U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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Report Nos:	50-182/96001(DNMS); 70-152/96001(DNMS)
Licensee:	Purdue University
Facility Name:	Purdue University Reactor Fast Breeder Blanket Facility
Location:	West Lafayette, Indiana
Dates:	December 16-19, 1996
Inspectors:	T. D. Reidinger J. R. Kniceley T. M. Burdick
Approved by:	Gary L. Shear, Chief Fuel Cycle Branch

Executive Summary

Purdue University Nuclear Reactor
and Fast Breeder Blanket Facility
Report Nos. 50-182/96001(DNMS); 70-152/96001(DNMS)

This routine, announced inspection included aspects of organization; operations and maintenance; procedures; requalification training; surveillance; experiments; radiation controls and environmental protection; design change; audit and review; emergency preparedness; fuel handling activities (IP 40750); transportation activities (IP 86750); periodic and special reports (IP 90713); Physical Protection (IP 81421) and Special Nuclear Material Control and Accountability (IP 85102).

Organization (IP 40750)

- The organizational structure and assignment of responsibilities were as specified in Technical Specifications (TS). Pending semi-retirement of the incumbent Reactor Supervisor and Laboratory Director has resulted in some changes. (Section 1.0)

Operations and Maintenance (IP 40750)

- The reactor was operated and maintained in accordance with the reactor's license conditions and TS requirements. The licensee's logs and records satisfactorily documented reactor operations and maintenance activities. (Section 2.0)

Procedures (IP 40750)

- The licensee had approved procedures to sufficiently conduct reactor operations, maintenance, experiments, surveillance testing and instrument calibrations according to TS requirements. (Section 3.0)

Licensed Operator Requalification (IP 40750)

- The licensee's approved program has been exempted from full implementation based on the unique status of the licensed staff since 1982. The licensee will reimplement the full program with pending changes in the staff. (Section 4.0)

Surveillances (IP 40750)

- All reactor surveillance tests had been completed and documented at the required frequencies, and the surveillance test results met TS requirements. The inspectors noted a criticality monitor was not operable. The licensee committed to include the Fast Flux Breeder Facility criticality alarms in the reactor schedule to maintain their operability (Section 5.0)

Experiments (IP 40750)

- All reactor experiments were conducted in accordance with properly reviewed and approved procedures and satisfactorily documented in the reactor operations log. (Section 6.0)

Radiation Control (IP 40750)

- The reactor staff received monitored doses that were insignificant. The Radiological and Environmental Management office was proactive in oversight of the reactor program. (Section 7.0)

Environmental Protection (IP 40750)

- The Purdue University Reactor (PUR-1) has not performed any airborne or liquid effluent releases since the last inspection. (Section 8.0)

Audits and Reviews (IP 40750)

- The annual operations audits of the reactor laboratory were adequately detailed and technically comprehensive. The inspectors noted, however, that the findings were not always resolved. (Section 9.0)

Emergency Preparedness (IP 40750)

- Emergency Plan exercises and training were adequate to ensure public safety. The licensee committed the Radiological and Environmental Management office (REM) to retrain fire fighters on an annual basis. (Section 10.0)

Fuel Handling (IP 40750)

- Procedures for fuel handling were adequate. (Section 11.0)

Periodic and Special Reports (IP 90713)

- Required reports had been submitted to the NRC in accordance with TS requirements. (Section 12.0)

Transportation (IP 86750)

- The transfer of irradiated material from the reactor to the broad scope license was conducted per procedure. (Section 13.0)

Fast Breeder Blanket Facility (IP 40750)

- The Fast Breeder Blanket Facility (FBBF) has not been used for several years. The licensee is seeking DOE cooperation to have it dismantled and moved. In the interim the licensee will continue to meet all conditions of the license. (Section 14.0)

Fixed Site Physical Protection of Special Nuclear Material of Moderate Strategic Significance (IP 81421)

- The licensee's physical protection program for the protection of SNM was adequately implemented. (Section 15.0)

Nuclear Material Control and Accountability (IP 85102)

- There has been no receipt or shipment of special nuclear material subsequent to the last inspection. The licensee's program to account for and control SNM is considered adequate and effective. (Section 16.0)

DETAILS

1.0 Organization

a. Inspection Scope (IP 40750)

The inspectors reviewed Technical Specifications (TS) and the Safety Analysis Report (SAR) related to organization and staffing.

b. Observations and Findings

The inspectors determined that the organizational structure and assignment of responsibilities were as specified in TS 6. The membership of the Committee on Reactor Operations (CORO) was in accordance with TS and the SAR. Pending personnel changes in January 1997 will result in a newly hired replacement for the Laboratory Director. The Laboratory Director will also be relieved as the Reactor Supervisor by the only remaining member of the reactor staff. The new Lab Director will obtain his senior reactor operator's license within 18 months of his starting date. The outgoing staff member will remain in a part time capacity with a senior reactor operator's license.

Through log reviews, the minimum staffing requirements were verified to have been met during reactor operations and fuel handling or refueling operations. Selected reactor operator logs from December 1994 through November 1996 were reviewed with no concerns identified. The operator logs were well maintained.

c. Facility Tour

The control room and pool floor areas were brightly illuminated, generally free of clutter and clean. Fire extinguishers in these areas and the other lab facilities had appropriate pressures and current inspection dates.

d. Conclusions

Compliance with TS requirements, CORO membership and reactor programs was good.

2.0 Operations and Maintenance Activities

a. Inspection Scope (IP 40750)

The inspectors reviewed the reactor operations and maintenance logs and observed reactor operations to determine compliance with Operating License Condition 3.A. and the requirements in TS 2.0 and TS 3.0.

b. Observations and Findings

The licensee operated the reactor on December 19, 1996 during the inspection. All actions were consistent with procedures and the license. The licensee has operated the reactor for experiments, research, and training.

The reactor operations logs and records were in compliance with the reactor's license conditions and TS requirements. The licensee had operated the reactor at steady state thermal power levels not in excess of 1.0 kilowatt in accordance with Operating License Condition 4.A. The inspectors verified that the reactor safety limits had not been exceeded and were in compliance with TS 2.1.

During the annual shim safety control rod reactivity worth determinations, the reactor shutdown margin and excess reactivity were verified to be within TS limits. The inspectors also verified that all of the required reactor control system instrument channels, safety circuits, and safety interlocks required by the TS were tested and operable. The licensee's logs and records adequately documented reactor operations.

The reactor's maintenance logs and records were found to be in compliance with the TS requirements. Safety-related corrective maintenance performed on the reactor and related systems were properly documented in the reactor's maintenance log.

c. Conclusions

The reactor was operated and maintained in accordance with the reactor's license conditions, safety limits and limiting conditions for operation, and TS requirements. The licensee's logs and records satisfactorily documented reactor operations and maintenance activities.

3.0 Procedures

a. Inspection Scope (IP 40750)

The inspectors reviewed the licensee's written procedures for operating and maintaining the reactor, performing surveillance activities and reactor instrument calibrations, and conducting experiments to determine compliance with the requirements in TS 6.5.

b. Observations and Findings

No concerns were identified. The licensee had approved procedures to sufficiently conduct reactor operations, maintenance, experiments, surveillance testing and instrument calibrations in compliance with TS requirements.

c. Conclusions

The licensee was in compliance with the license and TS requirements.

4.0 Requalification Training

a. Inspection Scope (IP 40750)

The inspectors reviewed the reactor operator requalification training program to determine compliance with the requirements in 10 CFR 19.12 and 10 CFR 55.59.

b. Observations and Findings

The licensee's approved operator requalification program conformed to the requirements of 10 CFR Part 55.59. The program has been exempted from full implementation since 1982 because there were only two licensed senior reactor operators, both of which were active in teaching and operating the reactor. The addition of new staff will require the licensee to reinstate the full program since they will no longer meet the conditions of the exemption.

c. Conclusions

Essentially, the approved program has been exempted from implementation and has remained inactive.

5.0. Surveillances

a. Inspection Scope (IP 40750)

The inspectors reviewed surveillance test results to determine compliance with the requirements in TS 4.0.

b. Observations and Findings

All reactor surveillance tests had been completed and documented at the required frequencies, and the surveillance test results met TS requirements. Although not required by the license, the licensee committed to include the FBBF criticality alarms in the reactor schedule to ensure that they maintain them operable.

c. Conclusions

The reactor surveillance program was in compliance with the license and TS.

6.0 Experiments

a. Inspection Scope (IP 40750)

The inspectors reviewed the licensee's program to control and conduct experiments performed in the reactor to determine compliance with the requirements in TS.

b. Observations and Findings

Experiments were conducted in accordance with written procedures which were approved and properly documented as required by TS.

c. Conclusions

All reactor experiments were conducted in accordance with properly reviewed and approved procedures and satisfactorily documented in the reactor operations log.

7.0 Radiation Control

a. Inspection Scope (IP 40750)

The inspectors reviewed the radiation protection program to determine compliance with the requirements in 10 CFR Part 20 and TS.

b. Observations and Findings

The inspectors reviewed personnel exposure records from the last inspection to the present. The records indicated that badged reactor personnel had not exceeded 10 CFR 20.1201 regulatory limits.

Postings, labeling, and surveys met regulatory requirements as observed on the tour of the reactor laboratory. Operators were observed using adequate contamination control techniques. In general, the staff appeared to be adequately trained and aware of the radiological conditions in their work areas.

Area radiation monitors and portable instruments were calibrated as required.

c. Conclusions

Training of the staff and radiation workers appeared to be adequate and reactor radiation monitoring was maintained operable.

8.0 Environmental Protection

a. Inspection Scope (IP 40750)

The inspectors reviewed the licensee's program for the discharge or removal of radioactive liquid, gases, and solids from the reactor laboratory.

b. Observations and Findings

The licensee did not release radioactive effluents to the environment and all radioactive waste had been properly transferred to the University broad scope license for disposal.

c. Conclusions

Solid radioactive waste was disposed of properly.

9.0 Audit and Reviews

a. Inspection Scope (IP 40750)

The inspectors reviewed the meetings, audits and reviews conducted by the Committee on Reactor Operations (CORO) to determine compliance with the requirements in TS 6.2.

b. Observations and Findings

The inspectors reviewed the last two annual operations audits of the reactor laboratory and determined that they were adequately detailed and technically comprehensive. The findings were not always resolved in the cases reviewed by the inspectors. The licensee committed to revise the audit procedure to require closure of the finding with acceptable resolutions.

c. Conclusions

CORO meetings were conducted as required. Audits were adequate; however, findings were not always resolved.

10.0 Emergency Preparedness

a. Inspection Scope (IP 40750)

The inspectors reviewed the Emergency Plan for the reactor laboratory to determine compliance with the requirements in 10 CFR 50.54(q) and (r). The inspectors also followed up on a licensee identified weakness in the notification of offsite authorities for bomb threats.

b. Observations and Findings

The emergency plan procedures were sufficiently detailed. The CORO review of the audit of the emergency plan and procedures was appropriately documented in the CORO meeting minutes and met the requirements in TS 6.2.

The inspectors reviewed documentation related to the emergency drills held in December 1995 and 1996. Subsequent discussions with various reactor personnel confirmed that these activities were conducted successfully. REM documented the findings adequately.

The emergency equipment locker was maintained at a strategic location and included monitoring equipment and contamination control supplies. Emergency equipment had been inventoried annually as required.

The inspectors conducted discussions with the campus police and determined that they had an adequate understanding of their roles in emergencies at the reactor laboratory. The inspectors also discussed a licensee identified weakness regarding the notification of offsite agencies and were satisfied that the police understood their responsibilities.

The inspectors interviewed the fire department staff and inspected their radiation monitoring equipment. The staff said they would rely on the REM to authorize their entrance to any radiation facility even if imminent life threatening conditions required their immediate action. The inspectors discussed this apparent misunderstanding with the licensee and the Radiation Safety Officer (RSO) committed to retrain fire fighters annually to keep them more informed about potential radiation hazards in the reactor and FBBF facility.

No significant changes in the Emergency Response Organization were noted.

c. Conclusions

Review of emergency equipment and supplies, changes to the emergency plan, and documentation relating to emergency drills as well as interviews and observations indicated that the licensee's emergency program was maintained in a state of adequate readiness.

11.0 Fuel Handling

a. Inspection Scope (IP 40750)

The inspectors reviewed the fuel handling procedures at the reactor laboratory to determine compliance with TS 6.

b. Observations and Findings

The reactor fuel is handled annually only for inspection. Records review and discussions with personnel indicated that fuel handling operations had been carried out in conformance with procedures. Log entries and fuel location maps for fuel handling activities were appropriately documented.

c. Conclusions

Procedures for fuel handling were technically adequate for reactor operations.

12.0 Review of Periodic and Special Reports

a. Inspection Scope (IP 90713)

The inspectors reviewed the licensee's submittal of reports and notifications to the NRC to determine compliance with the requirements in TS 6.6.

b. Observations and Findings

The 1995 annual report had been submitted in a timely manner and contained the information required by TS. No special reports had been issued to the NRC since the last NRC inspection of the reactor laboratory in November 1994.

c. Conclusions

Required reports had been submitted to the NRC in accordance with TS requirements.

13.0 Transportation of Radioactive Materials

a. Inspection Scope (IP 86750)

The inspectors reviewed the licensee's radioactive materials shipping program for compliance with the requirements in Department of Transportation (DOT) and NRC regulations, 49 CFR Parts 172 & 173 and 10 CFR Part 71, respectively.

b. Observations and Findings

The reactor laboratory transferred reactor irradiated material from the reactor license to the university byproduct material license. No problems were identified.

c. Conclusions

The transfer of reactor irradiated material was per procedure.

14.0 Fast Breeder Blanket Facility (FBBF)

a. Inspection Scope (IP 40750)

The inspectors reviewed the license conditions against the observed practices at the facility.

b. Findings and Observations

The licensee has not used the FBBF for several years and hopes to obtain DOE assistance to decommission and remove it from the campus as soon as possible. The californium-252 neutron source lifting mechanism is no longer connected to a power source. The inspectors observed that one of the two criticality monitors was in the process of being repaired. Although the license does not explicitly require it, the licensee has committed to include the criticality monitors on the reactor surveillance schedule to ensure continued operation.

c. Conclusions

The FBBF will be dismantled and removed as quickly as possible with DOE support. Until then the licensee is committed to the license conditions.

15.0 Protection of Special Nuclear Material of Moderate Strategic Significance

a. Inspection Scope (IP 81421)

The inspection included a review of the approved "Security Plan for the Purdue University Reactor, the Fast Breeder Blanket Facility and the Nuclear Fuel Storage Areas," Revision 3 dated May 15, 1987.

b. Findings and Observations

The licensee's physical protection program was found to be adequately implemented and effective. The physical barriers, alarm equipment, records and reports were adequately maintained. The campus police were appropriately trained and adequately responded to alarms associated with the reactor facility. Liaison with the campus police appeared good. The lock/key control and access control programs were adequately implemented and were restricted to those with an established need for access.

c. Conclusions

The inspector concluded that the requirements identified in the security plan were adequately implemented and the program minimized the potential for unauthorized removal of special nuclear material.

16.0 Special Nuclear Material Control and Accountability (MC&A)

a. Inspection Scope (IP 85102)

The inspector reviewed the licensee's program for the possession and use of special nuclear material authorized under their licenses.

b. Observations and Findings

The inspection showed that the licensee limited their possession and use of special nuclear material (SNM) to locations and purposes authorized under their licenses. Inspection of material balance reports showed no activity in the receipt or shipment of special nuclear material subsequent to the last physical security and MC&A inspection on January 18, 1995. The material balance reports (Form NRC-742) accurately reflected the licensee's activities for this period. The licensee's most recent physical inventory dated September 1996 showed no discrepancies.

c. Conclusion

The licensee's program of accounting for and controlling of SNM was considered adequate and effective.

17.0 Persons Contacted

Purdue University

V. H. Ransom*	Purdue	Head, School of Nuclear Eng.
Dr. J. Schweitzer*	Purdue	Radiation Safety Officer
Dr. F. Clikeman*	Purdue	Reactor Supervisor
E. Merritt*	Purdue	Reactor Lab Assistant
R. Bean*	Purdue	

US NRC

G. L. Shear*	NRC	Chief, Fuel Cycle Branch
T. M. Reidinger*	NRC	Senior Fuel Facility Inspector
T. D. Burdick*	NRC	Non-Power Reactor Inspector
J. R. Kniceley*	NRC	Fuel Facility Safeguards Inspector

Additional technical, operational, and administrative personnel were contacted by the inspectors during the course of the inspection.

* Denotes those attending the exit meeting on December 19, 1996.

18.0 Exit Interview (IP 30703)

The inspectors presented the inspection results to members of the licensee management at an exit meeting on December 19, 1996. The licensee acknowledged the findings that were presented. The inspectors

asked the licensee whether any material examined during the inspection should be considered proprietary. No proprietary information was identified.

Inspection Procedures Used

IP 40750	Class II Nonpower Reactors
IP 86750	Inspection of Transportation Activities
IP 90713	Review of Periodic and Special Reports
IP 81421	Protection of Special Nuclear Material of Moderate Strategic Significance
IP 85102	Special Nuclear Material Control and Accountability (MC&A)
IP 81401	Plans, Procedures and Reviews
IP 81402	Reports of Safeguards Events
IP 81403	Receipt of New Fuel at TRTR

Items Opened and Closed

None

List of Documents Reviewed

Safety Analysis Report
Safety Evaluation Report
Reactor Operating License
Technical Specifications
FBBF license
Operating Procedures
Maintenance Procedures
Surveillance Procedures
Maintenance and Surveillance Records
Emergency procedures
Training Program
Emergency Plan
Dosimetry Records
Various Reports
Purdue Radiation Safety Manual
Security Plan
Material Balance Reports

List of Acronyms Used

ALARA	As Low as Reasonably Achievable
CFR	Code of Federal Regulations
DNMS	Division of Nuclear Materials and Safeguards
DOT	Department of Transportation
FBBF	Fast Breeder Blanket Facility
IP	Inspection Procedure
NRC	Nuclear Regulatory Commission
PDR	Public Document Room
PM	Preventive Maintenance
CORO	Committee on Reactor Operations
REM	Radiological and Environmental Management
RSO	Radiation Safety Officer
SAR	Safety Analysis Report
SNM	Special Nuclear Material
TLD	Thermal Luminescent Detector
TS	Technical Specifications
PUR-1	Purdue University Nuclear Research Reactor