

November 8, 2017

Dr. Paul O'Connor, Facility Director
Dow Chemical Company
1602 Building
Midland, MI 48674

SUBJECT: DOW CHEMICAL COMPANY – U.S. NUCLEAR REGULATORY COMMISSION
ROUTINE INSPECTION REPORT NO. 50-264/2017-201

Dear Dr. O'Connor:

From August 15 - 17, 2017, the U.S. Nuclear Regulatory Commission (NRC), conducted an inspection at your Dow TRIGA Research Reactor. The enclosed report presents the results of that inspection, which were discussed on August 17, 2017, with members of your staff.

This 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 selective 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* 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 Publicly Available Records component of 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).

Should you have any questions concerning this inspection, please contact Johnny Eads at (301) 415-0136 or by electronic mail at Johnny.Eads@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. 50-264
License No. R-108

Enclosure:
As stated

cc: w/enclosure: See next page

Dow Chemical

Docket No. 50-264

cc:

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SUBJECT: DOW CHEMICAL COMPANY, U.S. NUCLEAR REGULATORY COMMISSION
ROUTINE INSPECTION REPORT NO. 50-264/2017-201
DATED: NOVEMBER 8, 2017

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

Docket No. 50-264

License No. R-108

Report No. 50-264/2017-201

Licensee: Dow Chemical Company

Facility: Dow TRIGA Research Reactor

Location: Midland, Michigan

Dates: August 15-17, 2017

Inspector: Johnny Eads

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

EXECUTIVE SUMMARY

The Dow Chemical Company
TRIGA Research Reactor
NRC Inspection Report No. 50-264/2017-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the Dow Chemical Company (the licensee's) Class II research reactor facility safety programs including: (1) health physics; (2) design changes; (3) emergency planning; (4) maintenance logs and records; and (5) experiments; (6) fuel handling logs and records; (7) transportation of radioactive materials. The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with the U.S. Nuclear Regulatory Commission (NRC) requirements.

Health Physics

- Surveys were being completed and documented as required.
- Postings met regulatory requirements.
- Personnel dosimetry was being worn and recorded doses were within the NRC's regulatory limits.
- Radiation monitoring equipment was being maintained and calibrated as required.
- The Radiation Protection Program satisfied regulatory requirements.
- The radiation protection training program was being administered as required.
- Environmental monitoring satisfied license and regulatory requirements.

Design Changes

- No changes, tests, or experiments subject to Title 10 of the *Code of Federal Regulations* Section 50.59 reporting were performed.

Emergency Planning

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

Maintenance Logs and Records

- The licensee maintained records documenting principal maintenance activities.

Experiments

- Experiments were reviewed and approved as required by technical specification (TS).

Fuel Handling Logs and Records

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

Transportation of Radioactive Materials

- The program for shipping radioactive material satisfied regulatory requirements.

REPORT DETAILS

Summary of Facility Status

The Dow Chemical Company (Dow or the licensee's) 300 kilowatt Training Research Isotope Production General Atomics (TRIGA) Mark I research reactor has been operated in support of experiments, reactor operator training, and periodic equipment surveillances. During the inspection, the reactor was operated in support of on-going work.

1. Health Physics

a. Inspection Scope (Inspection Procedures (IP) 69001)

The inspector reviewed the following to verify compliance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations," 10 CFR Part 20, "Standards for Protection against Radiation," and the applicable technical specification (TS) requirements:

- Radiological signs and posting in various areas of the facility
- Area and personnel dosimetry results for 2016 and 2017 to date
- Facility and equipment during tours
- Radiation protection training records
- Maintenance and calibration of radiation monitoring equipment, including the water radioactivity monitor, area radiation monitor, and the continuous air monitor
- Organization and staffing
- Dow Nuclear Research Reactor Procedure (DNRRP) No. 4.2.2, "Area Monitor Calibration," dated November 2006
- DNRRP No. 4.7.1, "Wipe Tests and Radiation Surveys," dated December 2016

b. Observations and Findings

(1) Surveys

The inspector reviewed monthly radiation and contamination surveys of the reactor building, which were conducted by the facility staff. The results were documented on the appropriate forms, evaluated as required and corrective actions taken when readings or results exceeded set action levels. The number and location of survey points was adequate to characterize the radiological conditions. The licensee investigates any readings above background levels. The inspector verified that the Radiation Safety Officer (RSO) reviews all of the survey records. The RSO also conducts an annual independent contamination survey of the facility and has verified that all of the readings are as expected.

(2) Postings and Notices

The inspector reviewed the postings required by 10 CFR Part 19 at the entrances to various controlled areas including the Reactor Bay, and radioactive material storage areas. The postings were acceptable and indicated the radiation and contamination hazards present. The facility's radioactive material storage areas were found to be properly posted. No unmarked radioactive material was found in the facility.

(3) Dosimetry

The licensee used a National Voluntary Laboratory Accreditation Program-accredited vendor to process personnel dosimetry. Through direct observation, the inspector determined that dosimetry was used in an acceptable manner by facility personnel. For visitors to the facility, radiation exposures are recorded through the permanent staff at the facility. Records indicate that no abnormal readings were obtained.

An examination of the records for the inspection period showed that all exposures were well within NRC limits and within licensee action levels. All of the staff and researchers associated with the facility wear Optically Stimulated Luminescent Dosimeter (OSLD) badges and minimal doses were recorded for 2016 through present. The as low as reasonably achievable (ALARA) goal specified in the radiation safety procedures is to keep exposures to less than 10 percent of the applicable U.S. Nuclear Regulatory Commission (NRC) requirements and the licensee consistently meets this goal.

(4) Radiation Monitoring Equipment

The calibration verification of portable survey meters and friskers was completed by a contracted company. 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 TS 4.6 while records were being maintained as required. The inspector verified that proper precautions are always used to maintain doses ALARA while conducting the calibrations. The inspector reviewed the licensee's tracking system for ensuring the instrument calibrations are completed on time and found it to be useful.

(5) Radiation Protection Program

The licensee's Radiation Protection Program (RPP) was established through the procedures. The RPP provides guidance for keeping doses ALARA and is consistent with the guidance in 10 CFR Part 20. The inspector verified that the RPP was being reviewed annually as required by 10 CFR 20.1101, "Radiation protection programs," paragraph (c). No issues related to the RPP were identified in the review of the program. The RSO reviews the overall implementation of the RPP at the Dow TRIGA Research Reactor (DTRR).

The RPP requires that all personnel who work with radioactive materials receive training in radiation protection, policies, procedures, requirements, and the facilities prior to having unescorted access at the facility. The RSO is responsible for conducting the training and all of the training is typically conducted both on a computer and with practical applications. A test is administered at the end of the training to verify that the individuals understood the material presented. The training covered the topics required to be taught in 10 CFR Part 19 and the review of training materials and tests indicated that the staff were instructed on the appropriate subjects.

(6) Facility Tour

The inspector toured the reactor facility, counting laboratories and accompanying facilities. Control of radioactive material and control of access to radiation and high radiation areas were observed to be acceptable. The postings and signs for these areas were appropriate. Licensee personnel followed the indicated precautions for access to controlled areas.

(7) Environmental Monitoring

Several OSLDs were placed around the inside walls of the reactor facility and minimal doses were recorded. Records show that there was minimal radiation exposure to the environment from the reactor during the previous year. There was no liquid effluent discharged from the reactor facility. The licensee indicated that gaseous effluents from the reactor facility were less than 25 percent of the allowed or recommended maximum concentrations in 10 CFR Part 20.

c. Conclusion

The inspector determined that: (1) surveys were being completed and documented as required, (2) postings met regulatory requirements, (3) personnel dosimetry was being worn and recorded doses were within the NRC's regulatory limits, (4) radiation monitoring equipment was being maintained and calibrated as required, (5) the RPP satisfied regulatory requirements, (6) the radiation protection training program was being administered as required, and (7) environmental monitoring satisfied license and regulatory requirements.

2. Design Changes

a. Inspection Scope (IP 69001)

The inspector reviewed the following materials to verify compliance with regulatory requirements. In order to verify that any modifications to the facility were consistent with 10 CFR 50.59, "Changes, tests and experiments," the inspector reviewed selected aspects of:

- Facility design changes and records
- Facility configuration and associated records
- DNRPP No. 4.5.3, "Facility Maintenance and Modifications," dated June 2014
- DTRR Annual Report – 2016

b. Observations and Findings

Through review of applicable records and interviews with licensee personnel, the inspector determined that there have not been any significant changes at the facility in the previous two years.

c. Conclusion

Based on the records reviewed, the inspector determined that the licensee's design change program was being implemented as required.

3. Emergency Planning

a. Inspection Scope (IP 69001)

The inspector reviewed the implementation of selected portions of the emergency preparedness program including:

- DTRR Emergency Plan (E-Plan), dated December 4, 2012
- Emergency Planning Drill conducted June 28, 2017
- Procedure entitled, "1602 Building Radiation Emergency," revised February 2013
- Emergency response facilities, supplies, equipment, and instrumentation
- Monthly Inventories of Emergency Equipment
- Memorandum of Agreement, Office of Emergency Management, County of Midland Michigan, dated February 2, 2017

b. Observations and Findings

The inspector reviewed the revised E-Plan in use at the DTRR and verified that the E-Plan was being properly implemented at the facility. The inspector reviewed the emergency facilities, instrumentation, and equipment and verified that the emergency response equipment, in general, was as described in the E-Plan. Through direct observation, records review, and interviews with emergency organization personnel, the inspector determined that they were capable to respond, and knowledgeable of the proper actions to take in case of an emergency. The facility staff is responsible for responding to an emergency

during all hours and making assessments and corrective as well as protective actions. The responsibility and authority for directing and coordinating emergency response activities are assigned to the Facility Director (FD)/Reactor Supervisor (RS), acting as the emergency director. All facility personnel receive annual emergency response training. The inspector verified that the licensee has continually reviewed the E-Plan and conducted an inventory of the emergency response equipment.

Emergency drills had been conducted annually as required by the E-Plan. The drill for 2017 was a practical exercise and tested the notification and response of emergency personnel. The critique was written and discussed following the drill to document any problems identified during the exercise. The action items that resulted were incorporated as part of the lesson learned policy.

The inspector observed that the Dow Emergency Services and Security staff were very helpful and knowledgeable on the requirements and their responsibilities. The inspector observed that there appeared to be a good working relationship between the licensee and the Emergency Services and Security Center which was capable to handle a variety of events that could happen at the DTRR.

c. Conclusion

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

4. Maintenance Logs and Records

a. Inspection Scope (IP 69001)

To verify that the licensee was complying with the applicable regulations, the inspector reviewed selected aspects of:

- DNRRP No. 4.5.3, "Facility Maintenance and Modification," dated June 2014
- Completed "Dow TRIGA Research Reactor Maintenance," forms from 2016 to present

b. Observations and Findings

The inspector reviewed the maintenance records related to 2016 and 2017 scheduled and unscheduled preventive and corrective maintenance activities. Routine/preventive maintenance was controlled and documented on reactor maintenance forms, which are maintained in a binder. All maintenance of reactor systems was reviewed by the FD/RS or the alternate RS. Implementation of changes to equipment, systems, tests, or experiments are generally done by the staff at the facility. After all maintenance items are completed, system operational checks are performed to ensure the affected systems function before returning them to service. During a facility tour, the inspector noted that the equipment in the Control Room and the Reactor Room was operational.

c. Conclusion

Maintenance logs, records, and performance satisfied TS and procedure requirements.

5. Experiments

a. Inspection Scope (IP 69001)

To ensure that the requirements of TS Sections 3.7 and 6.5 were being met concerning experimental programs, the inspector reviewed selected aspects and/or portions of:

- Experimental administrative controls and precautions
- Approved reactor experiments documentation
- Review and approval process for experiments
- Completed "TRIGA Activation Request Form," forms dated from November 2016 to present
- Completed Approval Sheet for Special Experiments, "Annual Fuel Inspection," for 2016 and 2017

b. Observations and Findings

One of the many uses for the DTRR is the irradiation of various materials. The most frequently used experimental facilities are the pneumatic tube irradiation facility and the lazy susan. Samples that have been irradiated at DTRR include various materials that are produced or utilized at Dow. All experiments conducted are in accordance with approved authorization requests. The FD or RS reviews and approves all routine samples to be irradiated in accordance with the TS limitations for each sample to be irradiated in the core. No new routine experiments had been initiated, reviewed, or approved since the previous inspection at the facility. One special experiment was approved to conduct the annual fuel inspections. This special inspection must obtain Reactor Operations Committee (ROC) approval prior to performance. All new and special experiments are reviewed and approved by the ROC.

The inspector confirmed that all of the experiments conducted were in accordance with TS limits and procedural requirements.

c. Conclusion

Experiments were reviewed and approved as required by TS.

6. Fuel Handling Logs and Records

a. Inspection Scope (IP 69001)

To verify that TS and procedural requirements were being met, the inspector reviewed selected aspects of:

- Reactor Logbooks Nos. 122 to 124, covering operations from April 4, 2016 to present
- DNRRP No. 4.3.2, "Movement of Fuel - General Requirements," dated December 2012
- DNRRP No. 4.3.3, "Movement of Fuel - Approach to Criticality," dated December 2012
- DNRRP No. 4.3.4 a, "Procedure for the Performance of the Annual Fuel Inventory," dated June 2014
- Fuel movement and inspection records for 2016

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 Operating Logbook as well as in the Fuel Element Location and Inventory Logbook. The fuel element inspections generally included all of the fuel elements every four years and inspection of the control rods on an annual frequency, which is more frequent than the TS requirements. Inspections of the fuel elements and control rods showed consistency with accepted values and did not indicate any deterioration of cladding. Data recorded for fuel handling was clear and cross-referenced in the operations logs and the core map. Log entries clearly identified, as required by procedure, that a minimum of two persons were present when fuel was being moved. The inspector determined that the procedures and the controls specified (ROC approval) for these operations were acceptable.

c. Conclusion

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

7. Transportation of Radioactive Materials

a. Inspection Scope (IP 86740)

To verify compliance with regulatory and procedural requirements for transferring or shipping licensed radioactive material, the inspector reviewed the following:

- Dow Radiation Protection Manual

b. Observations and Findings

Through records review and discussions with licensee personnel, the inspector determined that the licensee had not shipped any radioactive material since the previous inspection in this area under the reactor license. Transfer of radioactive material to other Dow facilities was under the Broad Scope License (21-00265-06) with guidance from the Radiation Safety Committee, the RSO and the Dow Radiation Protection Manual.

c. Conclusion

No radioactive material shipments had been made under the auspices of the reactor license during the past year.

8. **Exit Interview**

The inspection scope and results were summarized on August 17, 2017, with members of licensee management. The inspector described the areas inspected and discussed in detail the inspection findings. 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

PARTIAL LIST OF PERSONS CONTACTED

Licensee

B. Haskins	Senior Reactor Operator
P. O'Connor	Facility Director
J. Seeburger	Emergency Services and Security
J. Weldy	Radiation Safety Officer
S. Yusuf	Reactor Supervisor

INSPECTION PROCEDURES USED

IP 69001	Class II Non-Power Reactors
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ITEMS OPENED, CLOSED, AND DISCUSSED

Opened:

None

Closed:

None

Discussed:

None

LIST OF ACRONYMS USED

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ALARA	As low as reasonably achievable
DNRRP	Dow Nuclear Research Reactor Procedure
DTRR	Dow TRIGA Research Reactor
E-Plan	Emergency Plan
IP	Inspection Procedure
NRC	U.S. Nuclear Regulatory Commission
OSLD	Optically Stimulated Luminescent Dosimeter
ROC	Reactor Operations Committee
RPP	Radiation Protection Program
RS	Reactor Supervisor
RSO	Radiation Safety Officer
TRIGA	Training Research Isotope Production General Atomics
TS	Technical Specification