maintain logs and records for equipment and component surveillance activities was considered to be a violation (50-27/85-01-01).

f. Radiation Monitoring Systems

1. General

Technical Specifications, Section 3.7, "Radiation Monitoring System" states that the reactor shall not be operated unless two area radiation monitors (ARMs), one continuous air monitor (CAM), and one exhaust gas monitor are operable. TS, Section 3.8, "Argon-41 Discharge Limit" prescribes the concentration limits of Argon-41 that may be discharge from the reactor facility. The purpose for these monitoring systems are described in TS, Section 5.4, "Radiation Monitoring System." TS, Section 3.12, "As Low As Reasonable Achievable (ALARA) Radioactive Effluent Releases" prescribes the measures required for ensuring airborne releases are in accordance with the ALARA system. Section 3.8 states that concentrations of Argon-41, after dilution, shall not exceed 4×10^{-8} microCuries per milliliter (mCi/ml) and Section 3.12 states that the annual

discharge of Argon-41 to the environment shall not exceed 20 Curies (Ci) per year. TS Section 4.3.3, "Radiation Monitoring System" prescribes the surveillance requirements for the ARM equipment and continuous air monitoring system. Section 4.3.3 states that the equipment shall be verified to be operable at monthly intervals and shall be calibrated annually. It should be noted that Section 3.12 requires that the facility liquid effluents released shall not exceed one Curie per year.

Records related to the above requirements, were examined during the inspection.

No violations or deviations were identified.

2. Calibration and Functional Tests

The examination disclosed that the functional tests and calibrations of the ARMs, CAM, and the exhaust gas monitor were performed at the frequencies specified in the TS.

no violations or deviations were identified.

3. Particulate Airborne Concentrations

The examination disclosed that particulate airborne activity levels ranged from 2×10^{-13} uCi/ml to 4×10^{-14} uCi/ml.

No violations or deviations were identified.

4. Argon-41 Releases

The examination disclosed that the amount of Argon-41 released was a small fraction of 10 CFR Part 20.106, "Radioactivity in effluents to unrestricted areas" limits. The releases were consistent with the values provide in the licensee's annual reports.

No violations or deviations were identified.

e. Liquid Releases

A review of the licensee's liquid release records for the period of July 1982 through June 1984 was conducted. The review disclosed that twelve releases were made during the period. The releases were a small fraction of 10 CFR Part 20.106 and TS limits.

No violations or deviations were identified.

4. Reactor Operators Regualification Program

Discussions were held with the licensee's staff and records related to reactor operators regualification program, including periodic and annual examinations, were examined to verify the program was being implemented in accordance with the program approved by the NRC on August 20, 1974.

The program is designed to meet the requirements set forth in 10 CFR Part 50.54(i-1), "Conditions of License" and 10 CFR Part 55, Appendix A, "Requalification Programs for Licensed Operators of Production and Utilization Facilities."

The examination disclosed that the licensee's reactor operating staff consists of two Senior Reactor Operators (SROs). One of the SRO's is the Associate Director while the other SRO is the Reactor Supervisor. The Associate Director is responsible for implementing the qualification program. He is exempted from taking the annual written examinations that have routinely been administered to the other SRO's and Reactor Operators (ROs).

The licensee's approved reactor staff requalification program states in part:

"2. Quarterly Operation Requirements

Each licensed reactor operator and senior operator must actively participate in the operation of the facility in order to remain qualified. The minimum quarterly operation required is listed below.

- a. Reactor Operators (personally perform)
 - i. One complete reactor checkout and startup
 - ii. One pulse
 - iii. Ten hours of reactor operation time
- b. Senior Operator (directly supervise or personally perform)
 - i. One complete reactor checkout and startup
 - ii. One pulse
 - iii. Twenty hours of reactor operation time
- c. Each individual who fails to perform the above minimum reactor operation in any one calendar quarter shall be considered to be unqualified to perform his license duties. In order to be requalified an individual must be administered the equivalent of a practical reactor operator's exam...

4. Training Records

A training record file shall be maintained which shall indicate the performance of each licensed individual in the requalification program. This record shall contain at least the following information:

a...

b...

- c. Extent of reactor operations engaged in during each quarter."

The inspection disclosed:

Records related to the extent of reactor operations the Associate Director actually witnessed as part of maintaining his RSO qualifications were not maintained. A review of reactor operations records, logs and discussions with the licensee's staff and reactor operator previously employed at WSU revealed that the Associate Director manipulated the controls of reactor only for brief periods (e.g., breaks, head calls). He has not manipulated the controls by performing an actual startup or shutdown during the past two years. Additionally, the Associate Director stated his prime responsibilities were purely of an administrative nature and has interpreted that he could maintain his qualifications current by performing the direct supervisory functions specified in the qualification program from his office. The reactor controls cannot be seen from his office. The Associate Director's records were not maintained in a manner that can be used for verifying that he personally performed and/or directly supervised the activities described in the approved qualification program for SROs.

The involved SRO stated that he more than likely spent greater than twenty hours per quarter providing direct supervision of normal reactor operations. The SRO added that he could not prove it because he failed to maintain adequate records.

The above observations were brought to the licensee's attention at the exit interview. The inspector was informed that a method will be developed for verifying that the Associate Directors' RSO license is maintained in accordance with the NRC's approved requalification program.

The inspector informed the licensee that failure to maintain appropriate qualification records was an apparent violation (50-27/85-01-02).

5. Review and Audit Function

The licensee's review and audit program prescribed in Technical Specifications, Section 6.5, "Reactor Safeguards Committee (RSC)" was examined. Discussions with the licensee management and a review of the RSC quarterly meeting minutes and audit reports were conducted. The RSCs written charter required pursuant to Section 6.5.3, "Operations" of the TS was also reviewed.

RSC meeting records and audit reports for the period between January 1982 and July 1985 were reviewed.

The inspection indicated that the RSC meetings, review and audit functions of the TRIGA reactor activities were accomplished at a frequency that is consistent with the TS. The inspector noted that the Campus Radiation Safety Officers talents were not being utilized by the RSC to perform audit and review functions of the TRIGA reactors radiological safety program. This observation was brought to the attention of the RSC Chairman and was discussed at the exit meeting.

Technical Specifications, Section 6.5.4 requires:

"...(8) biennial review of all standard procedures, the facility emergency plan,...". The examination disclosed that the latest biennial review of standard procedures was last accomplished in January 1983. The inspector noted that the RSCs charter failed to identify the need for performing the biennial review of all standard procedures as required by the TS.

The licensee was informed of the above observation and that failure to accomplished the biennial review of standard operating procedures was considered to be a violation (50-27/85-01-03).

6. Annual Report

The inspector verified the data provided in the licensee's annual reports for the period June 1982 through June 1984.

No violations or deviations were identified.

7. Emergency Preparedness

The licensee's capabilities for responding to emergencies as described in their Emergency Plan of September 1983 and for demonstrating compliance with 10 CFR 50.54(q) and Appendix E of 10 CFR Part 50 was examined. 10 CFR 50.54(q) states, "...A licensee authorized to possess and/or operate a research reactor or fuel facility shall follow and maintain in effect emergency plans which meet the requirements in Appendix E of this part." A letter, dated July 10, 1984, from C. O. Thomas of the NRC to the licensee identified that time to implement the plan had been extended from June 11, 1984 until January 1, 1985. On May 21, 1985, the licensee informed the NRC that the emergency plan for the TRIGA reactor was implemented on January 1, 1985, pursuant to the stipulations provided NRC letters dated June 11, 1984 and July 10, 1984. It should be noted that the June 11, 1984 letter required that full implementation of the plan be accomplished within 120 days from the NRCs approval date of the plan, e.g., 120 days from January 1, 1985. The examination considered the above criteria for the purpose of determining if the plan had been implemented. Discussions related to this topic were held with the TRIGA reactor staff, Campus Radiation Safety Officer, RSC Chairman, and the Campus security staff.

Emergency plan procedures identified in the licensee's May 21, 1985 letter were also reviewed.

The examination disclosed that the licensee had not fully implemented the plan in that the Campus Police, Fire Department, Ambulance Service, and all of the Memorial Hospital emergency room personnel had not been trained in radiation safety and the Nuclear Radiation Center's emergency procedures as stated in Section 10.1 of the plan.

The examination also disclosed that initial training of the Radiation Safety Office and Nuclear Radiation Center staffs was accomplished on

November 21, 1984. The examination revealed that the annual drills specified in Section 10.2 had not been conducted in 1984 or 1985.

Discussions with the licensee revealed that the licensee's staff interpreted full implementation to mean one year from the NRC's January 1, 1985 approval date of the plan.

The inspector informed the licensee that training of the facility staff, ambulance service personnel, campus police and fire department personnel, and the hospital emergency room personnel should be accomplished before the end of 1985. The inspector added that any other commitments identified in the emergency plan should be accomplished at their prescribed frequencies. This matter will be examined during a subsequent inspection (50-27/85-01-04).

No violations or deviations were identified.

8. Radiation Protection Program

a. Surveys

The licensee's health physics monitoring (surveys) program associated with reactor operations was examined.

Direct radiation measurement, contamination, and airborne survey records for the period January 1983 through June 1985 were reviewed.

The examination disclosed that all of the routine health physics monitoring of reactor operations is conducted by the reactor operating staff.

Additionally, the examination disclosed that the radiation and contamination levels, and airborne concentration levels were consistent with the levels identified in the licensee's annual reports.

In conversations with the licensee's staff the inspector described specific areas for improvement. The inspector was informed that the licensee's staff would evaluate the inspector's observations for the purpose of improving their health physics monitoring program.

The licensee's health physics monitoring program appeared to be consistent with 10 CFR Part 20.201, "Surveys" and 10 CFR Part 20.401, "Records of Surveys, Radiation Monitoring, and Disposal."

No violations or deviations were identified.

b. Solid Waste

Solid radioactive wastes generated at the facility are kept to a minimum. Radioactive solid wastes are transferred to the University's State of Washington licensee for disposal through the campus Radiation Safety Office. Approximately 15 milliCuries of

radioactivity in 23 cubic feet of waste was packaged in 55 gallon drums over a two year period.

No violations or deviations were identified.

c. Posting and Labeling

The inspector verified that the licensee's posting and labeling practices were consistent with 10 CFR Part 19.11, "Posting of Notices to Workers" and 10 CFR 20.203, "Caution Signs, Labels, Signals and Controls.

No violations or deviations were identified.

d. Personnel Monitoring

The inspector verified that the licensee's personnel monitoring program is consistent with 10 CFR Part 20.101, "Radiation Dose Standards in Restricted Areas," 10 CFR Part 20.103, "Exposures of Individuals...in Air In Restricted Areas," 10 CFR Part 20.104, "Exposures of Minors", and 10 CFR Part 20.1, "Purpose" (e.g., ALARA).

An examination of personnel monitoring records for 1983, 1984, and 1985, to date, was conducted. No exposures above the regulatory limits were noted.

The inspector noted that the licensee does not test or calibrate pocket ionization chambers (PICs) as is recommended by Regulatory Guide-8.4, "Direct-Reading and Indirect-Reading Pocket Dosimeters." This observation was brought to the licensee's attention during the exit interview. The licensee stated that a calibration program would be considered.

No violations or deviations were identified.

e. Training

The licensee's training program for assuring compliance with 10 CFR Parts 19.12, "Instructions to Workers" was examined. Training lesson plans, written examinations and training attendance records were reviewed as part of the examination.

The examination disclosed the required training is provided in part by the TRIGA reactor staff and campus Radiation Safety Officer.

The inspector concluded that the licensee's training program for non-licensed personnel is consistent with the regulatory requirements.

No violations or deviations were identified.

f. Transportation Activities

The licensee transfers possessions of any material to be shipped to the University's State of Washington by-product materials license prior to shipments. All such shipments from the reactor facility are accomplished under the cognizance of the TRIGA reactors' operating staff.

No violations or deviations were identified.

9. Environmental Monitoring Program

The licensee's environmental monitoring program was examined and was found to be consistent the data provided in the licensee's annual reports for the period of June 1982 through June 1984.

The licensee's environmental monitoring program uses an array of thermoluminescent (TLDs) dosimeters at locations in and around the reactor building facility. The inspector noted that reactor pool water sampling and analysis required in the licensee's Standard Operating Procedure (SOP) 21, "Standard Procedure for Environmental Monitoring" has not been accomplished for the period between January 1983 and June 1985. This observation was brought to the licensee's attention at the exit interview.

The results obtained from the licensee's TLD environmental monitoring program was reviewed during the inspection. The values observed indicate that there is no significant effect on the environs as a result of reactor operations.

No violations or deviations were identified.

10. Licensee Action on Previous Inspection Findings

a. Enforcement Item

(Closed) (50-27/83-01-01). This item identified that the licensee failed to calibrate the reactors constant air monitor for activity and volumetric flows. The licensee's corrective actions with respect to this item were examined and found to be satisfactory. This matter is closed (50-27/83-01-01).

b. Followup Items

(Closed) (50-27/83-01-02). This item concerned the licensee's program for assessing non-penetrating exposures to the extremities. A review of the licensee's actions with respect to this item disclosed that the licensee has incorporated the use of extremity monitoring (e.g., finger rings) into their personnel monitoring program. This matter is considered closed (50-27/83-01-02).

No violations or deviations were identified.

11. Licensee Evaluations of Information Notices

The inspector verified that the licensee had developed an acceptable method for evaluating Information Notices.

No violations or deviations were identified.

12. Exit Interview

The inspector met with the licensee's representatives (denoted in paragraph 1) at the conclusion of the inspection on July 17, 1985. The inspector summarized the scope and findings of the inspection. The licensee was informed of the violations described in paragraphs 3(d), 4, 5, and 7.