

October 17, 2006

Mr. Ward L. Rigot
Facility Director/Reactor Supervisor
The Dow Chemical Company
1602 Building
Midland, MI 48667

SUBJECT: NRC ROUTINE INSPECTION REPORT NO. 50-264/2006-201

Dear Mr. Rigot:

This letter refers to the inspection conducted on September 26-28, 2006, at The Dow Chemical Company TRIGA Research Reactor. The inspection included a review of activities authorized for the facility. The enclosed report presents the results of this inspection.

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

In accordance with Section 2.390, "Public inspections, exemptions, requests for withholding," of Title 10 of the *Code of Federal Regulations*, a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

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

Sincerely,

/RA/

Johnny Eads, Branch Chief
Research and Test Reactors Branch B
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-264
License No. R-108

Enclosure: NRC Inspection Report No. 50-264/2006-201

cc w/encl: See next page

Dow Chemical

Docket No. 50-264

cc:

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333 West Ellsworth
Midland, MI 48640

Office of the Governor
Room 1 - Capitol Building
Lansing, MI 48913

Alex Pollock
Chair, Radiation Safety Committee
2030/410 Dow Center
Midland, MI 48674

Dr. Kevin Hool, Level 1 Manager,
The Dow Chemical Company
1897 Building
Midland, MI 48667

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

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

Docket No: 50-264

License No: R-108

Report No: 50-264/2006-201

Licensee: The Dow Chemical Company

Facility: TRIGA Mark I Research Reactor Facility

Location: 1602 Building
Midland, Michigan

Dates: September 26-28, 2006

Inspector: Kevin M. Witt

Approved by: Johnny H. Eads, Jr., Branch Chief
Research and Test Reactors Branch B
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

The Dow Chemical Company TRIGA Mark I Research Reactor Facility NRC Inspection Report No.: 50-264/2006-201

The primary focus of this routine, announced inspection was the on-site review of selected aspects and activities since the last NRC inspection of the licensee's Class II non-power reactor safety programs including: organization and staffing, operations logs and records, procedures, operator requalification, surveillance and limiting conditions for operations, experiments, radiation protection program, design changes, committees, audits and reviews, emergency preparedness, maintenance logs and records, fuel handling, and follow-up on previous open items.

The licensee's programs were acceptably directed toward the protection of public health and safety and in compliance with NRC requirements.

Organization and Staffing

- The organization and staffing were consistent with Technical Specification (TS) requirements.

Operations Logs and Records

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

Procedures

- Procedural control and implementation generally satisfied TS requirements.

Operator Requalification

- The licensee's requalification program was implemented satisfactorily, the program was up-to-date, and plan requirements were met.

Surveillance and Limiting Conditions for Operation (LCOs)

- The licensee's program for completing surveillance inspections and LCO confirmations satisfied TS and licensee administrative controls.

Experiments

- The approval and control of experiments met TS and applicable regulatory requirements.

Radiation Protection Program

- Surveys were being completed and documented acceptably to permit evaluation of the radiation hazards present.

- Postings met the regulatory requirements specified in 10 CFR Parts 19 and 20.
- Personnel dosimetry was worn as required and doses were well within the licensee's procedural action levels and NRC's regulatory limits.
- Radiation monitoring equipment was maintained and calibrated as required.
- The Radiation Protection Program satisfied regulatory requirements.
- Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and TS limits.

Design Changes

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

Committees, Audits and Reviews

- Review and oversight functions required by the TSs were acceptably completed by the Reactor Operations Committee.

Emergency Preparedness

- The emergency preparedness program was conducted in accordance with the requirements stipulated in the Emergency Plan. One Inspector Follow-up Item was issued to verify the Emergency Plan reflects the status of emergency evacuation drills and the status of emergency assessment equipment.

Maintenance Logs and Records

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

Fuel Handling

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

Follow-up on Previous Open Items

- The issue regarding facility procedure updates was closed.

REPORT DETAILS

Summary of Plant Status

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 and operator training. The licensee indicated that there has been no transportation of radioactive materials from the reactor license since the previous inspection.

1. Organization and Staffing

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

The inspector reviewed the following to verify compliance with the staffing requirements in Technical Specification (TS) Section 6:

- organization and staffing
- qualifications
- management responsibilities
- administrative controls
- Reactor Logbooks Nos. 93 to 97 covering operations from January 31, 2005 to present
- Dow Nuclear Research Reactor Procedure (DNRRP) No. 3, "Administrative Procedures," dated 1967
- DOW TRIGA Research Reactor Annual Report - 2004, dated March 25, 2005
- DOW TRIGA Research Reactor Annual Report - 2005, dated March 27, 2006
- TS for the DOW TRIGA Research Reactor (DTRR), Amendment No. 8, dated February 11, 1998

b. Observations and Findings

The DTRR organizational structure and the responsibilities of the reactor management and staff had not changed since the last inspection (see NRC Inspection Report No. 50-264/2004-201). Current DTRR staff consisted of the Facility Director/Reactor Supervisor (FD/RS) and three staff members. Three of the staff members, including the FD/RS, are qualified Senior Reactor Operators (SROs). One of the staff members is training to become a SRO and the inspector reviewed the training program to verify that the NRC recognized standards were being followed.

The DTRR staff's qualifications satisfied the training and experience requirements stipulated in the TSs. The operations log and associated records confirmed that shift staffing met the minimum requirements for duty personnel. Review of records verified that management responsibilities were administered as required by TS and applicable procedures. The annual reports summarized the required information and was issued at the frequency specified in TS Section 6.6.1. No special reports were submitted pursuant to TS Section 6.6.2.

c. Conclusion

The organization and staffing were consistent with TS requirements.

2. Operation Logs and Records

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that selected records were maintained as required by TS Section 3 and procedural requirements:

- Reactor Logbooks Nos. 93 to 97 covering operations from January 31, 2005 to present
- Scram Log, dated from January 2004 to present
- DOW TRIGA Research Reactor Annual Report - 2004, dated March 25, 2005
- DOW TRIGA Research Reactor Annual Report - 2005, dated March 27, 2006
- DNRRP No. 3, "Administrative Procedures," dated 1967
- DNRRP No. 3.3.5, "Authorization for Operation of the Reactor," Revision 2, dated December 18, 1992
- DNRRP No. 3.4, "Procedural and Administrative Limitations," dated 1967
- DNRRP No. 3.5, "Reactor Operations Log Book," dated 1967
- DNRRP No. 4.1.1, "Daily Prestart Checkout," Revision 2, dated September 20, 1995
- DNRRP No. 4.1.2, "Daily Startup/Shutdown," Revision 5, dated February 22, 1999
- DNRRP No. 4.6.1, "Procedure for Startup, Operation, and Shutdown of the DOW TRIGA Research Reactor," Revision 2, dated January 2, 1991
- DNRRP No. 4.6.2, "Samples in the Lazy Susan - Placement and Retrieval," Revision 2, dated March 2006
- Completed "Daily Checklist" forms, dated from April 12, 2005 to present

b. Observations and Findings

The inspector verified that reactor operating characteristics, and other TS and procedure required entries, were recorded on the operations log. A review of the logs indicated that TS operational limits had not been exceeded. The information required for the startup checkout and the shutdown checklist are included in the operations log. Operations records confirmed that shift staffing met the minimum requirements for duty personnel. The inspector determined that reactor operations were carried out following written procedures and TS requirements.

Unintentional scrams that occurred during reactor operations were recorded in the master log. The inspector noted that there was an increased number of scrams that have been occurring at the facility. A majority of the recorded scrams were a result of computer errors, with the digital control system locking up. The licensee has investigated this trend further, but has not uncovered a

method to correct the observed problems. The licensee is working with the manufacturer of the control console to devise a solution to the problem. When a scram occurs, the root cause analysis is completed by the RS or the alternate RS before the resumption of operations.

The licensee communicated to the inspector an incident which occurred with the reactor control console key not properly stored. The licensee stated that the key to the console is normally stored in a locked box, which only selected individuals have access to. While conducting a Daily Prestart Checkout, the staff member conducting the operation improperly stored the key in a location that is not locked. TS 1.23.b states that the console key must be stored in a locked storage area or in the possession of a licensed reactor operator in order for the reactor to be in a secured condition. The licensee stated that the key was stored in the locked control room, however, the key was not stored in its designated locked storage location. The licensee immediately implemented corrective actions such as revising the procedure to instruct the operators to store the key in the designated locked storage location. The licensee also instructed all of the licensed operators on the incident and the proper way of storing the reactor control console key. The inspector determined that there was no violation of NRC regulations or requirements, and the licensee properly controlled the situation in order to prevent future occurrences.

The inspector conducted observations of the reactor staff operating the reactor on September 27, 2006, and reviewed the reactor logbook. The inspector noted that the licensed operator and trainee on duty were knowledgeable and competent. Observation of operational activities also confirmed that reactor operations were carried out in accordance with written procedures and TS requirements.

c. Conclusions

Operational activities were consistent with applicable TS and procedural requirements.

3. Procedures

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the requirements of TS Section 6.3 were being met concerning written procedures:

- administrative controls
- procedural implementation
- selected administrative and operations procedures
- records of changes and temporary deviations to procedures
- Reactor Operations Committee (ROC) meeting minutes, dated March 23, June 20, October 10, and December 19, 2005 and February 8, June 27 and August 9, 2006
- DNRRP No. 3.2.2, "ROC - DOW TRIGA Reactor," dated 1967

- DNRRP No. 4.6.2, "Samples in the Lazy Susan - Placement and Retrieval," Revision 2, dated March 2006

b. Observations and Findings

The inspector determined that written procedures were available for the activities delineated in TS Section 6.3 and were approved by the ROC before they were implemented. The clarity and detail in the procedures was acceptable. Temporary procedures that do not change the intent of previously approved procedures and do not involve any unreviewed safety question may be employed upon approval by the RS. DTRR reactor staff generally conducted TS activities in accordance with applicable procedures. One new procedure that the inspector reviewed was the procedure for experiment handling in the pneumatic tube experimental facility. Previous to this procedure approval, there was no approved procedure for operation of the pneumatic tube experimental facility. The inspector noted that the procedure approval laid out an effective manner for conducting the experiments in a way that reduces personnel exposure and assures the safety of the facility.

The new procedure was proposed due an incident with the pneumatic tube experiment facility. The licensee indicated that the problem had occurred with the pneumatic tube experiment facility, where a sample container had dismantled at the bottom of the device and could not be easily retrieved. The licensee eventually retrieved all pieces of the device and conducted a root cause analysis. The licensee determined that the responsible experimenter most likely had not discovered that one of the sample containers did not return from the experiment facility in the same form it had been inserted into the reactor. The licensee immediately revised the experiment procedures for pneumatic tube irradiations and reprimanded the individual for failure to adequately observe the proper operation of the experimental facility. The inspector determined that no violations of NRC regulations or requirements had occurred as a result of this incident.

The licensee also indicated that another incident occurred where an experimenter did not properly follow the procedures for experiment approval and operation. The licensee stated that the experimenter had irradiated some samples that were different than those on the approved TRIGA Activation Request Form. As a result of this error, the licensee reprimanded the individual for not following the procedures and immediately conducted a root cause analysis. The licensee determined that the procedures concerning experiment approval and handling were adequate for the experiments that are being conducted. The individual was reprimanded by the licensee for failure to obtain the proper authorization for the samples as required by TS 6.4. The licensee stated that there was no safety significance as a result of this error in experiment handling. The inspector determined that the course of action taken by the licensee was adequate for the situation.

c. Conclusions

Procedural control and implementation generally satisfied TS requirements.

4. Operator Requalification

a. Inspection Scope (IP 69001)

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

- DNRRP No. 3.8, "DOW TRIGA Research Reactor Requalification Program," dated August 14, 1987
- Reactor Logbooks Nos. 93 to 97 covering operations from January 31, 2005 to present
- requalification training records for the last requalification cycle
- operator active license status
- operator physical examination records
- reactivity manipulation records

b. Observations and Findings

The licensee's requalification program is described in the program submitted to the NRC. The inspector reviewed the requalification program records of the three SROs currently employed at the facility. The FD/RS and the alternate RS is responsible for the implementation of the requalification program and administers the written and operating examinations. The inspector verified that physical examinations of the licensed staff was conducted biennially as required. The inspector also verified that all of the licensed operators were reviewing the contents of all abnormal and emergency procedures on an annual basis. The number of hours in the facility performing licensed duties were recorded in the reactor logbook. The licensee stated that all of the licensed operators operate the reactor a minimum of four hours per quarter, which the inspector confirmed.

c. Conclusions

The licensee's requalification program was implemented satisfactorily, the program was up-to-date, and plan requirements were met.

5. Surveillance and Limiting Conditions for Operation

a. Inspection Scope (IP 69001)

The inspector reviewed the following to ensure that the surveillance requirements and limiting conditions for operation (LCOs) specified in TS Section 4.0 were met:

- DNRRP No. 4.1.1, "Daily Prestart Checkout," Revision 2, dated September 20, 1995

- DNRRP No. 4.1.2, "Daily Startup/Shutdown (checklist)," Revision 5, dated February 22, 1999
- DNRRP No. 4.1.2, "Daily Checklist," Revision 7, dated September 27, 2001
- DNRRP No. 4.1.3, "Monthly Checklist," Revision 2, dated March 5, 1998
- DNRRP No. 4.1.4, "Semi-Annual Checklist," Revision 2, dated June 25, 2001
- DNRRP No. 4.1.5, "Annual Checkout," Revision 2, dated December 18, 1992
- DNRRP No. 4.1.2.1, "Thermal Calibration," Revision 1, dated January 31, 1991
- DNRRP No. 4.2.2, "Area Monitor Calibration," Revision 1, dated August 7, 1991
- DNRRP No. 4.2.3, "Water Radioactivity Monitor Calibration," Revision 2, dated July 15, 1998
- DNRRP No. 4.2.4, "Continuous Air Monitor Calibration," dated August 7, 1991
- DNRRP No. 4.2.5, "Control Rod Calibration," dated August 7, 1991
- DNRRP No. 4.4.1, "Procedure for the Control Rod Removal and Inspection," Revision 2, dated December 18, 1992
- DNRRP No. 4.4.2, "Rod Drop Time," Revision 0, dated January 22, 1991
- Completed "Water Radioactivity Monitor Calibration" forms, dated from March 23, 2004 to August 16, 2006
- Completed "Area Monitor Calibration" forms, dated from March 23, 2004 to August 16, 2006
- Completed "Continuous Air Monitor Calibration" forms, dated from March 23, 2004 to August 16, 2006
- Completed "Daily Checklist" forms, dated from April 12, 2005 to present
- Completed "Thermal Calibration" forms, dated February 12, 2004, March 9, 2005 and March 15, 2006
- Completed "Annual Checkout" forms, dated March 17, 2004, April 5, 2005 and April 13, 2006
- Completed "Semi-Annual Checklist" forms, dated March 24 and October 11, 2004, March 31 and August 31, 2005 and April 4 and August 28, 2006
- Completed "Monthly Checklist" forms, dated from January 14, 2005 to present
- DOW TRIGA Research Reactor Annual Report - 2004, dated March 25, 2005
- DOW TRIGA Research Reactor Annual Report - 2005, dated March 27, 2006

b. Observations and Findings

The inspector noted that daily, monthly, semiannual, and annual channel checks, tests, and/or calibrations for TS-required surveillance were completed as required. The LCO verifications were completed on schedule and in accordance with licensee procedures. All of the recorded results were within the TS and procedurally prescribed parameters. The records and logs were noted to be

complete and were being maintained as required. The procedures for the surveillances provided clear and concise direction and control of reactor operational tests and surveillances.

The inspector observed the licensee complete the startup checkout form for TS required items on September 28, 2006. All of the items on the startup checkout form were carried out appropriately and the personnel conducting the tests did so in a safe and knowledgeable manner. The inspector verified that all of the checks conducted were in compliance with TS required values and parameters.

c. Conclusions

The licensee's program for completing surveillance inspections and LCO confirmations satisfied TS and licensee administrative controls.

6. Experiments

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify compliance with TS Sections 3.7 and 6.8:

- experimental administrative controls and precautions
- approved reactor experiments documentation
- review and approval process for experiments
- ROC meeting minutes, dated March 23, June 20, October 10, and December 19, 2005 and February 8, June 27 and August 9, 2006
- Reactor Logbooks Nos. 93 to 97 covering operations from January 31, 2005 to present
- DNRRP No. 3, "Administrative Procedures," dated 1967
- DNRRP No 3.3, "Rules Governing Experiments, Storage and Handling of, and Accountability for Nuclear and Radioactive Material," dated 1967
- DNRRP No 3.3.1, "Classes of Experiments," dated 1967
- DNRRP No 3.3.5, "Authorization for Operation of the Reactor," Revision 2, dated December 18, 1992
- DNRRP No. 3.4, "Procedural and Administrative Limitations," dated 1967
- DNRRP No. 3.5, "Reactor Operations Log Book," dated 1967
- DNRRP No. 4.6.2, "Samples in the Lazy Susan - Placement and Retrieval," Revision 2, dated March 2006
- Completed "Approval Sheet For Special Experiment" forms, dated from December 14, 2004 to November 10, 2005
- Completed "TRIGA Activation Request Form" forms, dated from January 4, 2006 to present

b. Observations and Findings

One of the experiments conducted at the DTRR is the irradiation of various materials for the purpose of neutron activation analysis. 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 The Dow Chemical Company. The FD/RS or alternate RS approves all routine samples to be irradiated in accordance with the TS limitations. No new experiments had been initiated, reviewed, or approved since the previous inspection at the facility. If any new experiments were to be initiated, they would be reviewed and approved by the ROC. The inspector confirmed that all of the experiments conducted were in accordance with TS limits and procedural requirements. The licensee has conducted operations for approximately 1000 experiments for 2005 and through 2006.

Several special experiments were conducted during the previous two years. The special experiments conducted include manipulating fuel for required fuel inspections and movement of the pneumatic tube experiment facility into and out of the core. All of these experiments were reviewed and approved by the FD/RS and the ROC.

The inspector observed the licensee conduct operations for an experiment in the lazy susan experiment facility on September 27, 2006. All of the procedures required for loading and extracting the samples were strictly followed and the personnel conducting the operation did so in a safe and knowledgeable manner. The inspector verified that all of the checks conducted were in compliance with TS required values and parameters.

c. Conclusions

The approval and control of experiments met TS and applicable regulatory requirements.

7. Radiation Protection Program

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with 10 CFR Part 19 and Part 20 and the applicable TS requirements:

- radiological signs and posting in various areas of the facility
- area and personnel dosimetry results for 2005 and 2006
- facility and equipment during tours
- radiation protection training records
- maintenance and calibration of radiation monitoring equipment
- organization and staffing
- radiological signs and posting
- facility monthly, annual, and other periodic contamination and area radiation surveys from January 2005 to September 2006
- monthly pool water Tritium analyses from January 2005 to September 2006
- TRIGA Reactor 2004 Annual Audit, dated March 10, 2005
- TRIGA Reactor 2005 Annual Audit, dated March 21, 2006

- Radiation Safety Committee Meeting Minutes, dated February 24, May 23, and August 22, 2006
- The Dow Chemical Company 2006 Radiation Protection Program Audit - Michigan Operations, dated September 1, 2006
- Procedure entitled, "Personnel and Area Survey Procedures Using a Geiger-Mueller (GM) Survey Meter," dated May 11, 2004
- Procedure entitled, "Wipe Testing Procedures - Loose Isotopes," dated May 11, 2004
- DNRRP No. 3.3.3, "Handling, Storage, and Disposal of Radioactive Material," dated 1967
- DNRRP No. 4.7.1, "Wipe Tests and Radiation Surveys," dated April 24, 1989
- DNRRP No. 4.7.2, "Procedure for the Disposal of Waste Generated in the Neutron Activation Analysis Group," dated 1976
- Standard IH-477 - Radiation Protection Program, "Control of Ionizing Radiation Hazards," revised May 24, 2004

b. Observations and Findings

The Radiation Safety Officer (RSO) applies the radiation protection program uniformly to the two licensed activities at the Dow Midland Complex (broad scope and the reactor). The licensee's program for radiological health and safety related to the reactor license was evaluated during this inspection.

(1) Surveys

The inspector reviewed the monthly radiation wipe surveys of the reactor facility. Annual surveys of the radiation fields inside the reactor facility were conducted while the reactor was at full power. 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. Surveys by the DTRR staff were conducted in accordance with the appropriate procedure. Some elevated readings were discovered in places that are to be expected such as the experiment handling facilities. The licensee took prompt corrective action to reduce the levels of contamination in the discovered areas.

(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 noted 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, the radiation dose received is generally inferred from the escort's dosimetry results. If the reactor is to be run while conducting a tour, a direct read pocket dosimeter is issued to a group of individuals on the tour. If radioactive materials are to be handled by the visitors to the facility, an Optically Stimulated Luminescence Dosimeter (OSLD) is issued to the individuals. 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. Four individuals are currently monitored at the facility. All of the staff associated with the facility wear OSLD badges and received an annual deep dose exposure less than 10 millirem (mrem) for 2005 and through 2006. The licensee formally investigates any dosimetry readings that indicate a quarterly exposure above 125 mrem for whole body.

(4) Radiation Monitoring Equipment

The calibration verification of portable survey meters and friskers was completed by a contracted company. The fixed area radiation detectors were calibrated at the facility by the DTRR staff using a Cs-137 source. The calibration records of portable survey meters and fixed radiation detectors in use at the facility were reviewed. Calibration frequency met the requirements established in TS 4.4 while records were being maintained as required. The inspector observed that proper precautions are always used to maintain doses for calibrations as low as reasonably achievable (ALARA).

(5) Radiation Protection Program

The inspector verified that the radiation protection program was being reviewed annually as required. No issues related to the radiation protection program at DTRR were identified in the review of the program.

The Radiation Protection Program 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. Refresher training is required for all personnel on an annual basis. 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 Tours

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

(7) Environmental Monitoring

The licensee ensures compliance with NRC regulations for environmental monitoring by ensuring that all doses at the site boundary are less than the dose limits specified in 10 CFR 20.1301. Several OSLDs are strategically placed in several locations around the perimeter of the reactor room. Records for 2005 and 2006 indicate slightly elevated doses that are generally below the applicable requirements. The licensee has stated that the levels measured outside of the facility are within the regulatory requirements. There were no liquid effluents discharged from the facility for 2004 and 2005. The licensee calculated a dose of 0.2 mrem per year that an individual member of the public could potentially receive from the operations of the DTRR.

c. Conclusions

The inspector determined that: (1) surveys were being completed and documented acceptably to permit evaluation of the radiation hazards present; (2) postings met the regulatory requirements specified in 10 CFR Parts 19 and 20, (3) personnel dosimetry was being worn as required and doses were well within the licensee's procedural action levels and NRC's regulatory limits; (4) radiation monitoring equipment was being maintained and calibrated as required, (5) the radiation protection program satisfied regulatory requirements; and (6) effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and TS limits.

8. Design Changes

a. Inspection Scope (IP 69001)

In order to verify that any modifications to the facility were consistent with 10 CFR 50.59, the inspector reviewed selected aspects of:

- facility design changes and records
- facility configuration and associated records
- The Dow TRIGA Reactor (Docket No. 50-264) Facility Modification, 50.59 Review, Upgrade to the Heat Exchanger, dated December 10, 2004

- ROC meeting minutes, dated March 23, June 20, October 10, and December 19, 2005 and February 8, June 27 and August 9, 2006
- DNRRP No. 3, "Administrative Procedures," dated 1967
- DNRRP No. 3.2.2, "Reactor Operations Committee - DOW TRIGA Reactor," dated 1967
- DNRRP No 3.3,"Rules Governing Experiments, Storage and Handling of, and Accountability for Nuclear and Radioactive Material," dated 1967
- DNRRP No. 3.4, "Procedural and Administrative Limitations," dated 1967
- facility design change records for the past two years
- DOW TRIGA Research Reactor Annual Report - 2004, dated March 25, 2005
- DOW TRIGA Research Reactor Annual Report - 2005, dated March 27, 2006

b. Observations and Findings

Through review of applicable records and interviews with licensee personnel, the inspector determined that no changes requiring prior NRC approval had been initiated and/or completed at the facility in the last two years. The inspector verified that changes or modifications to the facility would be analyzed by the staff, presented to and reviewed by the ROC, determined to be acceptable, and approved as required.

One design change the licensee has initiated was the installation of a new heat exchanger in the water treatment room and a new cooling tower. This design change for the primary and secondary cooling systems was analyzed by the licensee and determined to have no effect on the safety of the reactor. The licensee has stated that the design of the new heat exchanger makes it impossible for any liquid to leak between the primary and secondary coolant systems. The inspector also confirmed if there were to be a leak in the heat exchanger, the coolant inlet and outlet lines are designed to minimize the amount of water that is siphoned from the pool.

c. Conclusions

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

9. Committees, Audits, and Reviews

a. Inspection Scope (IP 69001)

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

- safety review records and audit reports since June 2001
- responses to the review and audit reports
- ROC meeting minutes, dated March 23, June 20, October 10, and December 19, 2005 and February 8, June 27 and August 9, 2006

- Peer Review of the Dow TRIGA Research Reactor, dated June 14, 2006
- DNRRP No. 3, "Administrative Procedures," dated 1967
- DNRRP No. 3.2.2, "Reactor Operations Committee - DOW TRIGA Reactor," dated 1967
- DNRRP No 3.3, "Rules Governing Experiments, Storage and Handling of, and Accountability for Nuclear and Radioactive Material," dated 1967
- DNRRP No. 3.4, "Procedural and Administrative Limitations," dated 1967

b. Observations and Findings

The ROC is defined in the TSs and the inspector verified that the committee is following all aspects of the requirements. The ROC generally had quarterly meetings and a quorum was always present as required. The licensee indicated that the period in between the meetings on February 8 and June 27, 2006 exceeded the quarterly meeting frequency required by TS 6.2.1.c. The licensee implemented immediate corrective actions such as scheduling a meeting months in advance in addition to a backup meeting in case the first meeting needs to be cancelled. Adherence to the scheduled meetings will provide for compliance with the specified frequency. Review of the minutes indicated the ROC provided guidance, direction and oversight, and ensured suitable use of the reactor. The minutes provided an acceptable record of ROC review functions and of their safety oversight of reactor operations.

Audits of the items required by TS 6.2.3 were completed by individuals appointed by the ROC and were typically staff members from other research reactor licensees. The licensee indicated that the audit for 2005 was not recorded due the failure of the auditor to submit a written account of the audit. The licensee tried to induce the individual to provide a report, but ultimately no presentation was made. The licensee arranged for the 2006 audit to be completed by different individuals and the report was issued to the licensee in a timely manner. Minor issues that were not safety related were noted in the audit reports and meeting minutes and the inspector observed that any safety related items were properly controlled. The inspector noted that there were no significant issues discovered and that the licensee took appropriate corrective actions in response to the audit findings. The inspector noted that the safety reviews and audits, and the associated findings, were acceptably detailed and that the licensee responded and took corrective actions as needed.

c. Conclusions

Review and oversight functions required by the TSs were acceptably completed by the ROC.

10. Emergency Preparedness

a. Scope (IP 69001)

The inspector reviewed selected aspects of:

- DOW TRIGA Research Reactor Emergency Plan (E-Plan), dated September 14, 1998
- EP Drill for May 2005, dated May 8, 2005
- Review of the EP Drill on April 11, 2006
- Procedure entitled, "1602 Building Radiation Emergency," revised August 8, 2006
- DNRRP No. 4.8.1, "Emergencies," Revision 1, dated September 22, 1992
- emergency response facilities, supplies, equipment, and instrumentation
- Monthly Inventories of Emergency Equipment

b. Observations and Findings

The inspector reviewed the 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. The inspector inquired about the statement in the E-Plan Section 9.B, which states that there are quarterly facility and building evacuations. The licensee stated that these evacuations are no longer conducted. The licensee also stated that the assessment equipment listed in Section 7.b.4 is also not current. The licensee plans on correcting these changes and will either request approval of the E-Plan, or will notify the NRC of the changes. This issue will be considered by the NRC as an Inspector Follow-up Item (IFI) and will be reviewed during the next inspection at the facility (IFI 50-264/2006-201-01).

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 FD/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 drills for 2005 and 2006 were both practical exercises and tested the notification and response of emergency personnel. Critiques were written and discussed following the drills to document any problems identified during the exercises.

The inspector visited the 1100 building, which is the Dow Emergency Services and Security Center on September 27, 2006. While at the center, the inspector talked to the Emergency Services and Security Delivery Specialist about the supplies and equipment at the Support Center that would be available in case of an emergency. The coordinator stated that designated individuals on the emergency services teams had radiation training and if additional support is needed, other support staff can respond. The inspector observed that there appeared to be a good working relationship between the licensee and the Emergency Services and Security Center. The Specialist stated that the Dow

Chemical Company Midland Michigan Complex is the site of numerous toxic and carcinogenic chemicals, which are very hazardous to the public health and safety and the first responders are able to manage almost any type of incident. The inspector confirmed that the Emergency Services and Security was well prepared to handle a variety of events that could happen at the DTRR.

c. Conclusions

The emergency preparedness program was conducted in accordance with the requirements stipulated in the E-Plan. One IFI was issued to verify the E-Plan reflects the current status of emergency evacuation drills and the status of emergency assessment equipment.

11. 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:

- Dow TRIGA Research Reactor Maintenance Forms, dated from June 7, 2005 to present
- DNRRP No. 3, "Administrative Procedures," dated 1967
- DNRRP No. 4.5.3, "Maintenance," Revision 1, dated December 18, 1992
- completed "Dow TRIGA Research Reactor Maintenance" forms, from January 2005 to present

b. Observations and Findings

The inspector reviewed the maintenance records related to 2005 and 2006 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. These documents indicated that all maintenance activities were controlled and documented in accordance with the requirements in 10 CFR 50.59. The inspector observed that there was an entry for the purification system filter, where the licensee observed that the particulate filter had been damaged while being installed and was not noticed until the typical time period had passed without any pressure changes being noted. The licensee stated that the filter used at that time was not the correct size for the filter holder and the situation has been resolved by obtaining copious quantities of the proper size filters.

All maintenance of reactor systems were 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. Conclusions

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

12. Fuel Handling

a. Inspection Scope (IP 69001)

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

- Reactor Logbooks Nos. 93 to 97 covering operations from January 31, 2005 to present
- DNRRP No. 3.4, "Procedural and Administrative Limitations," dated 1967
- DNRRP No. 3.5, "Reactor Operations Log Book," dated 1967
- DNRRP No. 4.3.2, "Movement of Fuel - General Requirements," Revision 4, dated November 20, 1997
- DNRRP No. 4.3.3, "Movement of Fuel - Approach to Criticality," Revision 4, dated November 20, 1997
- DNRRP No. 4.3.4, "Procedure for the Performance of the Annual Fuel Inventory," Revision 2, dated December 18, 1992
- DNRRP No. 4.4.1, "Procedure for the Control Rod Removal and Inspection," Revision 2, dated December 18, 1992
- DNRRP No. 4.5.3, "Maintenance," Revision 1, dated December 18, 1992
- fuel handling equipment and instrumentation
- fuel movement and inspection records

b. Observations and Findings

The inspector determined that the licensee was maintaining the required records of the various fuel movements that had been completed and verified that the movements were conducted and recorded in compliance with procedure. All fuel movements were noted in the 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 for these operations were acceptable.

c. Conclusions

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

13. Follow-up on Previous Open Items

a. Inspection Scope (IP 69001)

The inspector reviewed the actions taken by the licensee following identification of one IFI during a previous inspection.

b. Observations and Findings

- (1) IFI 50-264/2001-201-02 - Written procedures would be updated to match present practices or activities would be performed as in current procedures.

NRC Inspection Report No. 50-264/2001-201, dated October 29, 2001, addressed the situation. During that inspection, the inspector noted a number of mismatches between some written procedures and the present manner and frequencies in which some operations /surveillance activities were performed. It appears that some older licensee procedures had not been formally updated when newer practices were implemented. The FD stated that the written procedures would be reviewed and updated to match present practices or the activities would be performed as outline in the written procedures.

During this inspection, the inspector determined that the licensee had updated the relevant procedures and all activities carried out at the facility were in accordance with the approved procedures. This issue is considered closed.

c. Conclusions

The issue regarding facility procedure updates was closed.

14. Exit Meeting

The inspector presented the inspection results to licensee management at the conclusion of the inspection on September 28, 2006. The inspector discussed the findings for each area reviewed. The licensee acknowledged the findings 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	Operator in Training
K. Hool	Chairman, Reactor Operations Committee and Director of Core Technologies
T. Quinn	Senior Reactor Operator and Alternate Reactor Supervisor
W. Rigot	Facility Director and Reactor Supervisor
J. Seeburger	Emergency Services and Security Delivery Specialist
J. Weldy	Radiation Safety Officer
S. Yusuf	Senior Reactor Operator

INSPECTION PROCEDURES USED

IP 69001 CLASS II NON-POWER REACTORS

ITEMS OPENED, CLOSED, AND DISCUSSED

OPENED:

50-264/2006-201-01 IFI Follow-up to verify the E-Plan reflects the current status of emergency evacuation drills and the status of emergency assessment equipment.

CLOSED:

50-264/2001-201-02 IFI Written procedures would be updated to match present practices or activities would be performed as in current procedures.

LIST OF ACRONYMS USED

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ADAMS	Agencywide Documents Access and Management System
ALARA	As Low As Reasonably Achievable
DNRRP	Dow Nuclear Research Reactor Procedure
DTRR	Dow TRIGA Research Reactor
E-Plan	Emergency Plan
FD/RS	Facility Director/Reactor Supervisor
IFI	Inspector Follow-up Item
IP	Inspection Procedure
kW	Kilo-Watts
LCO	Limiting Condition for Operation
MREM	Millirem
NRC	Nuclear Regulatory Commission
OSLD	Optically Stimulated Luminescence Dosimeter
Rev	Revision
ROC	Reactor Operations Committee
RSO	Radiation Safety Officer
SRO	Senior Reactor Operator
TRIGA	Training Research Isotope Production General Atomics
TS	Technical Specification