

U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No: 50-027

License No: R-76

Report No: 50-027/98-201

Licensee: Washington State University

Facility: Washington State University
TRIGA Reactor

Location: Nuclear Radiation Center
Roundtop Dr.
Pullman, Washington 99164

Dates: September 8-10, 1998

Inspector: Stephen W. Holmes, Reactor Inspector

Approved by: Seymour H. Weiss, Director
Non-Power Reactors and Decommissioning
Project Directorate

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EXECUTIVE SUMMARY

This routine, announced inspection consisted of the review of selected conditions and records since the last inspection, verification of corrective actions previously committed to by the licensee, review of licensee reported items, and related discussions with licensee personnel. The inspection was conducted in accordance with the guidance of NRC Inspection Manual.

The reactor was being maintained and operated as required by the license and applicable regulations. Technical Specification required tests and surveillances were being done as required. As previously reported by the reactor director, minor pool leaks were being contained and sealing of the tank walls was being accomplished. Past deferred maintenance was being done and evaluation of reactor system maintenance needs was ongoing. The licensee plans to enhance reactor pool and waste water analyses. One non-cited violation was noted for failure to provide the 1997 annual training to university police as required by the NRC approved security plan. One inspector follow-up item regarding the calibration of the liquid scintillation counter was closed.

Report Details

Summary of Plant Status

The reactor was being operated daily in support of research and training programs and for production of isotopes for outside contracts. Reactor tank wall leaks were being sealed. BNCT facility work activities were continuing.

I. Operations

01 Conduct of Operations

01.1 Reactor Staffing

a. Inspection Scope (Inspection Procedure 69001)

The inspector reviewed reactor staff qualifications, operations logs and records, selected events, and interviewed staff.

b. Observations and Findings

Since the last inspection, licensed staff consisted of the Director, Nuclear Radiation Center (DIR), the Reactor Supervisor (RS), and two or three Reactor Operators and Senior Reactor Operators. The reactor staff satisfied the training and experience required by the Technical Specifications (TS). Operation logs and records confirmed that shift staffing met the minimum requirements for duty and on-call personnel for day and evening shifts.

c. Conclusions

The operations staffing of the research reactor satisfied TS requirements.

01.2 Control and Performance of Experiments

a. Inspection Scope (Inspection Procedure 69001)

The inspector reviewed approved experiment records, reactor logs, experimental data, Reactor Safeguards Committee (RSC) minutes and interviewed staff.

b. Observations and Findings

Experiments and changes to approved experiments had been reviewed and approved as required by TS.

Review of the experiment data in the reactor log, interviews with staff, observation of experimental set-up and review of the RSC experiment approvals verified that experiments were constrained as required by the TS and experiment authorization, and were installed, conducted, and removed as outlined in the experiment authorization and licensee's procedures.

The inspector observed selected aspects for an experiment on the production of Ir¹⁹². The irradiation process was well controlled with transfer shields and other handling apparatus being used to keep exposures ALARA.

c. Conclusions

Control and performance of experiments met TS and licensee requirements.

01.3 Reactor Operations and Fuel Handling

a. Inspection Scope (Inspection Procedure 69001)

The inspector interviewed staff, reviewed reactor operations and fuel logs, and periodic checkout, start-up and shutdown checklists. The inspector observed full power operations.

b. Observations and Findings

Reactor operations were implemented in accordance with written procedures and TS. Information on operational status was recorded in log books and checklists as required by procedures and TS. Use of maintenance and repair logs complied with procedures and satisfied regulatory and licensee requirements. Shift turnover control and transfer of reactor status information was acceptable.

Fuel movement and handling was infrequent. Data recorded for the one fuel movement since the last inspection was acceptable. Fuel movement, inspection, log keeping, and recording followed the facility's procedures and satisfied TS requirements.

c. Conclusions

Reactor operations and shift turn-overs conformed to TS and licensee procedural requirements. Fuel handling, record maintenance, and documentation were accomplished as required by TS and licensee procedures. No safety concerns were identified.

03 Operations Procedures and Documentation

a. Inspection Scope (Inspection Procedure 69001)

The inspector reviewed operating procedures and updates, reactor operating records and logs, and RSC minutes.

b. Observations and Findings

Written procedures required by the TS were available and used by the staff. Implementation of and adherence to the procedures was acceptable. No procedure changes, other than those for new experiments, had been made since the last inspection.

Records of power level, operating periods, unusual events, calibration and maintenance procedures, installed experiments, and start-up and shutdown checks were being kept.

c. Conclusions

Facility procedures satisfied TS requirements. Reactor operating records and logs were being maintained as required by TS.

05 Operator Training and Qualification Program

a. Inspection Scope (Inspection Procedure 69001)

The inspector reviewed requalification program records, NRC licenses, training records and interviewed staff.

b. Observations and Findings

Currently licensed operators were successfully completing reactivity manipulations, and participating in the ongoing training as required by the NRC-approved requalification plan. Review of records showed that performance and competence evaluations of the operators had been given as required. Past test questions covered the material prescribed by the program and demonstrated technical depth. Required quarterly operation hours were being tracked. Biennial medical exams had been performed as required.

c. Conclusions

The requalification program was being acceptably implemented. TS and NRC-approved requalification plan requirements were met.

06 Organization and Administration

a. Inspection Scope (Inspection Procedure 69001)

The inspector reviewed organization, staffing and administrative controls and interviewed management and staff.

b. Observations and Findings

A new Vice Provost for Research had been appointed since the last inspection. However this did not entail any functional change in the management organization or administrative controls required by TS.

c. Conclusions

Organizational and administrative controls remain consistent with TS and license requirements and commitments.

07 Quality Assurance in Operations

a. Inspection Scope (Inspection Procedure 69001)

The inspector reviewed RSC minutes, annual reviews, audits, and interviewed staff.

b. Observations and Findings

The meeting schedule and membership satisfied TS requirements and the committee's procedural rules. Review of the minutes confirmed that the RSC provided guidance, direction and oversight, and ensured suitable use of the reactor. The minutes provided a record of the safety oversight of reactor operations.

The inspector reviewed the new experiment approval for the Ir¹⁹² production and the approvals for the removal of the thermal column lead shielding and graphite blocks. The RSC approvals of these activities were detailed, met TS constraints, and implemented ALARA principles.

c. Conclusions

The RSC performed its duties as required by license, TS, and administrative criteria.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Surveillances and Limiting Conditions for Operation

a. Inspection Scope (Inspection Procedure 69001)

The inspector reviewed selected surveillance records, data sheets and records of tests, licensee procedures, reactor logs, checklists, periodic reports, and interviewed staff.

b. Observations and Findings

Daily and other periodic checks, tests, and verifications for TS required limiting conditions for operations (LCO) were completed as required. All surveillance and LCO verifications were completed on schedule as required by TS and licensee procedures. All were within prescribed TS and procedure parameters.

The TS surveillance for periodic pool water analyses is to detect leaking of the sealed cobalt-60 sources stored in the reactor pool. Although the licensee is only required to measure cobalt-60, they review all energy peaks identified to evaluate contamination levels in the pool water. To enhance their program the licensee had ordered a new mixed gamma calibration source for liquid analyses and stated they were periodically going to perform an alpha/beta boil-down count on future pool water samples.

c. Conclusions

The licensee's program for surveillance and LCO confirmations satisfied TS requirements.

M2 Maintenance and Material Condition of Facilities and Equipment

M1.1 General Facility Maintenance and Repair

a. Inspection Scope (Inspection Procedure 69001)

The inspector reviewed maintenance and reactor logs, RSC minutes, repair records, and observed facility and equipment during an accompanied tour.

b. Observations and Findings

Reactor maintenance was noted in a maintenance log and the reactor logbook as required by procedures. Routine/preventative maintenance was adequately controlled and documented. Unscheduled maintenance was routinely evaluated by use of a checklist to verify that it did not constitute a change or if it did that it posed no unreviewed safety question and was approved under 50.59 criteria.

c. Conclusions

Maintenance logs, records, performance, and 50.59 reviews satisfied TS and procedure requirements.

M2.2 Reactor Pool

a. Inspection Scope (Inspection Procedure 69001)

The inspector reviewed maintenance and reactor logs, RSC minutes, repair records, observed facility and equipment during an accompanied tour and met with university engineering, radiological, and reactor staffs.

b. Observations and Findings

As reported to the NRC by the DIR, after an overnight cool-down of the pool water from 55°C to 35°C pool leaks increased in number and rate of loss. The leaks were controlled such that the water was channeled into the facility waste holding tanks. Additionally, the volume was well within the capacity of the make-up demineralizer resins resulting in no change in pool water level. The contracted repairs for the leaks were ongoing during the inspection.

The university had their Facilities Development (FD) section evaluate the pool integrity and recommend corrective actions. Personnel involved included professional Civil and Structural engineers, a Building Construction Specialist, project managers including the Boron/Neutron Capture Therapy experiment manager, the FD Acting Assistant Director, and pertinent reactor and radiation safety staffs.

In discussing with the inspector the licensee representatives outlined their evaluation of the pool and their strategy for repairing the present leaks and preventing future leaks. The reactor pool, consisting of high and regular densities reinforced concrete, was structurally sound. The leaks were normally at penetrations in the tank wall, such as water lines, electrical conduits, experimental beam tubes, concrete pour interfaces, etc. The waterproof pool lining, which was past its useful life expectancy, was bubbling and degraded. Although they would continue to seal the leaks on the outside of the tank, to correct the problem the tank liner would be replaced. FD representatives were evaluating a number of options for lining the tank, from metal or rubber inner liners to various coatings to permanently seal and water proof the inner wall. The FD representative stated that the NRC staff would be informed of the progress on this project.

c. Conclusions

Since the volume of water is within the capacity of the reactor's make-up system and the leakage is controlled, TS requirements for pool water levels and management of liquid effluents were being met.

Licensee actions regarding relining the tank and sealing exterior pool leaks were acceptable.

M2.3 Secondary Cooling System

a. Inspection Scope (Inspection Procedure 69001)

The inspector reviewed maintenance and reactor logs, RSC minutes, repair records, observed facility and equipment during an accompanied tours and met with university engineering, radiological, and reactor staffs.

b. Observations and Findings

As previously reported to the NRC by the DIR, they observed that during recent high outside temperatures and longer full power runs the secondary cooling system was unable to keep the pool water temperature stable. This had caused them to run the secondary cooling system after hours to bring the pool temperatures down. During this period the pool water reached a peak temperature of 55°C.

The WSU TS do not have a pool temperature limit for operations. Facilities similar to WSU who do have such limits have them to prevent degradation of the pool water demineralizer resins. The reactor staff contacted their resin's manufacturer and confirmed that temperatures up to 60°C would not damage the resins. The DIR stated that a procedural temperature limit would be imposed to prevent damage to the resins.

In a meeting with the inspector the licensee representatives outlined their evaluation of the cooling system and their strategy for repair/replacement of the system. The cooling tower and heat exchanger are original and, due to aging, no longer meet their original heat transfer capacities. The FD representative stated that replacement of the cooling tower had been funded and that they were going to clean the heat exchanger and evaluate its effectiveness. Based on the performance of the heat exchanger after cleaning, they would decide if a replacement was needed. The FD representative stated that the NRC staff would be informed of the progress on this project.

c. Conclusions

Licensee actions regarding repair or replacement of cooling water system components and controlling the pool temperature were acceptable.

III. Engineering

E1 Conduct of Engineering, Design Changes

a. Inspection Scope (Inspection Procedure 69001)

The inspector reviewed selected design change packages, associated procedures and drawings, logs, records, and RSC files. The inspector also interviewed staff.

b. Observations and Findings

No design changes had been made since the last inspection. Previous licensee design changes were reviewed, approved, implemented, tested, and controlled as required by TS, licensee procedures, and pertinent regulations. Adequate change procedures were in place.

c. Conclusions

Design changes satisfied TS and regulatory requirements.

IV. Plant Support

R1 Radiological Protection and Chemistry Controls

R1.1 Radiation Protection Surveys

a. Scope (Inspection Procedure 69001)

The inspector reviewed procedures, survey records, and interviewed staff.

b. Observations and Findings

Periodic surface contamination surveys were evaluated using liquid scintillation counters(LSC). The inspector verified that alpha contamination determined by counts in the low energy channel "a" of the LSC were less than licensee limits and normally less than background. The university office, who performed periodic contamination surveys outside reactor areas, stated that their results were similar.

c. Conclusions

Surveys were performed and documented as required by 10 CFR 20. TS and licensee requirements for alpha contamination were met.

R1.2 Personnel Dosimetry

a. Scope (Inspection Procedure 69001)

The inspector reviewed dosimetry records, licensee procedures, and interviewed staff.

b. Observations and Findings

In reviewing the staff's dosimetry records the inspector confirmed that the shallow doses received, indicative of low energy gamma and beta exposures, were very low and routinely less than the minimum reportable by their National Voluntary Laboratory Accreditation Program - accredited vendor. Extremity doses, monitored using finger rings, of those staff who usually retrieved activated experimental material and package such were also well within regulatory limits.

c. Conclusions

Shallow and extremity doses were in conformance with licensee and 10 CFR 20 limits.

R2 Status of Radiation Protection and Control (RP&C) Facilities and Equipment

a. Scope (Inspection Procedure 69001)

The inspector reviewed calibration of the liquid scintillation counters and interviewed staff.

b. Observations and Findings

The LSCs used by the licensee were computer controlled models with no recommended calibration other than the computer controlled daily start-up check/verification. The inspector verified by interviews with reactor staff that, as with other new computer controlled LSC these checks along with the manufactures annual servicing of the unit satisfied calibration requirements. This was confirmed through discussions with two manufacturer representatives. Inspection Follow-up Item IFI 50-027/97-201-01 is closed.

c. Conclusions

RP&C equipment was being maintained according to industry and equipment manufacturer standards. LSC calibrations satisfied TS requirements.

S1 Conduct of Security

a. Inspection Scope (Inspection Procedures 69001 & 81401)

The inspector reviewed the NRC-approved security plan, toured the facility, reviewed security test records, reports, and security related training records, and interviewed reactor and university police staff.

b. Observations and Findings

The laboratory and reactor facility were individually secured with only authorized persons having unescorted access to the reactor facility. University police provided security as required by the plan. Periodic checks and tests of the security system were performed as well as security screening of personnel imposed by the plan. Related key control activities also satisfied plan requirements. Fuel inventories had been performed as required.

Training is provided to both the Nuclear Research Center staff, which includes the reactor staff, and the university police. The 1997 training for the police was late. In discussion with the police representative, the inspector found that this was in part due to shift staffing and duty requirements. The police representative stated that recent changes had been made to have specific "training days" for their officers. The licensee and university police representatives stated that they would coordinate future training to ensure it is on time. This failure constitutes a violation of minor significance and is being treated as a Non-Cited Violation, consistent with Section IV of the NRC Enforcement Policy.

c. Conclusions

Conduct of security activities satisfied the NRC-approved plan.

S2 Status of Security Facilities, Equipment, and Procedures.

a. Inspection Scope (Inspection Procedures 69001 & 81401)

The inspector reviewed the NRC-approved security plan, toured the facility, reviewed reports, and security related documents, and interviewed reactor staff.

b. Observations and Findings

The inspector verified that the security system was as described in the NRC approved plan. The system provided detection and assessment of unauthorized removal of special nuclear material from the facility. The inspector verified that the alarms, devices, and procedures were adequate to allow the university police to detect and respond to unauthorized activities. Response rosters and emergency phone lists were current and posted.

c. Conclusions

Security facilities, equipment, and, procedures satisfied plan requirements.

V. Management Meetings

X1 Exit Meeting Summary

The inspector presented the inspection results to members of licensee management at the conclusion of the inspection on September 10, 1997. The licensee acknowledged the findings presented.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

D. Baker	Vice Provost Academic Affairs
J. Becker	Acting Assist and Director, Facilities Development
K. Bloom	Building Constructor Specialist, Facilities Development
B. Bunce	Senior Reactor Operator
S. Eckberg	Assistant Director, Radiation Safety Office
K. Fox	Reactor Operator
M. Miles	Chairman, Reactor Safeguards Committee
J. Neidiger	Reactor Supervisor
L. Porter	Director, Radiation Safety Office
G. Tripard	Director, Nuclear Radiation Center

INSPECTION PROCEDURE (IP) USED

IP 69001: CLASS II NON-POWER REACTORS
IP 81 J1: PLANS, PROCEDURES, AND REVIEWS

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

NONE

Closed

IFI 027-97-201-01 Licensee to check on liquid scintillation counter for a recommended manufacturer calibration

NCV 027-98-201-01 Failure to provide annual training for University police staff as required by the NRC approved Security Plan.

PARTIAL LIST OF ANACHRONISMS USED

ALARA	As Low As Reasonably Achievable
DIR	Director, Nuclear Radiation Center
FD	Facilities Development
LCO	Limiting Conditions for Operations
RSC	Reactor Safeguards Committee
TS	Technical Specifications