



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

March 20, 2019

Dr. Robert Bean, Director  
Purdue University Radiation Laboratory  
School of Nuclear Engineering  
400 Central Drive  
West Lafayette, IN 47904-2017

SUBJECT: PURDUE UNIVERSITY – U.S. NUCLEAR REGULATORY COMMISSION SAFETY  
INSPECTION REPORT NO. 05000182/2019-201

Dear Dr. Bean:

From March 5-7, 2019, the U.S. Nuclear Regulatory Commission (NRC) conducted an announced safety inspection at the Purdue University Reactor. The inspection included a review of activities authorized for your facility. The enclosed report presents the results of that inspection.

During the inspection, the NRC staff examined activities conducted under your license as they relate to public health and safety to ensure compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel. Based on the results of this inspection, no findings of significance 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, requests for withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (Agencywide Documents Access and Management System (ADAMS)). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

R. Bean

- 2 -

Should you have any questions concerning this inspection, please contact Mr. William Schuster at 301-415-1590 or by electronic mail at [William.Schuster@nrc.gov](mailto:William.Schuster@nrc.gov).

Sincerely,

*/RA/*

Anthony J. Mendiola, Chief  
Research and Test Reactors Oversight Branch  
Division of Licensing Projects  
Office of Nuclear Reactor Regulation

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

Enclosure:  
As stated

cc: See next page

Purdue University

Docket No. 50-182

cc:

Mung Chiang, Dean of Engineering  
Purdue University  
School of Nuclear Engineering  
400 Central Drive  
West Lafayette, IN 47907

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

Kaci E. Studer, Radiation Programs Director  
Office of the State Fire Marshal  
Indiana Department of Homeland Security  
302 West Washington Street, Room E-238  
Indianapolis, IN 46204

Clive Townsend, Reactor Supervisor  
Purdue University  
School of Nuclear Engineering  
400 Central Drive  
West Lafayette, IN 47907

Test, Research and Training  
Reactor Newsletter  
Attention: Amber Johnson  
Dept of Materials Science and Engineering  
University of Maryland  
4418 Stadium Drive  
College Park, MD 20742-2115

SUBJECT: PURDUE UNIVERSITY – U.S. NUCLEAR REGULATORY COMMISSION SAFETY  
INSPECTION REPORT NO. 05000182/2019-201 DATE: MARCH 20, 2019

**DISTRIBUTION:**

PUBLIC	AMendiola, NRR	RidsNrrDlpProb
PROB r/f	WSchuster, NRR	NParker, NRR
RidsNrrDlpPrlb	CMontgomery, NRR	DHardesty, NRR

**ADAMS Accession No.: ML19074A267 \*concurred via e-mail NRC-002**

<b>OFFICE</b>	NRR/DPR/PROB/PM*	NRR/DPR/PROB/LA*	NRR/DPR/PROB/BC
<b>NAME</b>	WSchuster	NParker	AMendiola
<b>DATE</b>	3/15/19	3/15/19	3/20/19

**OFFICIAL RECORD COPY**

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

Docket No.: 50-182

License No.: R-87

Report No.: 05000182/2019-201

Licensee: Purdue University

Facility: Purdue University Reactor

Location: West Lafayette, Indiana

Dates: March 5-7, 2019

Inspector: William Schuster

Approved by: Anthony Mendiola, Chief  
Research and Test Reactors Oversight Branch  
Division of Licensing Projects  
Office of Nuclear Reactor Regulation

Enclosure

## EXECUTIVE SUMMARY

Purdue University  
Purdue University Reactor  
Inspection Report No. 05000182/2019-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the Purdue University (the licensee) research reactor facility safety program, including: (1) organization and staffing, (2) operating logs and records, (3) procedures, (4) requalification training, (5) surveillance and limiting conditions for operation, (6) experiments, (7) health physics, (8) design changes, (9) committees, audits and reviews, (10) emergency planning, (11) maintenance logs and records, (12) fuel handling logs and records, and (13) transportation of radioactive material. The licensee's programs were acceptably directed toward the protection of public health and safety, and generally in compliance with U.S. Nuclear Regulatory Commission (NRC) requirements.

### Organization and Staffing

- Organization and staffing were in compliance with the technical specification (TS) requirements.

### Operations Logs and Records

- Operations logs and records were found to be in conformance with the approved TS and administrative procedures.

### Procedures

- Procedural review, revision, control, and implementation generally satisfied the TS requirements. One Inspector Follow-up Item (IFI) was opened on updates to procedures.

### Requalification Training

- Requalification activities generally satisfied regulatory and requalification program requirements. One IFI was opened on documentation of annual operating tests and literature reviews.

### Surveillance and Limiting Conditions for Operation

- Surveillance activities at the facility were generally completed within the TS-prescribed time frames. One Unresolved Item (URI) was opened for environmental monitoring thermoluminescent dosimetry (TLD) cycles.

### Experiments

- The program for reviewing, approving, and conducting experiments satisfied TS and procedural requirements.

### Health Physics

- Surveys were being completed and documented acceptably.
- Postings met regulatory requirements.
- Personnel dosimetry was being worn as required and doses were within regulatory limits.
- Radiation monitoring equipment was being maintained and calibrated as required.
- Radiation protection training was being provided to facility personnel.
- Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory limits.

### Design Changes

- Changes to the facility were being evaluated using the criteria specified in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.59, "Changes, tests and experiments."

### Committees, Audits, and Reviews

- The review and audit functions performed by the Committee on Reactor Operations (CORO) generally satisfied TS requirements. One IFI was opened on CORO meeting frequency and audits.

### Emergency Planning

- The emergency preparedness program was conducted in accordance with the emergency plan (EP).

### Maintenance Logs and Records

- Maintenance activities were documented and records maintained as required by TS and facility procedures.

### Fuel Handling Logs and Records

- Fuel handling activities were completed and documented as required by TS and facility procedures.

### Transportation of Radioactive Materials

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

## REPORT DETAILS

### Summary of Facility Status

The Purdue University (the licensee) 1-kilowatt research reactor has been shutdown since June 2017 due to instrumentation issues with the previous control console; currently awaiting regulatory decision on a licensing amendment request for digital control system upgrades.

#### 1. Organization and Staffing

##### a. Inspection Scope (Inspection Procedure (IP) 69001, Section 02.01)

To verify compliance with the TS requirements for organization and staffing, the inspector reviewed select aspects of the licensee's program, including:

- "Technical Specifications for the Purdue University Reactor, PUR-1"
- Select records, "Prestart Checklist and Reactor Operation Record"
- Reactor Logbook No. 58, September 29, 2015, to April 29, 2016
- Reactor Logbook No. 59, April 29, 2016, to June 16, 2017
- Reactor Logbook No. 60, June 27, 2017, to present
- Annual Report for January 1 to December 31, 2016, dated March 2017
- Annual Report for January 1 to December 31, 2017, dated March 2018

##### b. Observations and Findings

The inspector reviewed annual reports, reactor logbooks, prestart checklists, and reactor operation records. The inspector determined that the organizational structure had not changed since the previous inspection. The inspector noted that there is a license amendment request pending to change TS 6.1, "Organization." The inspector verified that the facility staffing had not changed since the previous inspection and was maintained as required by TS 6.1.c, "Staffing," for times that the reactor was not secured and when events required the presence of a senior reactor operator (SRO).

##### c. Conclusion

Organization and staffing were in compliance with the TS requirements.

#### 2. Operations Logs and Records

##### a. Inspection Scope (IP 69001, Section 02.02)

To verify compliance with the TS and procedural requirements for logs and records, the inspector reviewed select aspects of the licensee's program, including:

- "Technical Specifications for the Purdue University Reactor, PUR-1"
- Select records, "Prestart Checklist and Reactor Operation Record"
- Reactor Logbook No. 58, September 29, 2015, to April 29, 2016
- Reactor Logbook No. 59, April 29, 2016, to June 16, 2017



- Reactor Logbook No. 60, June 27, 2017, to present
- Select records, "PUR-1 Maintenance Log"
- PUR-1 Procedures Manual
- Annual Report for January 1 to December 31, 2016, dated March 2017
- Annual Report for January 1 to December 31, 2017, dated March 2018

b. Observations and Findings

The inspector reviewed annual reports, procedures, reactor logbooks, prestart checklists, reactor operation records, and maintenance logs. The inspector verified records were maintained in accordance with administrative requirements. The reactor had not been operated at power since the last inspection in this area; however, other activities and maintenance were recorded, as required.

c. Conclusion

Operations logs and records were found to be in conformance with the approved TS and administrative procedures.

### 3. Procedures

a. Inspection Scope (IP 69001, Section 02.03)

To verify compliance with the TS requirements for procedures, the inspector reviewed selected aspects of the licensee's program, including:

- "Technical Specifications for the Purdue University Reactor, PUR-1"
- Standard Operating Procedure [SOP]-1, "Prestart Checklist"
- SOP-2, "Reactor Startup, Operation, Shutdown, and Securing Procedure"
- SOP-07-01, "Partial or Complete Disassembly and Reassembly of the PUR-1 Core"
- SOP-07-05, "Core Loading"
- Standard Maintenance Procedure-6, "Measuring Shim-Safety Rod Drop Times"
- Procedure M-6, "Determining Excess Reactivity"
- Standard Emergency Procedure [SEP]-1, "Emergency Procedures"
- CORO Minutes, February 22, 2016, to August 17, 2017

b. Observations and Findings

The inspector reviewed annual reports, written procedures, and CORO meeting minutes. The inspector verified that procedures had been developed as required by TS 6.4, "Procedures." The inspector noted several procedures reference TS requirements that were changed during license renewal. The licensee is currently considering updates to these procedures in order to implement the aforementioned license amendment request currently under NRC review. The licensee was informed that these procedure updates would be tracked by the NRC as an IFI and reviewed during a future inspection. (IFI 50-182/2019-201-01).

c. Conclusion

Procedural review, revision, control, and implementation generally satisfied TS requirements. One IFI on updates to procedures was opened.

**4. Requalification Training**

a. Inspection Scope (IP 69001, Section 02.04)

To verify compliance with the regulations in 10 CFR Part 55, "Operators' Licenses," and approved requalification program, the inspector reviewed select aspects of the licensee's program, including:

- Operator Requalification Program for the PUR-1 Reactor Facility
- "Biennial Requalification Program Records," for the 2016/2017 and 2018/2019 cycle
- Individual data sheets for the 2016/2017 and 2018/2019 cycle
- Individual SRO operator medical records
- Reactor Logbook No. 58, September 29, 2015, to April 29, 2016
- Reactor Logbook No. 59, April 29, 2016, to June 16, 2017
- Reactor Logbook No. 60, June 27, 2017, to present

b. Observations and Findings

During the entrance meeting, the licensee indicated that portions of the requalification program were unable to be completed with the facility in an extended shutdown condition. At the time of this inspection, the 2016/2017 requalification cycle ended and 2018/2019 requalification cycle was in progress. The inspector reviewed the requalification records for the three licensed SROs at the facility. Two of the three licensed SROs received their license in March 2016. During the 2016/2017 requalification cycle, the licensed SROs attended lectures that covered the topics as required by 10 CFR 55.59(c)(2). Until the time of the facility shutdown in June 2017, the licensed SROs conducted control manipulations as required by 10 CFR 55.59(c)(3)(i). The inspector was unable to find documentation of the annual operating test and literature reviews from 2017 to present. The licensee was informed that these two items would be tracked by the NRC as an IFI and reviewed during a future inspection (IFI 50-182/ 2019-201-02).

c. Conclusion

Requalification activities generally satisfied regulatory and requalification program requirements. One IFI was opened on documentation of annual operating tests and literature reviews.

## 5. Surveillance and Limiting Conditions for Operation

### a. Inspection Scope (IP 69001, Section 02.05)

To verify compliance with the TS requirements for surveillances and limiting conditions for operation, the inspector reviewed select aspects of the licensee's program, including:

- "Technical Specifications for the Purdue University Reactor, PUR-1"
- PUR-1 Maintenance Log
- PUR-1 [Planned Maintenance System (PMS)] Records & Description
- Select records, "Cycle Schedule" datasheet
- Select records, "Quarter #\_\_\_ Schedule" datasheet
- Select records, "Prestart Checklist and Reactor Operation Record"
- Select records, "PUR-1 Water Analysis Report," May 5, 2017, to present
- Reactor Logbook No. 58, September 29, 2015, to April 29, 2016
- Reactor Logbook No. 59, April 29, 2016, to June 16, 2017
- Reactor Logbook No. 60, June 27, 2017, to present
- CORO Minutes, August 17, 2017
- Annual Report for January 1 to December 31, 2017, dated March 2018
- Select records, personnel dosimetry results from 2018
- Select records, environmental dosimetry results from 2018

### b. Observations and Findings

The licensee used surveillance datasheets to ensure the required annual, semiannual, quarterly, monthly, and weekly administrative and TS items were completed in periodicity. The inspector reviewed check lists, data sheets, and reactor logbooks. In August 2017, the CORO approved deferring a number of TS surveillances that were not able to be completed due to the extended facility shutdown. The deferred TS surveillances are required to be performed prior to startup. Surveillance requirements performed were documented in the reactor logbooks and surveillance datasheets.

TS 4.6, "Fuel Parameters," states that [r]epresentative fuel plates shall be inspected annually, with no interval to exceed 15 months. Contrary to TS 4.6 the fuel inspection was not conducted within the grace period of the required interval. The licensee self-identified the discrepancy in the surveillance interval and performed the fuel inspection while unloading the core in March 2018. The licensee self-reported the violation of the TS requirement with the submission of the 2017 PUR-1 Annual Report. There was little or no potential safety consequence because PUR-1 has been in an extended shutdown condition and primary coolant resistivity has been maintained as required by TS 3.3, "Primary Coolant Conditions," Specification a. Therefore, the inspector determined that failure to perform the annual fuel inspection was a violation of minor safety concern. Based on Section 2.3.1, "Minor Violation," of the NRC's Enforcement Policy, violations of minor safety concern generally do not warrant enforcement action but must be corrected. The licensee was informed that this non-repetitive, licensee-identified and corrected violation would be treated as a minor violation. This issue is considered closed.

The inspector noted that the surveillance requirements for effluents indicates that TLD badges for environmental monitoring shall be changed out according to the guidance of the Purdue University Department of Radiological and Emergency Management (REM) on the same time period as facility personnel or semiannually, not to exceed seven and one half months, whichever is lesser. During a review of the dosimetry report, the inspector noted that the dosimetry cycle for personnel and environmental TLD badges are different, two and three months, respectively. The Radiation Safety Manual did not specify a cycle for dosimetry; industry standards vary cycle length based on expected or actual exposures and may be shortened to maintain radiation doses to personnel as low as reasonably achievable (ALARA). The licensee was informed that this item is considered open, will be tracked by the NRC as an URI, and reviewed during a future inspection (URI 50-182/2019-201-01).

c. Conclusion

Surveillance activities at the facility were generally completed within the TS-prescribed time frames. One URI was opened for environmental monitoring TLD cycles.

**6. Experiments**

a. Inspection Scope (IP 69001, Section 02.06)

To verify compliance with the TS requirements for experiments, the inspector reviewed select aspects of the licensee's program, including:

- "Technical Specifications for the Purdue University Reactor, PUR-1"
- Procedure 91-3, "Use of Drop Tubes for the Irradiation of Small Samples"
- Select records, "Request for Reactor Operations" forms
- Select records, "Request for Sample Irradiation" forms
- CORO Minutes, February 22, 2016, to August 17, 2017
- Reactor Logbook No. 58, September 29, 2015, to April 29, 2016
- Reactor Logbook No. 59, April 29, 2016, to June 16, 2017
- Reactor Logbook No. 60, June 27, 2017, to present

b. Observations and Findings

The inspector reviewed the sample irradiation requests and reactor logbooks. Through discussion with licensee staff, the inspector determined that no new types of experiments were reviewed or approved during the past 2 years. The inspector reviewed the last sample irradiation request from May 2017, which occurred a month prior to the beginning of the extended facility shutdown. The inspector noted that there was a process in place to evaluate experiments to ensure conformance to the requirements of TS 4.5, "Experiments."

c. Conclusion

The program for reviewing, approving, and conducting experiments satisfied TS and procedural requirements.

## 7. Health Physics

### a. Inspection Scope (IP 69001, Section 02.07)

To verify compliance with the regulations in 10 CFR Part 20, "Standards for Protection against Radiation," the inspector reviewed select aspects of the licensee's program, including:

- Purdue University Radiation Safety Manual, updated January 26, 2018
- "Technical Specifications for the Purdue University Reactor, PUR-1"
- Annual Report for January 1 to December 31, 2016, dated March 2017
- Annual Report for January 1 to December 31, 2017, dated March 2018
- Select records, personnel dosimetry results from 2018
- Select records, environmental dosimetry results from 2018
- Radiation and Emergency Management procedures
- Select records, Calibration of radiation monitoring instruments
- Select records, "PUR-1 Contamination Survey," from May 2017 to present
- Select records, "PUR-1 Water Analysis Report," from May 2017 to present
- Select records, Annual radiation safety training for personnel

### b. Observations and Findings

The inspector noted that radiological support is provided to PUR-1 by REM. The inspector reviewed select records of monthly radiation and contamination surveys from May 2017 to the present day. The surveys had been completed as required by procedures and in accordance with the requirements in Subpart F, "Surveys and Monitoring," to 10 CFR Part 20.

During a tour of the facility, the inspector observed that signage, posting, and labels were used in accordance with requirements in Subpart J, "Precautionary Procedures," to 10 CFR Part 20. Radioactive material storage areas were noted to be properly posted. Copies of notices to workers were posted in the facility, including a copy of the most recent revision of NRC Form 3, "Notice to Employees," as required by 10 CFR 19.11, "Posting of notices to workers."

The inspector determined that the licensee was monitoring individuals in accordance with the requirements in 10 CFR 20.1502, "Conditions requiring individual monitoring of external and internal occupational dose." The licensee used TLD badges for whole body monitoring of beta, gamma, and neutron radiation exposure. The licensee also used TLD finger rings for extremity monitoring for beta and gamma radiation exposure. The dosimetry was supplied through REM and processed by a National Voluntary Laboratory Accreditation Program accredited vendor, Mirion. An examination of the dosimetry records for the past year showed that the highest occupational doses were within Subpart C, "Occupational Dose Limits," to 10 CFR Part 20 limits and licensee action levels.

The inspector reviewed the records of selected meters, detectors, and air

monitoring equipment in use at the facility. Calibration of the portable and fixed meters and monitors were consistent with manufacturer's recommendations and appropriate calibration records were being maintained. Portable survey meters were maintained as required by Subpart F to 10 CFR Part 20.

The inspector reviewed the radiation protection training delivered to PUR-1 staff. The course materials were maintained online, consisting of a presentation and evaluation (quiz). Through records review, the inspector verified that refresher training was completed by the PUR-1 facility staff. The content of the training program satisfied the requirements in 10 CFR 19.12, "Instruction to workers."

The radiation protection program was acceptably established in the Purdue University Radiation Safety Manual and implementing procedures. The manual outlined various ways the program maintains radioactive exposure to personnel ALARA, and was consistent with the requirements in 10 CFR 20.1101, "Radiation protection programs."

The inspector reviewed annual reports, reactor logbooks, and facility effluent records. No measurable amount of radioactive effluent was released to the environment during the time period reviewed. Environmental gamma radiation monitoring was conducted using TLDs in accordance with the applicable procedures. The data indicated that there were no radiation doses in uncontrolled areas from operation of the reactor that would result in a member of the public exceeding the limits in Subpart D, "Radiation dose limits for individual members of the public," to 10 CFR Part 20.

c. Conclusion

Surveys were being completed and documented acceptably. Postings met regulatory requirements. Personnel dosimetry was being worn as required and doses were within regulatory limits. Radiation monitoring equipment was being maintained and calibrated as required. Radiation protection training was being provided to facility personnel. Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory limits.

**8. Design Changes**

a. Inspection Scope (IP 69001, Section 02.08)

To verify compliance with the regulations in 10 CFR 50.59, the inspector reviewed select aspects of the licensee's program, including:

- "Technical Specifications for the Purdue University Reactor, PUR-1"
- Annual Report for January 1 to December 31, 2016, dated March 2017
- Annual Report for January 1 to December 31, 2017, dated March 2018
- Select memoranda, Subject: "Re: 10 CFR 50.59 Review [...]" from 2016-2017

b. Observations and Findings

Based on reviews of annual reports and related records, the inspector

determined various modifications and design changes had been initiated at the facility since the last NRC inspection. Changes in 2017 were related to ongoing improvements to the surrounding engineering building, which included: 1) replacement of the reactor room exhaust fan, 2) construction of rooms adjacent to the reactor room, and 3) replacement of the reactor room air handling unit. Changes to structures, systems, or components were typically reviewed and evaluated by the reactor staff. The licensee determined that none of the changes that had been proposed to date met the criteria of 10 CFR 50.59(c)(2) paragraphs (i) through (viii), which would require NRC approval of the changes.

c. Conclusion

Changes to the facility were being evaluated using the criteria specified in 10 CFR 50.59.

**9. Committees, Audits and Review**

a. Inspection Scope (IP 69001, Section 02.09)

To verify compliance with the TS requirements for review and audit, the inspector reviewed select aspects of the licensee's program, including:

- Annual Report for January 1 to December 31, 2016, dated March 2017
- Annual Report for January 1 to December 31, 2017, dated March 2018
- Quarterly CORO Minutes, February 22, 2016, to August 17, 2017
- PUR-1 Biennial Requalification Program Audit, dated March 31, 2017
- PUR-1 Emergency Plan Audit, dated June 14, 2017
- Form, "PUR-1 Technical Specifications Audit"

b. Observations and Findings

The inspector reviewed the CORO meeting minutes since the last inspection in this area. Based on this review, a quorum was present at each of the meetings as required by TS 6.2, "Review and Audit," item b.2. Meeting minutes were maintained as required by TS 6.2.b.5. The inspector verified that the committee was performing the review functions as defined in TS 6.2.c. The inspector verified that the committee completed requalification and emergency planning audits as required by TS 6.2.d.3 and TS 6.2.d.4. During the entrance meeting, the licensee informed the inspector that some of the CORO functions have not occurred due to the extended shutdown condition of the facility. The inspector was unable to find documentation of the annual CORO meeting and facility operations audit. The licensee was informed that these two items would be tracked by the NRC as an IFI and reviewed during a future inspection (IFI 50-182/2019-201-03).

c. Conclusion

The review and audit functions performed by the CORO generally satisfied TS requirements. One IFI was opened on CORO meeting frequency and audits.

## 10. Emergency Planning

### a. Inspection Scope (IP 69001, Section 02.10)

To verify compliance with Appendix E to 10 CFR Part 50, "Emergency Planning and Preparedness for Production and Utilization Facilities," and the approved EP, the inspector reviewed select aspects of the licensee's program, including:

- "Emergency Plan for the [PUR-1]," dated June 30, 2008
- SEP-1, "Emergency Procedures," dated August 17, 2017
- Summaries and reports of annual reactor exercises, from 2016-2018
- PUR-1 PMS Records & Description
- Emergency Equipment Locker Inventory datasheets

### b. Observations and Findings

The inspector reviewed the EP, which had changed since the previous inspection in this area, and the implementing procedures. The EP was submitted for NRC review during the license renewal; which was granted in October 2016. The implementing procedure was maintained current and readily available to staff. The inspector verified that drills and exercises were conducted annually, as required by Section 9.2 of the EP. The inspector noted that training for emergency response personnel is typically accomplished through the operator requalification program at the facility. The inspector checked the emergency kit at the facility for use by responders and observed the supplies to be maintained appropriately. The emergency supply inventories were conducted annually by PUR-1 staff, as required by Section 9.5 of the EP.

### c. Conclusion

The emergency preparedness program was conducted in accordance with the EP.

## 11. Maintenance Logs and Records

### a. Inspection Scope (IP 69001, Section 02.11)

To verify compliance with TS requirements for maintenance records, the inspector reviewed select aspect of the licensee's program, including:

- PUR-1 Maintenance Log
- PUR-1 PMS Records & Description
- Select records, "Cycle Schedule" datasheet
- Select records, "Quarter #\_\_ Schedule" datasheet
- Reactor Logbook No. 58, September 29, 2015, to April 29, 2016
- Reactor Logbook No. 59, April 29, 2016, to June 16, 2017
- Reactor Logbook No. 60, June 27, 2017 to present
- Annual Report for January 1 to December 31, 2016, dated March 2017
- Annual Report for January 1 to December 31, 2017, dated March 2018

### b. Observations and Findings



The inspector reviewed reactor and maintenance logs since the previous inspection in this area. The inspector noted corresponding entries in the reactor and maintenance logs allowing detailed tracking of events. The licensee utilized datasheets that described and assigned periodicity for each task. Tasks were completed within assigned periodicity and associated grace period.

c. Conclusion

Maintenance activities were documented and records maintained as required by TS and facility procedures.

## 12. Fuel Handling Logs and Records

a. Inspection Scope (IP 69001, Section 02.12)

To verify compliance with TS requirements for the PUR-1 fuel, the inspector reviewed select aspects of the licensee's program, including:

- SOP 07-01, "Partial or Complete Disassembly and Reassembly of the Core"
- SOP 07-02, "Inspection and Disassembly of Control Rods"
- SOP 07-05, "Core Loading Procedure"
- Procedure 95-5, "Inspection of Fuel Plates," dated April 1, 2015
- Reactor Logbook No. 58, September 29, 2015, to April 29, 2016
- Reactor Logbook No. 59, April 29, 2016, to June 16, 2017
- Reactor Logbook No. 60, June 27, 2017, to present
- PUR-1 Core Status Board

b. Observations and Findings

The inspector reviewed the fuel handling procedures, logs, and records. The inspector verified that procedures for loading, unloading, movement, inspections, and surveillances were reviewed and approved as required. Based on a review of the reactor logbook, the inspector determined that an SRO was present during the fuel movement activities as required by TS 6.1.c.2. The inspector verified that fuel handling tools were adequately controlled/secured when not in use.

c. Conclusion

Fuel handling activities were completed and documented as required by TS and facility procedures.

## 13. Transportation

a. Inspection Scope (IP 86740)

To verify compliance with the regulations in 10 CFR, "Energy," 49 CFR, "Transportation," the inspector conducted interviews of licensee personnel.

b. Observations and Findings

Through discussions with licensee personnel, the inspector discovered that the licensee had not conducted any shipments of radioactive material since the previous inspection in this area.

c. Conclusion

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

**14. Exit Interview**

The inspection scope and results were summarized on March 7, 2019, 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 Personnel**

R. Bean	Director, Radiation Laboratories
C. Townsend	Reactor Supervisor
D. Storz	Senior Reactor Operator

### **Other Personnel**

J. F. Schweitzer	Director, REM and Radiation Safety Officer
M. Tang	Health Physicist, REM

## **INSPECTION PROCEDURES USED**

IP 69001	Class II Non-Power Reactors
IP 86740	Transportation

## **ITEMS OPENED, CLOSED, AND DISCUSSED**

### **Opened**

50-182/2019-201-01	IFI	Follow up on updates to TS required procedures.
50-182/2019-201-02	IFI	Follow up on annual operating test and literature review
50-182/2019-201-03	IFI	Follow up on CORO meeting periodicity and audits
50-182/2019-201-01	URI	Follow up on environmental monitoring TLD cycles

### **Closed/Discussed**

None

## **LIST OF ACRONYMS USED**

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ALARA	As Low As Reasonably Achievable
CORO	Committee on Reactor Operations
EP	Emergency Plan
IFI	Inspector Follow-up Item
IP	Inspection Procedure
NRC	U.S. Nuclear Regulatory Commission
PMS	Planned Maintenance System
PUR-1	Purdue University Reactor
REM	Radiological and Emergency Management
SEP	Standard Emergency Procedure
SOP	Standard Operating Procedure
SRO	Senior Reactor Operator
TS	Technical Specifications
TLD	Thermoluminescent dosimetry
URI	Unresolved Item