

February 13, 2018

Dr. Lei Cao, Director  
Nuclear Reactor Laboratory  
Ohio State University  
1298 Kinnear Road  
Columbus, OH 43212

SUBJECT: OHIO STATE UNIVERSITY – NUCLEAR REGULATORY COMMISSION SAFETY  
INSPECTION REPORT NO. 50-150/2017-201

Dear Dr. Cao:

From November 27-29, 2017, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at the Ohio State University Nuclear Reactor Laboratory facility. The enclosed report documents the inspection results, which were discussed on November 29, 2017, with you and members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspector reviewed selected procedures and records, observed activities, and interviewed 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* 2.390, "Public inspections, exemptions, and 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).

If you have any questions concerning this inspection, please contact Anthony J. Mendiola at (301) 466-4495, or by electronic mail at [Anthony.Mendiola@nrc.gov](mailto:Anthony.Mendiola@nrc.gov).

Sincerely,

***/RA Elizabeth Reed for/***

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

Docket No. 50-150  
License No. R-75

Enclosure:  
As stated

cc: See next page

Ohio State University

Docket No. 50-150

cc:

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SUBJECT: OHIO STATE UNIVERSITY – NUCLEAR REGULATORY COMMISSION SAFETY  
INSPECTION REPORT NO. 50-150/2017-201 DATE: FEBRUARY 13, 2018

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<b>DATE</b>	2/12/18	2/12/18	2/13/18

**OFFICIAL RECORD COPY**

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

Docket No.: 50-150

License No.: R-75

Report No.: 50-150/2017-201

Licensee: Ohio State University

Facility: Nuclear Reactor Laboratory

Location: Columbus, Ohio

Dates: November 27-29, 2017

Inspector: Ossy Font

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

## **EXECUTIVE SUMMARY**

Ohio State University  
Nuclear Reactor Laboratory  
Nuclear Regulatory Commission  
Inspection Report No. 50-150/2017-201

The primary focus of this routine, announced inspection was the on-site review of selected aspects of the Ohio State University's (the licensee's) Class II research and test reactor safety program including: (1) organization and staffing; (2) operations logs and records; (3) requalification training; (4) surveillance and limiting conditions for operation; (5) emergency planning; (6) maintenance logs and records, and (7) fuel handling logs and records since the last U.S. Nuclear Regulatory Commission (NRC) inspection of these areas. The licensee's program was acceptably directed toward the protection of public health and safety and in compliance with NRC requirements. No violations or deviations were identified.

### Organization and Staffing

- The licensee's organization and staffing qualifications remain in compliance with the requirements specified in the technical specification (TS).

### Operations Logs and Records

- Operational activities were consistent with applicable TS and procedural requirements.

### Requalification Training

- Operator requalification was being conducted and completed as required by the Operator Requalification Program.

### Surveillance and Limiting Conditions for Operation

- The program for surveillance and limiting conditions for operation confirmation was implemented in accordance with TS requirements.

### Emergency Planning

- The emergency preparedness program was conducted in accordance with the Emergency Plan.

### Maintenance Logs and Records

- Maintenance activities ensured that equipment remained consistent with the safety analysis report and TS requirements.

### Fuel Handling Logs and Records

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

## **REPORT DETAILS**

### **Summary of Plant Status**

The Ohio State University's (OSU, the licensee's) five-hundred kilowatt open pool-type reactor continued to be operated in support of undergraduate instruction, laboratory experiments, reactor operator training, and various types of irradiation projects. During the inspection, the reactor was started up and operated, and shut down in accordance with applicable procedures to support these ongoing activities.

### **1. Organization and Staffing**

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

To ensure that the requirements of technical specification (TS) 6.1, "Organization," were being met, the inspector reviewed:

- Organizational structure (TS Figure 6.1)
- OSU Research Reactor (OSURR) Console Log Book entries from March 9, 2016 (page 7891) to present

#### **b. Observations and Findings**

The inspector determined that the organizational structure at the OSURR facility had not changed since the previous U.S. Nuclear Regulatory Commission (NRC) inspection. The Associate Director continued to be responsible for the day-to-day operation of the OSURR and ensured that operations were conducted in a safe manner.

The inspector noted that there were three Senior Reactor Operators (SROs) working at the facility and no reactor operators and determined that the minimum shift staffing composition for operation, including on-call personnel, is consistent with the TS.

#### **c. Conclusion**

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

### **2. Operations Logs and Records**

#### **a. Inspection Scope (IP 69001)**

To ensure that the requirements of TS 6.3, "Procedures," and TS 6.7, "Records," were being met, the inspector reviewed:

- OSURR Console Log Book entries from March 9, 2016 (page 7891) to present
- IM-03, "Pre-Start Checkout," and forms for 2015 – present
- IM-04, "Post-Shutdown Checkout," and forms for 2015 – present
- IM-01, "Reactor Operations," Revision 18, dated June 14, 2017
- Request for Reactor Operations procedures and forms for 2015 – present
- Radiation Safety 09, Area Radiation Survey procedures and forms for 2013-present

Enclosure

- Administrative Procedure (AP) 13 "Personnel Required for Reactor Operations," Revision 5, dated January 13, 2017
  - 16-01, "Neutron Transmission Testing"
  - 17-08, "Radiation Effects of Borated Silflex"
  - 17-13, "Radiation Effects on Lexan Samples"

b. Observations and Findings

The inspector reviewed selected log book entries, request for operations, and pre-start, post-shutdown, and area radiation safety survey forms and determined that logs and records are maintained as required by the licensee's administrative procedures. Records also showed that operational conditions and parameters were consistent with the license and TS requirements. The inspector also observed the reactor staff perform the required pre-start, post-shutdown, and area radiation survey checkout and a reactor startup and shutdown and the completion of the associated records and logs. The inspector determined that reactor operations were carried out following written procedures as required by TS 6.3 and TS 6.7.

c. Conclusion

Operational activities were consistent with applicable TS and procedural requirements.

### 3. Requalification Training

a. Inspection Scope (IP 69001)

To ensure that the requirements of the operator requalification program were being met, the inspector reviewed:

- AP-07, "Document Distribution"
- AP-09, "Reactor Operator/SRO Requalification," Revision 7, approval dated September 25, 1996
- AP-10, "Console Operating Experience Record," and Attachment A
- Operator physical examination records for the past two years
- OSURR Operator Requalification Training Sessions for the past two years
- OSURR Operator Requalification Operational Examination Records for the past two years
- OSURR Operator Requalification Written Examination Records for the past two years
- OSURR Console Operating Experience Records for the past two years
- OSURR Console Log Book entries from March 9, 2016 (page 7891) to present

b. Observations and Findings

As of the date of the inspection, all the operators' licenses were current. All operators were enrolled in the licensee's NRC-approved requalification and training program and had completed a minimum of four hours of shift functions per quarter. The inspector noted that operators were receiving the required biennial medical examinations. A review of the logs and records showed that training was being conducted in accordance with the program. Requalification program data such as completion of written examinations and operation tests was documented as required. Records of



reactivity manipulations, and other operations activities were being maintained throughout the year.

c. Conclusion

Operator requalification was being conducted and completed as required by the operator requalification program.

**4. Surveillance and Limiting Conditions for Operation**

a. Inspection Scope (IP 69001)

To ensure that the requirements of TS 3.0, "Limiting Conditions for Operations," and TS 4.0, "Surveillance Requirements," were being met, the inspector reviewed:

- Surveillance Item Sheets for the past two years
- OSURR Console Log Book entries from March 9, 2016 (page 7891) to present
- "Annual Report for The Ohio State University Research Reactor, License R-75, Docket 50-150," for the past two years
- Surveillance records for the past two years

b. Observations and Findings

The inspector performed a random sampling of the daily, weekly, monthly, quarterly, semi-annual, and other periodic checks, tests, and verifications for TS required limiting conditions for operation (LCO) and determined that they were completed in the specified time frame and in accordance with licensee procedures. The records and logs reviewed were complete and were being maintained as required. The inspector noted that the licensee maintained an effective record keeping system that helped ensure that all required tests, LCO verifications, and calibrations were completed in a timely manner. All routine periodic surveillance items and tasks were listed on log sheets readily visible and available to all operators. It tracks the previous completion and the most recent one, if done.

All the recorded results for the activities reviewed by the inspector were within the TS required parameters.

c. Conclusion

The program for Surveillance and LCO confirmation was implemented in accordance with TS requirements.

**5. Emergency Planning**

a. Inspection Scope (IP 69001)

To ensure that the requirements of emergency plan (E-Plan) were being met, the inspector reviewed:

- Emergency Preparedness Plan, March 2017
- Emergency Procedure (01-04)
- Annual Records from for the past two years
  - E-Plan Training
  - Emergency Drill and Critique
  - Plan Review
  - Inventory of emergency supplies

b. Observations and Findings

The inspector reviewed the new version of the E-Plan and determined that the effectiveness was not reduced.

The inspector confirmed that the E-Plan was being audited and reviewed annually as required. Implementing procedures were reviewed and revised as needed to effectively implement the E-Plan. Emergency preparedness and response training for reactor staff was completed during operator requalification and documented in the program's records. Emergency equipment (meters, supplies, communications, security, and alarms) was being maintained and inventoried annually as required in the E-Plan.

Emergency drills had been conducted annually as required by the E-Plan. The facility participated in a campus wide drill in 2015 called "Buckeye Thunder." The drill for 2016 was a reactor pool overflow. Drill critiques and recommendations were written following the exercises. The critiques indicated that the E-Plan was being properly implemented and all recommendations made following the drills were subsequently addressed.

The inspector visited the Columbus Fire Department and discussed there interaction with the facility. The last facility tours took place in 2015. Future tours will be scheduled. The inspector found that they are prepared to respond to an event at the facility.

c. Conclusion

The emergency preparedness program was conducted in accordance with the E-Plan.

**6. Maintenance Logs and Records**

a. Inspection Scope (IP 69001)

To ensure that maintenance activities associated with the requirements of TS 3.0, "Limiting Conditions for Operations," and TS 4.0, "Surveillance Requirements," were being completed, the inspector reviewed:

- Maintenance Log-Book Volume III and IV
- OSURR Console Log Book entries from March 9, 2016 (page 7891) to present
- IM-07, "Rod Parameter Testing"
- "Control Rod Data" binder
- "Annual Report for The Ohio State University Research Reactor, License R-75, Docket 50-150," for the past two years

b. Observations and Findings

The inspector reviewed the records regarding scheduled and unscheduled preventive and corrective maintenance activities the past two years. The records contained thorough documentation describing the maintenance activity and the repair setup. These records were controlled and maintained in the maintenance and/or operations log as required. After completion of maintenance activities, system operational checks were performed to ensure that the affected systems functioned properly before returning them to service. This was also documented.

One of the maintenance activities reviewed by the inspector involved a change to the period recorder scram setpoint. This was part of the period/startup rate recorder replacement. A new, more conservative setpoint was set. There was no change to the TS.

c. Conclusion

Maintenance activities ensured that equipment remained consistent with the safety analysis report (SAR) and TS requirements.

**7. Fuel Handling**

a. Inspection Scope (IP 69001)

To ensure that the fuel handling and inspection requirements specified in TS 4.1.2, "Fuel Elements," TS 5.3, "Reactor Core and Fuel," TS 5.4, "Fuel Storage," TS 5.5, "Fuel Handling Tools," TS 6.1.3, "Staffing," and TS 6.3.1, "Reactor Operating Procedures," were being met, the inspector reviewed:

- Fuel Inventory Inspection Records for the past two years
- Operation and Maintenance (OM) Procedure OM-07, "Fuel Element Inspections," Revision 8, dated November 11, 2016
- OM-02, "Control Rod Annual Inspection," Revision 3, dated October 28, 2016
- AP-05, "Special Nuclear Material Inventory," and Attachment B, "Fuel Element Inspection Form," Revision 5, dated Feb. 25, 2015
- AP-13, "Personnel Required for Reactor Operations," Revision 5, dated January 13, 2017
- OSURR Console Log Book entries from March 9, 2016 (page 7891) to present
- IM-03, "Pre-Start Checkout"
- IM-04, "Post-Shutdown Checkout"
- IM-05, "Core Reactivity Data"
- IM-07, "Rod Parameter Testing"
- Internal memorandum number NRC-2016-15, Revision 0, dated March 22, 2017, "Fuel Storage Well Criticality Analysis"

b. Observations and Findings

The licensee maintained a fuel element record of all their elements. The inspector reviewed selected records for fuel movements conducted for the periodic surveillance measurements and inspection of the reactor fuel and control rods. The movements of elements and their position in the core were maintained and tracked. All fuel

movements were noted in the appropriate OSURR Console Log Book. The inspector also verified that the fuel handling tool was secured.

Additionally, a fuel storage analysis was performed and it was determined that with the boral plates installed and the fuel storage racks full with every fuel element on site,  $k_{eff}$  upper limit is 0.59, below the 0.68 value stated in the SAR.

c. Conclusion

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

**8. Exit Interview**

The inspection scope and results were summarized on November 29, 2017, with members of licensee management and staff. 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**

L. Cao	Director, Nuclear Reactor Laboratory
A. Kauffman	Associate Director, Nuclear Reactor Laboratory and SRO
D. Konate	Acting RSO
K. Herminghuysen	Research Associate and SRO
S. White	Research Associate and SRO

### **Other Personnel**

J. Kasser	Lt. Col., Fire Station 25
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## **INSPECTION PROCEDURES USED**

IP 69001 Class II Non-Power Reactors

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

### **Opened**

None

### **Closed**

None

### **Discussed**

None

## **LIST OF ACRONYMS USED**

AP	Administrative Procedure
E-Plan	Emergency Plan
IP	Inspection Procedure
LCO	Limiting Conditions for Operation
NRC	U.S. Nuclear Regulatory Commission
OM	Operations and Maintenance Procedure
OSU	The Ohio State University
OSURR	The Ohio State University Research Reactor
SRO	Senior Reactor Operator
TS	Technical Specification