

September 2, 2005

Mr. Edward Merritt, Reactor Supervisor
1290 Nuclear Engineering Building
Department of Nuclear Engineering
Purdue University
West Lafayette, IN 47907-1290

SUBJECT: NRC INSPECTION REPORT NO. 50-182/2005-201

Dear Mr. Merritt:

This letter refers to the inspection conducted on August 15-18, 2005, at the Purdue University research reactor. The inspection included a review of activities authorized for your facility. The enclosed report presents the results of that inspection.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observation of activities in progress. Based on the results of this inspection, no safety concerns or noncompliance with NRC requirements were identified. No response to this letter is required.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/NRC/ADAMS/index.html>.

Should you have any questions concerning this inspection, please contact Mr. Kevin Witt at 301-415-4075.

Sincerely,

/RA/

Brian Thomas, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-182
License No. R-87

Enclosure: NRC Inspection Report No. 50-182/2005-201

cc w/enclosure: Please see next page

Purdue University

Docket No. 50-182

cc:

Mayor
City of West Lafayette
609 W. Navajo
West Lafayette, IN 47906

Indoor and Radiologic Health
Indiana State Department of Health
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Indianapolis, IN 46204-3006

State Board of Health
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1330 West Michigan Street
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Mr. Ed Merritt
Reactor Supervisor
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Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

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

Docket No.: 50-182

License No.: R-87

Report No.: 50-182/2005-201

Licensee: Purdue University

Facility: Purdue University Research Reactor

Location: West Lafayette, Indiana

Dates: August 15-18, 2005

Inspector: Kevin M. Witt

Approved by: Brian Thomas, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

Purdue University
Report No: 50-182/2005-201

The primary focus of this routine, announced inspection was the on-site review of selected aspects of the licensee's non-power training reactor operation including: organization and staffing; committees, audits and reviews; operations logs and records; procedures; requalification training; maintenance and surveillance; experiments; radiation protection; design changes; fuel handling logs and records; and emergency preparedness.

Organization and Staffing

- The licensee's organization and staffing remain in compliance with the requirements specified in Technical Specification Section 6.1.

Committees, Audits, and Reviews

- Review and oversight functions required by the Technical Specification were acceptably completed by the Committee on Reactor Operations.

Operations Logs and Records

- Records were kept in accordance with the regulatory requirements.

Procedures

- The procedural control and implementation program satisfied Technical Specification requirements.

Requalification Training

- Operator requalification was being conducted and completed as required by the Operator Requalification Program. One non-cited violation was noted for allowing an operator to continue licensed activities without meeting the conditions of the license.

Maintenance and Surveillance

- An URI was identified on ventilation damper checks.
- Maintenance was generally completed in accordance with Technical Specification and procedural requirements.

Experiments

- The program for the control of experiments satisfied regulatory, procedural and Technical Specification Section 6.7 requirements.

Radiation Protection Program

- Surveys were being completed and documented acceptably to permit evaluation of the radiation hazards present.
- Postings met the regulatory requirements specified in 10 CFR Parts 19 and 20.
- Personnel dosimetry was being worn as required and doses were well within the licensee's procedural action levels and NRC's regulatory limits.
- Radiation monitoring equipment was being maintained and calibrated as required.
- The Radiation Protection Program being implemented by the licensee satisfied regulatory requirements.

Design Changes

- No significant nor minor changes had been made at the facility since the last operations inspection

Fuel Handling Logs and Records

- Fuel movements and inspections in general were completed and documented in accordance with the requirements specified by procedure.

Emergency Preparedness

- The emergency response program was conducted in accordance with the requirements stipulated in the Emergency Plan.

REPORT DETAILS

Summary of Plant Status

The licensee's one kilowatt training reactor continues to be operated in support of undergraduate instruction and demonstrations for students. During the inspection, the reactor was operated for demonstration purposes. Records show that the reactor was utilized on 73 occasions during the past two years.

1. **Organization and Staffing**

a. Inspection Scope (Inspection Procedure [IP] 69001)

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of the Technical Specification (TS) Sections 6.1 and 6.2 were being met:

- organizational structure
- qualifications of reactor staff and members of the Committee on Reactor Operations (CORO)
- console log entries for 2004 and 2005

b. Observations and Findings

The inspector determined that the organizational structure at the facility had not changed since the previous NRC inspection in March 2003. However, the Laboratory Director and the chairman of the CORO were new. The new Laboratory Director has the proper education and experience in the operation of the Purdue University Reactor and is well qualified to take over the duties of the position. In addition, the Laboratory Director is in the process of obtaining a senior reactor operator (SRO) license, which will allow him to become more fully integrated into the daily functions of the facility. The Laboratory Director position is responsible for overseeing the activities in the laboratories, and is a voting member on the CORO. The Reactor Supervisor continued to be responsible for the safe operation of the training reactor and reported to the Head of the School of Nuclear Engineering. The new Chairman of the CORO is the Director of Radiological and Environmental Management (REM), and is well qualified to hold this position. A new electronics technician was hired since the previous inspection and is currently in the training program to become a licensed operator.

Through a review of résumés and discussions with personnel, the inspector determined that the operations staff and CORO members satisfied the TS qualification requirements. A review of reactor console records confirmed that the staffing requirements during reactor operations were met.

c. Conclusions

The licensee's organization and staffing remain in compliance with the requirements specified in the TSs.

2. Committees, Audits, and Reviews

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the audits and reviews stipulated in TS Section 6.2 were being completed:

- C CORO meeting minutes for January 27, March 24, July 8, October 8, 2004, and January 28, March 31, and June 29, 2005
- C Memorandum to CORO file entitled, "Updated CORO Membership", dated August 1, 2005
- C Reactor License Audit of the Technical Specifications, dated March 1, 2003, April 16, 2004, and February 25, 2005
- Audits of the Security Plan and Emergency Plan

b. Observations and Findings

The composition and meeting frequency of the CORO satisfied the TS requirements. The minutes of the meetings demonstrated that the CORO provided the review and oversight required by the TS. Issues brought up by the CORO were resolved in an appropriate time frame and were noted in CORO meeting minutes.

Designated members of the CORO, including others such as HP personnel, conducted audits of the technical specifications as required and the full CORO reviewed the results. Minor issues that were not safety related were noted in the audit reports, and the inspector observed that any safety related items were properly controlled. The inspector noted that there were no significant issues discovered and that the licensee took appropriate corrective actions in response to the audit findings. The inspector verified that the licensee had completed annual reviews of the Radiation Protection Program as required by 10 CFR Part 20. All aspects of the program had been reviewed. The inspector noted that the safety reviews and audits, and the associated findings, were acceptably detailed and that the licensee responded and took corrective actions as needed.

c. Conclusions

Review and oversight functions required by the TS were acceptably completed by the CORO.

3. Operations Logs and Records

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that selected records were maintained as required by TS Sections 6.5 and 6.6:

- Purdue University Reactor-1 (PUR-1) Operating Manual, dated May 25, 1965
- PUR-1 Procedure 91-1, "Reactor Startup, Operation and Shutdown", dated June 1991

- Licensee Annual Reports dated March 2003, March 2004 and March 2005
 - selected Pre-Startup Checklist and Operation Records for 2004 to present
 - selected Request for Reactor Operation (Form A) forms for 2004 to present
 - selected Request for Sample Irradiation (Form B) forms for 2004 to present
 - Purdue University Reactor-1 Reactor Log Book, dated November 13, 2003 - December 1, 2004 and December 1, 2004 to present
 - reactor startup, operations, and shutdown activities during the inspection
- C CORO meeting minutes for January 27, March 24, July 8, October 8, 2004, and January 28, March 31, and June 29, 2005

b. Observations and Findings

Annual reports contained the data required to be recorded by the TSs. Console log entries were highly detailed and descriptive. Logs and records were clear, well organized, and readily retrievable.

The operating logs were complete and provided an acceptable indication of operational activities. Logs and records also showed that operational conditions and parameters were consistent with license and TS requirements. Scrams that occurred during reactor operations were recorded on the bottom of the startup/shutdown checklist as well as in the reactor operations log. Scrams that occurred during the inspection period did not indicate problems with the reactor safety systems, but were typically spurious signals. All scrams were resolved before the resumption of operations under the authorization of the Reactor Supervisor.

The inspector reviewed selected Pre-Startup Checklist and Operation Records dating from January 2004 through the date of this inspection. The inspector determined that reactor operations were carried out following written procedures as required by TS Section 6.4.1. Logs and records also showed that operational conditions and parameters were consistent with license and TS requirements and that TS operational limits had not been exceeded. Sample irradiations were approved by filling out one of two forms. Form A, "Request for Reactor Operations", is used for sample irradiations where the samples are not going to leave the reactor bay and is approved by the reactor supervisor. Form B, "Request for Sample Irradiation", is used for sample irradiations where the samples will be transported to other locations outside of the facility and is approved by the radiological management office.

The inspector conducted observations of the reactor staff on August 18, 2005, and reviewed Pre-Startup Checklist and Operation Records forms and associated records and logs. The inspector noted that the licensed SRO on duty and operator trainee were both knowledgeable and competent. Observation of operational activities also confirmed that reactor operations were carried out in accordance with written procedures and TS requirements.

c. Conclusions

Records were kept in accordance with the regulatory requirements.

4. Procedures

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the requirements of TS Section 6.4 were being met concerning written procedures:

- selected PUR-1 procedures as noted in this report
- procedure revision, review, and approval process
- PUR-1 Procedure 05-1, "Sample Irradiation Procedure for a Sample with Unknown Reactivity Worth", dated April 12, 2005

b. Observations and Findings

The inspector determined that written procedures were available for the activities delineated in TS 6.4 and were approved by the CORO as required. The clarity and detail in the procedures was satisfactory.

The inspector noted that procedures had been developed for reactor operations and safety. CORO meeting minutes indicated that a new procedure entitled, "Sample Irradiation Procedure for a Sample with Unknown Reactivity Worth", had been approved by the committee in accordance with the abilities granted by the TSs. The inspector noted that the new procedure lays out a safe and effective method of irradiating samples with unknown reactivities and does not deviate from the TSs or NRC regulations. It was also noted that the reactor supervisor can revise procedures so long as the intent of the procedure is not changed and it is reviewed by the CORO. Major procedure changes must be sent to the CORO for review and approval as specified in the TSs.

c. Conclusions

The procedural control and implementation program satisfied Technical Specification requirements.

5. Requalification Training

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with the requirements in 10 CFR Part 55:

- "Operator Requalification Program for the PUR-1 Reactor Facility", dated February 12, 1988
- Purdue University Reactor-1 Reactor Log Book, dated November 13, 2003 to December 1, 2004 and December 1, 2004 to present
- operator active license status

- training
- operator physical examination records
- reactivity manipulations
- written examination results
- operator active duty status

b. Observations and Findings

The Reactor Supervisor, who has a SRO license, is currently the only staff member authorized to operate the reactor. The Reactor Supervisor's license expiration date was July 10, 2004, but under 10 CFR 55.55, "If a licensee files an application for renewal on Form NRC-398 at least 30 days before the expiration of the existing license, it does not expire until disposition of the application for renewal has been finally determined by the Commission." The new laboratory director recently took a SRO licensing examination administered by the NRC on July 28, 2005 and is waiting to hear the results. Several portions of the requalification program could not be followed by the one SRO, due to a lack of other licensed personnel. The required biennial written examination and a demonstration of operator proficiency in reactor operation were not completed during this inspection period. From the training of a new operator, the SRO at the facility received a review of reactor operations and a self-review of several literature topics discussed in the Operator Requalification Program. All of the required manipulations in the Requalification Program were completed successfully. The SRO reviewed the contents of the operating manual, TSs, and the emergency procedures annually, which was verified through review of signed memos. The licensee indicated that the Requalification Program, which requires meetings, reviews, and readings is difficult to satisfy for the small one licensed operator staff.

It was noted that the conditions specified in 10 CFR 55.53 for reactor operator (RO) or SRO licenses were not being reviewed to ensure compliance with the regulations. The inspector will verify that future audits conducted by the CORO ensure that all conditions of the operator's licenses are being met. This issue will be considered by the NRC as an Inspector Follow-up Item (IFI) and will be reviewed during the next inspection at the facility (IFI 50-182/2005-201-01).

While conducting a review of the reactor log book, the inspector had the licensee review the log books to determine whether the active operators performing the functions of an operator or senior operator had met all of their license conditions during the inspection period. The licensee determined that during the July - August, 2004 quarter, the only licensed SRO did not operate the reactor for a total of four hours. Cessation of reactor operations was caused by confusion about the status of the SRO's license, since the expiration date of the license had just passed. After the quarter was over, the SRO contacted the NRC for further explanations on whether the license was still active due to the expiration date passing, but no mention was made of not meeting the conditions of the license. Pursuant to this time frame, the licensee did not declare the SRO's license inactive in accordance with 10 CFR 55.53(e) and the SRO continued to operate the reactor without supervision.

The licensee was informed that allowing an operator to continue licensed activities without meeting the conditions of the license was an apparent violation of 10 CFR 55.53(e). However, due to unusual staffing circumstances (only one licensed operator), it is being treated as a Non-Cited Violation, consistent with Section VII.B.6 of the NRC Enforcement Policy (NCV 50-182/2005-201-02).

c. Conclusions

Operator requalification was being conducted and completed as required by the Operator Requalification Program. One non-cited violation was noted for allowing an operator to continue licensed activities without meeting the conditions of the license.

6. Maintenance and Surveillance

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the surveillance requirements and limiting conditions for operations (LCO) specified in TS Sections 3.0 and 4.0 met:

- PUR-1 Reactor Log Book, dated November 13, 2003 to December 1, 2004 and December 1, 2004 to present
- selected Pre-Startup Checklist and Operation Records for 2003 to 2005
- selected Request for Reactor Operation (Form A) forms for 2003 to 2005
- PUR-1 Maintenance Log, dated February 10, 2003 to present
- Procedure 98-SRW, "Shim Rod Worth"-data, dated October 5, 2004, November 12, 2003, and October 9, 2002
- Damper Checks, recorded in Reactor Log Book, dated December 19, 2002, June 12, 2003, December 16, 2003, and October 8, 2004
- Weekly pH and conductivity records for primary coolant water for the period September 29, 2003 to present

b. Observations and Findings

Within the scope of this review, the inspector determined that surveillance, test, and LCO verifications and calibrations were generally completed on schedule and in accordance with licensee procedures, checklists, or equipment manufacturers recommendations. All the recorded results were within the TS prescribed parameters. The records and logs reviewed were complete and were being maintained as required. The facility ventilation dampers were required to be checked to be operable on a semi-annual basis, not to exceed 7.5 months. After reviewing the records and the CORO meeting minutes, it was noticed that one of the surveillance periods exceeded the maximum allowable time. The damper checks were done on December 16, 2003 and October 8, 2004, which is a period of 9.5 months. The licensee was informed that failure to conduct a surveillance check

required by the TSs was identified as an Unresolved Item¹ (URI) pending corrective actions and implementation of controls to prevent recurrence. This issue will be reviewed during a future inspection (URI 50-182/2005-201-03).

The inspector reviewed the maintenance records related to 2003, 2004 and 2005 scheduled and unscheduled preventative and corrective maintenance activities. This review indicated that all maintenance activities were controlled and documented in the maintenance and/or operations log consistent with the requirements in 10 CFR 50.59. Implementation of any changes to equipment, systems, tests or experiments have previously been done by the reactor supervisor. With the addition of a new electronics technician, all work being performed will be overseen by the reactor supervisor. After all maintenance items are completed, system operational checks are performed to ensure the affected systems function before returning them to service.

c. Conclusions

An URI was identified on the ventilation damper checks. Maintenance was generally completed in accordance with Technical Specification and procedural requirements.

7. Experiments

a. Inspection Scope (IP 69001)

To ensure that the requirements of TS Section 3.5 were being met concerning experimental programs, the inspector reviewed selected aspects and/or portions of:

- C Procedure 91-2, "Sample Irradiation in Reflector", dated June 1991
- C Procedure 91-3, "Sample Irradiation in Drop Tubes", dated June 1991
- Procedure 99-SSG-2, "Sample Irradiation in SS Guide Tube", dated December 15, 1999
- selected experiment forms
- selected irradiation request forms
- potential hazards identification

b. Observations and Findings

There were two types of experiments frequently conducted at the PUR-1 facility. Approximately 67% of facility operations primarily consists of sample irradiations, while the rest of the facility operations is used for training purposes. One of the experimental facilities is the SS Guide Tube, which is a stainless steel tube that is extended to the outside of the core and is used by lowering the sample with string while the reactor is at power. The drop tube is a similar experimental facility except that it is a larger diameter PVC tube located further outside of the core. Another

¹An Unresolved Item is a matter about which more information is required to determine whether the issue in question is an acceptable item, a deviation, a nonconformance, or a violation.

experimental facility is the sample holders in the reflector elements. Samples can be loaded and unloaded from tubes in the graphite reflector while the reactor is shut down. Samples that have been irradiated at the PUR-1 include miscellaneous elements for demonstrations, hair and fingernail samples for isotope identification, and neutron detectors for testing operability.

No new experiments had been initiated, reviewed, or approved since the last inspection. If any experiments were to be initiated, they would be reviewed and approved by the CORO and would be completed under the supervision of the Reactor Supervisor and in accordance with TS requirements (e.g., reactivity limitations, corrosion resistance, etc.).

c. Conclusions

The program for the control of experiments satisfied regulatory, procedural and Technical Specification Section 3.5 and 4.5 requirements.

8. Radiation Protection Program

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with 10 CFR Part 20 and TS Sections 4.2(d) and 4.3(d):

- C Purdue University Radiation Safety Manual, last modified March 31, 2005
- C Health Physics Procedure, "SOP - Reactor Water Sampling and Analysis", revised January 2005
- C Health Physics Procedure, "SOP - Reactor Room Survey", revised January 2005
- C Health Physics Procedure, "SOP - Reactor Water Gamma Spec. Analysis", revised January 2005
- C Health Physics Procedure, "Standard Operating Procedure for Declared Pregnancies", revised January 2005
- Health Physics Procedure, "SOP - Calibration of Pocket Dosimeters", revised January 2005
- Health Physics Procedure, "SOP - Radiation Survey Instrument Calibration", undated
- Health Physics Procedure, "SOP - Survey Meter Efficiency to Beta Radiation", revised January 2005
- Audit of Radiation Safety Program Content and Implementation for 2003 and 2004
- Assorted Alpha, Beta Gamma Survey Forms, dated January 12, 2004 to present
- Reactor Air and Water Annual Report for 2003 and 2004
- Reactor Water and Reactor CAM Filter analysis reports for 2003 to present
- Memorandum to Ed Merritt from Jim Schweitzer, "Calibration of Nuclear Engineering Instruments", dated March 18 and August 15, 2005
- Personnel bimonthly dosimetry results for 2003 to present

b. Observations and Findings

The Department of Radiological and Environmental Management's (REM) radiation protection program applies uniformly to the four NRC-licensed activities on campus (broad scope, source material, special nuclear material, and the reactor). The licensee's program for radiological health and safety related to the reactor license was evaluated during this inspection.

(1) Surveys

The inspector reviewed monthly radiation and contamination surveys of the licensee's controlled areas and monthly radiation wipe surveys completed by campus REM Health Physics (HP) personnel. The surveys had been completed in accordance with the procedure, "SOP - Reactor Room Survey." The results were documented on the appropriate forms, evaluated as required, and corrective actions taken when readings or results exceeded set action levels. One minor elevated reading was discovered during the inspection period and subsequent surveys showed that the area was properly cleaned.

Reactor water samples were evaluated monthly for alpha and beta radiation as well as tritium content. A high reading was obtained during July 2003, and was verified to be a random fluctuation in normal readings. Further monitoring of the reactor water did not indicate abnormal readings. To assist the verification of abnormal readings, two samples are now obtained on a monthly basis. The second sample is only used for confirmation of high radiation levels. Filters from the Reactor Continuous Air Monitor (CAM) were analyzed on a bi-weekly basis for alpha and beta radiation. The samples that were taken indicate that the reactor integrity has not been compromised and shows no trend of breakdown, release, or degradation.

(2) Postings and Notices

The inspector reviewed the postings at the entrances to the facility controlled areas. The postings were acceptable and indicated the radiation hazards present. Other postings also showed the industrial hygiene hazards present in the areas. The facility's radioactive material storage areas were noted to be properly posted. No unmarked radioactive material was detected in the facility. Copies of current notices to workers required by 10 CFR Part 19 were posted on the bulletin board in the hallway leading to the reactor facility.

(3) Dosimetry

The licensee used a National Voluntary Laboratory Accreditation program-accredited vendor, Global Dosimetry Solutions, Inc., to process personnel dosimetry. Through direct observation, the inspector determined that dosimetry was acceptably used by facility personnel. For visitors to the facility and high school students, no dosimetry is issued for monitoring due to low background readings and no direct exposures to sources. If a source is to be manipulated or direct exposures are anticipated, pocket dosimeters are issued to the students.

An examination of the records for the inspection period showed that all exposures were well within NRC limits and within licensee action levels. There are currently four people at the facility that are being monitored, in addition to the REM personnel that perform duties less than full-time at the facility. Extremity monitoring, accomplished through the use of finger rings, also showed relatively low doses to the hands of staff members. All of the personnel associated with the facility received an annual whole body exposure less than 200 millirem (mrem). The highest extremity exposure received during a two month monitoring period for the past two years was approximately 211 mrem. For any whole body or extremity exposures that exceed 100 mrem in a two month period, a letter is sent to the badge holder notifying him/her of the exposure.

(4) Radiation Monitoring Equipment

The calibration of portable survey meters and friskers was typically completed by REM personnel at the radiation safety office while fixed radiation detectors and air monitoring instruments were calibrated by REM personnel at the facility. The inspector visually observed the calibration equipment and verified that the sources and electronics used were sufficient to conduct the calibrations. The calibration records of portable survey meters, friskers, fixed radiation detectors, and air monitoring equipment in use at the facility were reviewed. Calibration frequency met the requirements established in the applicable procedures while records were being maintained as required.

(5) Radiation Protection Program

The licensee's Radiation Protection Program was established in an online document. The program required that all personnel who had unescorted access to work in a radiation area or with radioactive material receive training in radiation protection, policies, procedures, requirements, and facilities prior to entry. The inspector verified that licensee staff had received the required radiation protection ("rad worker") training given by REM. In addition, the reactor supervisor or other senior licensee personnel supervise all new employees at the facility until they are given unescorted access.

The inspector also verified that the Purdue radiation protection program was being reviewed annually as required. No issues were identified in the audit of the program.

(6) ALARA Policy

The ALARA Program was outlined and established in the Purdue University Radiation Safety Manual, which is accessible via the internet. The ALARA program provided guidance for keeping doses as low as reasonably achievable and was consistent with the guidance in 10 CFR Part 20. The inspector noted that the information contained in the manual was all-inclusive and provided working examples of proper radiation safety.

(7) Facility Tours

The inspector toured the Reactor Room and the accompanying laboratories. Control of radioactive material and control of access to radiation and high radiation areas were acceptable. The postings and signs for these areas were appropriate. The inspector also determined that there were no measurable releases of gaseous or liquid radioactive material from the research reactor facility.

(8) Environmental Monitoring

A thermo-luminescent dosimeter (TLD) is placed in the classroom directly above the PUR-1, as well as the classroom located next to the reactor facility. Records show that there was no exposure to these rooms during the previous two years. All gaseous releases from the facility are determined by measuring the radioactivity deposited on the CAM filters located in the reactor room. There was no liquid effluent discharged from the facility. All potentially contaminated water was processed and reused.

c. Conclusions

The inspector determined that, because: (1) surveys were being completed and documented acceptably, (2) postings met regulatory requirements, (3) personnel dosimetry was being worn as required and doses were well within the licensee's procedural action levels and NRC's regulatory limits, (4) radiation monitoring equipment was being maintained and calibrated as required, the Radiation Protection Program being implemented by the licensee satisfied regulatory requirements.

9. Design Changes

a. Inspection Scope (IP 69001)

In order to verify that any modifications to the facility were consistent with 10 CFR 50.59 and TS Section 6.2, the inspector reviewed:

- C CORO meeting minutes
- C completed audits and reviews
- C procedures requiring review of changes under 10 CFR 50.59

b. Observations and Findings

Through review of applicable records and interviews with licensee personnel, the inspector determined that no significant nor minor changes had been initiated and/or completed at the facility since the last inspection. The inspector also verified that administrative controls were in place that required the appropriate review and approval of all changes prior to implementation.

c. Conclusions

No significant nor minor changes had been made at the facility since the last operations inspection.

10. Fuel Handling Logs and Records

a. Inspection Scope (IP 69001)

In order to verify adherence to fuel handling and inspection requirements specified in TS Section 4.3, the inspector reviewed:

- C Procedure 95-4, "Dis-assembly & Re-assembly of Core", dated July 28, 1995
- Procedure 95-5, "Inspection of Fuel Plates", dated July 28, 1995
- Procedure 95-6, "Inspection of Control Rods", dated July 28, 1995
- fuel handling and inspection procedures
- selected operations logs and records

b. Observations and Findings

The inspector determined that the licensee was maintaining the required records of the various fuel movements that had been completed and verified that the movements were conducted and recorded in compliance with procedure. All fuel movements were noted in the Reactor Log Book and generally included the same fuel elements every year for the fuel plate inspections and the control rod inspections. The inspector noted that the latest core loading or configuration had been in place since March 7, 1969.

The inspector verified that the representative fuel plates were being inspected annually as required by TS. The procedures and the controls specified for these operations were acceptable.

c. Conclusion

Fuel movements and inspections in general were completed and documented in accordance with the requirements specified by procedure.

11. Emergency Preparedness

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify the implementation of the Emergency Plan:

- C Emergency Plan for the Purdue University Reactor PUR-1, dated March 20, 2000
- C Emergency Procedure, Number 03-1-EP, approved March 25, 2003
- C Critiques of drills held February 25, 2004 and January 24, 2005

- Inventory of emergency supplies, dated December 22, 2003 and December 20, 2004
- Biennial audit of the emergency plan for 2003

b. Observations and Findings

The Emergency Plan (E-Plan) in use at the PUR facility was the same as the version most recently approved by the NRC, dated March 20, 2000. The E-Plan was audited and reviewed biennially as required. The inspector advised the licensee that the biennial audit of the plan was due. Implementing procedures were reviewed and revised as needed to effectively implement the E-Plan. Emergency facilities, instrumentation, and equipment were being maintained and controlled, and supplies were being inventoried annually as required in the E-Plan.

The inspector noted that emergency response relies on the University resources such as campus police, firefighters, and EMTs. No formal agreements for support by outside agencies was required.

Emergency drills had been conducted annually as required by the E-Plan. The drill for 2003 was a practical exercise, while the drill in 2004 was a table-top exercise. Critiques were written following the drills to document the strengths and weaknesses identified during the exercises and to develop possible solutions to any problems noted. Drill scenarios were challenging and involved response by most of the support organizations. Emergency preparedness and response training for reactor staff and the emergency responders was being completed and documented. Critiques indicated that the E-Plan was properly implemented. All problems identified during the drills were subsequently corrected and future drills will ensure that similar issues do not occur again.

The inspector visited the Purdue University Fire Department and observed the emergency response equipment that would be used during a radiological emergency at the facility. During the tour of the fire station, the inspector talked with the deputy fire chief about the support role the fire department provides to the licensee. The deputy fire chief was very confident of the services that they provide and did not have any suggestions for more communications with the licensee.

c. Conclusions

The emergency response program was conducted in accordance with the requirements stipulated in the Emergency Plan.

12. Exit Interview

The inspection scope and results were summarized on August 18, 2005, with members of licensee management. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

E. Merritt, Reactor Supervisor
J. Jenkins, Laboratory Director
S. McDeavitt, Associate Professor
J. Schweitzer, Radiation Safety Officer and Director, REM
K. Ply, Deputy Fire Chief, Purdue University Fire Department
B. Revis, Electronics Technician

INSPECTION PROCEDURES USED

IP 69001 Class II Non-Power Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-182/2005-201-01	IFI	Follow-up to verify that the licensee's future audits of the qualifications and training of the licensed operators ensure that all conditions of the operator's licenses are being met.
50-182/2005-201-02	NCV	The licensee allowed an operator to continue licensed activities without meeting the conditions of the license.
50-182/2005-201-03	URI	Failure to conduct damper checks of the ventilation system in accordance with TS requirements.

Closed

None

LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access and Management System (NRC's system)
CAM	Continuous Air Monitor
CFR	Code of Federal Regulations
CORO	Committee on Reactor Operations
E-Plan	Emergency Plan
HP	Health Physics
IFI	Inspector Follow-up Item
IP	Inspection Procedure
LCO	Limiting Conditions for Operation
MREM	millirem
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
PARS	Publicly Available Records
PUR-1	Purdue University Reactor 1
REM	Radiological and Environmental Management
RO	Reactor Operator
SRO	Senior Reactor Operator
TS	Technical Specifications
URI	Unresolved Item