

July 11, 2012

Mr. Jere Jenkins, Director
Purdue University Radiation Laboratory
School of Nuclear Engineering
400 Central Drive
West Lafayette, IN 47904-2017

SUBJECT: PURDUE UNIVERSITY - NRC ROUTINE INSPECTION REPORT NO.
50-182/2012-201

Dear Mr. Jenkins:

From June 11 to 14, 2012, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at your Purdue University 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 enclosed report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress. Based on the results of this inspection, no safety concerns or noncompliances with requirements were identified. No response to this letter is required.

In accordance with Title 10 of the *Code of Federal Regulations* Section 2.390, "Public inspections, exemptions, and requests for withholding," 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 (Agencywide Document Access and Management System (ADAMS)). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>.

Should you have any questions concerning this inspection, please contact Gary "Mike" Morlang at 301-415-4092 or by electronic mail at Gary.Morlang@nrc.gov.

Sincerely,
/RA/

Gregory T. Bowman, Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

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

Enclosure: As stated
cc w/ encl: See next page

July 11, 2012

Mr. Jere Jenkins, Director
Purdue University Radiation Laboratory
School of Nuclear Engineering
400 Central Drive
West Lafayette, IN 47904-2017

SUBJECT: PURDUE UNIVERSITY - NRC ROUTINE INSPECTION REPORT NO.
50-182/2012-201

From June 11 to 14, 2012, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at your Purdue University 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 enclosed report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress. Based on the results of this inspection, no safety concerns or noncompliances with requirements were identified. No response to this letter is required.

In accordance with Title 10 of the *Code of Federal Regulations* Section 2.390, "Public inspections, exemptions, and requests for withholding," 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 (Agencywide Document Access and Management System (ADAMS)). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>.

Should you have any questions concerning this inspection, please contact Gary "Mike" Morlang at 301-415-4092 or by electronic mail at Gary.Morlang@nrc.gov.

Sincerely,
/RA/

Gregory T. Bowman, Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

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

Enclosure: As stated
c w/ encl: See next page

DISTRIBUTION:

PUBLIC PROB/rf RidsNrrDprPrta RidsOgcMailCenter
GMorlang NRR DHardesty, NRR RidsNrrDprPrtb
MCompton (Ltr only O13-E19) GLappert, NRR

Accession Number:ML12187A041

TEMPLATE #: NRC-002

| | | | |
|--------|-----------|----------|-----------|
| OFFICE | PROB:RI | PRPB:LA | PROB:BC |
| NAME | GMorlang | GLappert | GBowman |
| DATE | 6/20/2012 | 7/5/2012 | 7/11/2012 |

OFFICIAL RECORD COPY

Purdue University

Docket No. 50-182

cc:

Leah Jamieson, Dean
College of Engineering
Purdue University
West Lafayette, IN 47907

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

Manager
Epidemiology Res Center/Indoor & Radiological Health
Indiana Department of Health
2525 N. Shadeland Ave., E3
Indianapolis, IN 46219

P.E., Director
Consumer Protection
Indiana State Department of Health
2 North Meridian Street, 5D
Indianapolis, IN 46204

Mr. Ed Merritt
Reactor Supervisor
Department of Nuclear Engineering
Purdue University
West Lafayette, IN 47907

Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

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

Docket No: 50-182

License No: R-87

Report No: 50-182/2012-201

Licensee: Purdue University

Facility: Purdue University Reactor

Location: West Lafayette, IN

Dates: June 11 to 14, 2012

Inspectors: Gary "Mike" Morlang
Ossy Font (Trainee)

Approved by: Gregory T. Bowman, Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

Purdue University
Purdue University Reactor
NRC Inspection Report No. 50-182/2012-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the Purdue University's (the licensee's) Class II research reactor facility safety programs including operations logs and records; procedures; surveillance and limiting conditions for operation; health physics; effluents and environmental monitoring; committees, audits, and reviews; and transportation. The licensee's programs were acceptably directed toward the protection of public health and safety and were in compliance with U.S. Nuclear Regulatory Commission requirements.

Operations Logs and Records

- Within the scope of this review, the licensee's operations record keeping program conformed to Technical Specification requirements.

Procedures

- The inspector found that appropriate procedures were in effect and new procedures were being prepared as needed.

Surveillance and Limiting Conditions for Operation

- Surveillance testing was observed to be performed in accordance with requirements as stated in the Technical Specifications.

Health Physics

- The inspectors verified that the licensee's health physics program was effective in minimizing radiation doses to individuals through training, notices to workers, radiation monitoring and surveys, and calibrated equipment.

Effluent and Environmental Monitoring

- Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory limits.

Committees, Audits, and Reviews

- The Committee on Reactor Operations provided the oversight required by the Technical Specifications.

Transportation

- The licensee had not shipped any radioactive material since the last inspection.

REPORT DETAILS

Summary of Facility Status

The Purdue University's (the licensee's) one kilowatt research reactor continued to be operated in support of graduate and undergraduate education and laboratory instruction. Since the inspection was performed at the end of a semester, laboratory experiments were not scheduled and the reactor was not operating.

1. Operations Logs and Records

a. Inspection Scope (IP 69001)

The inspectors reviewed selected parts of the following reactor operations records to verify that the requirements of Technical Specifications (TS) Section 6.5, "Operating Records," were being met:

- Purdue University Reactor (PUR) Procedures Manual
- PUR Procedure 91-1, "Reactor Startup, Operation and Shutdown," dated June 1991
- "Report on Reactor Operations for the Period January 1, 2010, to December 31, 2010," E. Merritt, dated March 2011
- Reactor Logbook No. 52, June 11, 2010, to October 27, 2010
- Reactor Logbook No. 53, October 27, 2010, to February 28, 2011
- Reactor Logbook No. 54, February 29, 2011, to November 30, 2011
- Reactor Logbook No. 55 November 30, 2011, to present
- File of completed Pre-start Checklists, including those for 2011 and 2012
- File of completed Shutdown Checklists, including those for 2011 and 2012

b. Observations and Findings

The PUR procedures specified a records system that was commensurate with TS requirements. Procedures called for operational data to be recorded in the reactor logbooks, startup checklists, and shutdown checklists. Data recorded indicated that the reactor was operated within reactor license and TS parameters.

c. Conclusion

The licensee's operations record keeping program conformed to TS requirements.

2. Procedures

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the requirements of TS Section 6.3, "Operating Procedures," were being met:

- PUR Procedures Manual
- PUR 91-1, "Reactor Startup, Operation and Shutdown," dated June 1991
- PUR 07-01, "Partial or complete disassembly and reassembly of the PUR core," dated September 7, 2007
- PUR-03-01-EP, "Emergency Procedure," dated March 25, 2003
- PUR-05-01, "Sample Irradiation," dated June 14, 2005
- PUR 07-05, "Procedure for core loading," dated September 1, 2007
- PUR M-2, "Procedure for checking the Source Missing Interlock," dated June 8, 1995
- PUR M-3, "Procedure for determining magnet current settings and checking the fast scrams," dated June 29, 1995
- PUR M-4, "Procedure for measuring Shim-safety rod drop times," dated July 28, 1995
- PUR M-5, "Calibration of Radiation Area Monitors," dated July 28, 1995
- PUR M-6, "Determining Excess Reactivity," dated July 27, 1995

b. Observations and Findings

The inspectors reviewed the licensee's written procedures and revisions to procedures. The procedures reviewed were thorough and of the appropriate level of detail. The Procedures Manual included lists of "Approved Procedures," "Maintenance Procedures," and "Emergency Procedures," all of which were reviewed and approved by the Committee for Reactor Operations (CORO). The inspectors noted that TS Section 6.4.8 requires all temporary pen and ink procedure changes initiated by the reactor supervisor to be "subsequently" reviewed by the CORO. A number of temporary changes had been made to several procedures over many years. No record of review by the CORO for these changes could be located.

The licensee was informed that failure to have the pen and ink procedure changes reviewed by the CORO 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-50-182/2010-201-01).

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.

c. Conclusion

The inspectors found that appropriate procedures were in effect and new procedures were being prepared as needed. A URI was noted for failure to have temporary pen and ink changes to maintenance procedures reviewed by the CORO.

3. Surveillance and Limiting Conditions for Operation

a. Inspection Scope (IP 69001 and IP 92701)

The inspectors reviewed the following to determine if the periodic surveillance tests on safety systems were performed as stipulated in TS Section 4.0, Surveillance Requirements:

- Surveillance Manual
- File of completed Pre-start Checklists including those for 2011 and 2012
- Procedure 91-1, "Reactor Startup, Operations and Shutdown," dated June 1991
- Procedure 95-7-RR, "Calibration of Regulating Rod," dated July 25, 1995
- Procedure 95-7-SS, "Calibration of Shim Safety Rod," dated July 28, 1995
- Reactor Logbook No. 52, June 11, 2010, to October 27, 2010
- Reactor Logbook No. 53, October 27, 2010, to February 28, 2011
- Reactor Logbook No. 54, February 29, 2011, to November 30, 2011
- Reactor Logbook No. 55, November 30, 2011, to present

b. Observations and Findings

Surveillance requirements were primarily done as part of the pre-start checkout; surveillance such as control rod drop time tests and water chemistry tests were documented with individual procedures or in the Console Log Books. Checks and calibrations were completed as required by TS.

TS 6.2.6.a requires that the CORO perform an annual audit of facility operation the TS and applicable license conditions. A thorough audit report indicated completion of the requirement for the year 2010. The audit for 2011 was completed with the exception of excess reactivity and rod worth calculations.

c. Conclusion

Surveillance test were observed to be performed in accordance with requirements as stated in the TS.

4. Health Physics

a. Inspection Scope (IP 69001)

The inspectors reviewed the following to verify compliance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20 requirements:

- Standard Operating Procedure Section 52, "Radiological Safety Program"
- Radiation Safety Manual
- Personnel dosimetry records
- Radiation Monitor Calibration Logbook, March 2010 to present
- 2012 Audit of Radiation Safety Program Content and Implementation, completed June 8, 2012, by Jim Schweitzer, Director/Radiation Safety Officer

b. Observations and Findings

The inspectors reviewed records of radiation surveys performed by a Radiological and Emergency Management (REM) health physics specialist, and found activity levels to be generally consistent with background radiation. A copy of the current NRC Form 3 notice to radiation workers required by 10 CFR Part 19 was posted at the entrance to the reactor bay.

Dosimetry results were reviewed by the inspectors and PUR facilities' associated exposures were in conformance with 10 CFR Part 20 and administrative limits. The maximum whole body exposure during 2011 was 10 millirem and the maximum exposure to extremities was 152 millirem. The maximum whole body exposure for year-to-date 2012 is 0 millirem and the maximum exposure to extremities is 40 millirem. All results are below 10 CFR Part 20 limits.

The calibration records of selected devices were reviewed. Calibration tags on devices found throughout the facility were verified to be current and in accordance with the calibration records that were reviewed. REM calibrated the PUR-1 facility portable radiological monitoring equipment onsite.

The inspectors reviewed Radiation Safety Training records given every 2 years to permanent reactor staff and found them to be up-to-date. Students are given separate training during their sophomore year.

c. Conclusion

The inspectors verified that the licensee's health physics program was effective in minimizing radiation doses to individuals through training, notices to workers, radiation monitoring and surveys, and calibrated equipment.

5. Effluent and Environmental Monitoring

a. Inspection Scope (IP 69001)

The inspectors reviewed the following to verify compliance with the requirements of 10 CFR Part 20:

- 2011 Reactor Air and Water Annual Report
- Reactor Continuous Air Monitor Filter Data Worksheets for 2011 and 2012
- Reactor Water Data Worksheets for 2011 and 2012

b. Observation and Findings

The inspectors reviewed air and water data collected by REM staff that would indicate if fuel integrity had been comprised or breached. There were no indications of nuclear fuel or its byproducts having been detected in the water or air samples. Licensee air samples showed that all samples were below minimum detectable activity and were normally counted approximately 2 weeks after collection to allow for radon daughter decay.

The licensee also reported the results of several thermoluminescent dosimeters (TLDs) placed around the PUR facility as environmental radiation monitors, including the Electrical Engineering classroom above it. In all cases the TLDs indicated no significant difference from background radiation levels.

c. Conclusion

Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory limits.

6. Committees, Audits, and Reviews

a. Inspection Scope (IP 69001 and IP 92701)

The inspectors reviewed the following to verify compliance with the requirements of TS Section 6.2, "Review and Audit":

- Annual Report for January 1 to December 31, 2010
- CORO Meeting Minutes, June 7, 2012
- CORO Meeting Minutes, July 22, 2011
- CORO Meeting Minutes, October 10, 2011
- 2012 Audit of Radiation Safety Program Content and Implementation, Completed June 8, 2012, by Jim Schweitzer, Director/Radiation Safety Officer

b. Observations and Findings

The CORO was short one member with the retirement of the Reactor Supervisor. The job was posted; however, at the time of the inspection there were no applicants. A quorum as defined in TS Section 6.2.4 was present at each of the meetings reviewed. Meetings were held at the required frequency as specified in TS Section 6.2.3.

Through review of CORO meeting minutes from the recent past, the inspectors verified that the committee was performing the review responsibilities defined in TS Section 6.2.5.

c. Conclusion

The Committee on Reactor Operations provided the oversight required by the TS.

7. Transportation

a. Inspection Scope (IP 86740)

The inspectors interviewed personnel to verify compliance with regulatory and procedural requirements for transferring licensed material.

b. Observations and Findings

None.

c. Conclusion

The licensee had not shipped any radioactive material since the last inspection.

8. Exit Meeting Summary

The inspectors reviewed the inspection results with members or the licensee management at the conclusion of the inspection on June 14, 2012. The licensee acknowledged the findings presented and did not identify as proprietary any of the material provided to or reviewed by the inspector during the inspection. The licensee acknowledged the results of the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

| | |
|------------------|------------------------------------|
| J. Cox | Chief, Purdue University Police |
| J. H. Jenkins | Director of Radiation Laboratories |
| E. C. Merritt | Reactor Supervisor |
| J. F. Schweitzer | Director/Radiation Safety Officer |
| Z. Tribbett | Health Physics Staff |

Other Personnel

None

INSPECTION PROCEDURES USED

| | |
|----------|-------------------------------------|
| IP 69001 | Class II Research and Test Reactors |
| IP 92701 | Follow-up |

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

| | | |
|--------------------|-----|---|
| 50-182/2010-201-01 | URI | Failure to have pen and ink temporary changes to procedures reviewed by the CORO. |
|--------------------|-----|---|

PARTIAL LIST OF ACRONYMS USED

| | |
|--------|--|
| ADAMS | Agencywide Document Access Management System |
| 10 CFR | Title 10 of the <i>Code of Federal Regulations</i> |
| CORO | Committee on Reactor Operations |
| IP | Inspection Procedure |
| No. | Number |
| NRC | U.S. Nuclear Regulatory Commission |
| NRF | Nuclear Reactor Facility |
| PARS | Publicly Available Records |
| PUR | Purdue University Reactor |
| REM | Radiological and Environmental Management |
| Rev. | Revision |
| TLD | Thermoluminescent Dosimeter |
| TS | Technical Specifications |
| URI | Unresolved Item |