



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

October 30, 2018

Dr. Robert Dimeo, Director
National Institute of Standards and Technology
NIST Center for Neutron Research
U.S. Department of Commerce
100 Bureau Drive, Mail Stop 8561
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SUBJECT: NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY – U.S.
NUCLEAR REGULATORY COMMISSION ROUTINE INSPECTION REPORT
NO. 50-184/2018-202

Dear Dr. Dimeo:

From October 15-18, 2018, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at the National Institute of Standards and Technology Center for Neutron Research. The enclosed report documents the inspection results, which were discussed on October 18, 2018, with you, Dr. Thomas Newton, Deputy Director, Dan Flynn, Acting Chief, Reactor Operations, and Dave Brown, Reactor Health Physics Group Leader.

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 observed various activities in progress, interviewed personnel, and reviewed selected procedures and representative records. 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).

If you have any questions concerning this inspection, please contact Craig Bassett at (240) 535-1842 or by electronic mail at Craig.Bassett@nrc.gov.

Sincerely,

/RA by Paulette Torres for/

Anthony J. Mendiola, Chief
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Office of Nuclear Reactor Regulation

Docket No. 50-184
License No. TR-5

Enclosure:
As stated

cc: See next page

cc:

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SUBJECT: NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY – U.S.
 NUCLEAR REGULATORY COMMISSION ROUTINE INSPECTION REPORT
 NO. 50-184/2018-202 DATED OCTOBER 30, 2018

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

Docket No: 50-184

License No: TR-5

Report No: 50-184/2018-202

Licensee: National Institute of Standards and Technology

Facility: Center for Neutron Research
National Bureau of Standards Test Reactor

Location: Gaithersburg, MD

Dates: October 15–18, 2018

Inspector: Craig Bassett

Accompanied by: Ashley Ferguson, Inspector Trainee
Anthony J. Mendiola, Branch Chief
Research and Test Reactors Oversight Branch
Mary Jane Ross-Lee, Deputy Division Director
Division of Licensing Projects

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

Enclosure

EXECUTIVE SUMMARY

National Institute of Standards and Technology
Center for Neutron Research
National Bureau of Standards Test Reactor
NRC Inspection Report No. 50-184/2018-202

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the National Institute of Standards and Technology (the licensee's) Class I 20 megawatts test reactor facility safety program including: (1) operator licenses, requalification, and medical examinations; (2) experiments; (3) organization and operations and maintenance activities; (4) review and audit and design change functions; (5) procedures; (6) fuel movement; (7) surveillance; (8) transportation activities, and, (9) emergency preparedness since the last U.S. Nuclear Regulatory Commission (NRC) inspection of these areas. The licensee's safety program was acceptably directed toward the protection of public health and safety and was in compliance with NRC requirements. No violations or deviations were identified.

Operator Licenses, Requalification, and Medical Examinations

- Operator requalification was being conducted and completed as required by the requalification program and the program was being maintained current.
- Medical examinations for operators were being completed every 2 years as required.

Experiments

- The program for experiment review and approval satisfied technical specification (TS) and procedural requirements.
- The experiments were conducted in compliance with the applicable procedural controls.

Organization and Operations and Maintenance

- The established organization was consistent with TS Section 6.1 requirements.
- Staffing levels at the facility were adequate for the current level of operations.
- Acceptable reactor operations were being conducted and the appropriate shift staffing was being maintained.
- The maintenance program was being conducted in accordance with applicable procedural requirements.

Review and Audit and Design Change Functions

- The facility Safety Evaluation Committee (SEC) was meeting as required and reviewing the topics outlined in the TSs.

- Annual independent audits were being conducted by a Safety Assessment Committee (SAC) as required.
- The design change program being implemented at the facility satisfied NRC requirements.

Procedures

- The procedure revision, control, and implementation program satisfied TS requirements.

Fuel Movement

- Fuel movement and handling was accomplished in accordance with TS and procedural requirements.

Surveillance

- The surveillance program was being completed in a timely manner and as specified in the facility's TSs.

Transportation Activities

- The program for transportation of radioactive materials satisfied U.S. Department of Transportation (DOT) and NRC regulations.

Emergency Preparedness

- The Emergency Plan (E-Plan) and Emergency Instruction Manual (or implementing procedures) were being audited and reviewed biennially as required.
- Drills and exercises were being held and follow-up critiques were conducted to identify corrective actions that could be taken as needed.
- Emergency preparedness training for staff and offsite personnel was being conducted as stipulated in the E-Plan.
- Adequate offsite emergency support was being provided by various agencies as required.

REPORT DETAILS

Summary of Facility Status

The National Institute of Standards and Technology (NIST) NIST Center for Neutron Research (NCNR) reactor, a 20 megawatts test reactor commonly known as the National Bureau of Standards Reactor (NBSR), continued to be operated in support of laboratory experiments and various types of research.

1. Operator Licenses, Requalification, and Medical Examinations

a. Inspection Scope (IP 69003)

To verify compliance with the operator requalification program for the NBSR, which was last updated March 2009, the inspector reviewed:

- Medical examination records from 2014 through 2018
- Current status of selected qualified operators' licenses
- NBSR requalification (biennial) examinations for 2016 and 2018
- Training provided the operators during the NBSR 2016-2017 and 2018-2019 requalification training cycles
- Operator training records for the years 2015, 2016, 2017, and 2018 to date, documented on forms entitled, "Requalification Program Documentation Review and Reactivity Changes," no revision date
- Supervisor's annual operator evaluations documented on forms entitled, "Operator Evaluation" (form revised November 2009)

b. Observations and Findings

The inspector noted that there were 23 qualified senior reactor operators (SROs) employed at the facility. In addition, it was noted that there were three SRO candidates in training. Through a review of various requalification and training documents, the inspector verified that the facility SRO operators' licenses were current and records of the licensed operator's requalification status were being maintained as required.

A review of program records also showed that operator training was consistent with the NBSR requalification program requirements. The inspector verified that all operators had completed the requalification training and had taken the written biennial requalification examinations. Additional training on various plant systems and industrial hygiene/safety was also provided. NBSR console logbooks and requalification records showed that operators maintained active duty status by participating in the reactivity manipulations and document reviews as outlined and required in the requalification program. The inspector also confirmed that the operators had been given annual operating evaluations as required.

Furthermore, the inspector verified that the qualified operators were receiving a physical examination every 2 years as well. During the review of supporting

documentation for the operators' biennial physical examinations, the inspector identified discrepancies between the Medical History and Exam Form submitted by the operators' to the NIST Health Unit physician, and the information included on the operators' NRC Form 396. The inspector discussed the discrepancies with NIST staff, which resulted in the licensee submitting an updated NRC Form 396 or revising their Medical History Exam Form. Additionally, the inspector identified multiple examples of conditions that could possibly cause sudden incapacitation, as described in American National Standard Institute/American Nuclear Society-15.4-2007 indicated by operators on their respective Medical History and Exam Form. The supporting evidence for the NIST Health Unit physician's recommendation of "No Restriction" was not submitted to the NRC with the respective operator's NRC Form 396. In discussion with NIST staff, the inspector expressed that relevant medical information provided to the NIST Health Unit physician should also be submitted to the NRC with the operator's/applicant's NRC Form 396 in order for the NRC to make well-informed licensing decision for granting the individual an operator license. The NRC inspector determined that there were no immediate concerns regarding the medical conditions of any of the operators scheduled to stand watch during the course of the inspection. In addition, the inspector emphasized that changes to an operator's medical condition resulting in incapacitation because of disability or illness should be reported to the NRC, in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.74.

c. Conclusion

Operator requalification was being conducted and completed as required by the licensee's requalification program. Physical examinations for the operators were being completed every 2 years as required.

2. Experiments

a. Inspection Scope (IP 69005)

To ensure that the requirements of TS Sections 3.8, 4.8, and 6.5, and administrative procedures were being met governing the licensee's program for conducting experiments, the inspector reviewed selected aspects and/or portions of:

- Beam Experiment Subcommittee (BES) Reports to the NCNR SEC during meeting: Number (No.) 384 held October 26, 2017, and No. 385 held April 9, 2018
- Experimental Control Procedures Summary Notebook containing experiments for various instruments located in the C-100 area and the guide hall
- Rabbit Request List maintained in the Control Room which contained the irradiation requests authorized for the pneumatic system as well as a list of authorized users
- Revision to Experimental Proposal Approval Sheet for No. 413, "High Flux Backscattering Spectrometer NG-2," approval by the BES dated July 23, 2018

- Experimental Proposal Approval Sheet for Activity No. 682.03.0113, “Re-calibration of NBS-1 Using NG6-m (Mn Bath),” approval by the NCNR Director, dated May 23, 2018

b. Observations and Findings

Experiments at the NBSR included: (1) irradiation experiments and (2) beam experiments. Irradiation experiments were those conducted in a pneumatic tube or in any other NBSR irradiation facility inside the thermal shield. Beam experiments were ones which were conducted in or with experimental instruments outside the reactor thermal shield. Beam experiments were typically conducted in the C-100 area or the guide hall. For irradiation experiments, the reactivity worth and other criteria were delineated in the TS; no criteria were listed in the TS for beam experiments. Depending upon the type of experiment being proposed, either the Irradiation Subcommittee or the BES reviewed the experimental proposal as required and provided recommendations. Since the TSs did not include criteria for beam port experiments, the licensee developed administrative guidelines to extend the review and approval requirements in TS Section 6.5 to include the beam port and guide hall experiments.

The inspector interviewed the Chair of the BES. He explained the process followed for experiment approval and discussed current experiments that were reviewed by his committee. The inspector reviewed the approval package for a beam experiment and a package dealing with the revision of another. It was noted that the BES had reviewed the beam experiment package and the revision of the other as required. The beam experiment had been reviewed by the NCNR Hazards Review Committee as well. The inspector verified that the beam experiment package was forwarded to the SEC for review and subsequently to the Director for approval. The inspector also noted that the approved beam experiment documentation specified certain engineering and radiation protection controls that were required to be implemented to limit radiation exposure to personnel conducting the experiments. It was noted further that the revised experiment proposal was a minor revision which only required BES approval.

The inspector interviewed the Chair of the Irradiation Subcommittee. It was noted that no new proposals dealing with experiments in the thermal shield or the pneumatic system had been forwarded to the subcommittee. The review and approval process for the Irradiation Subcommittee remained in effect. The inspector verified that any new experiments involving the thermal shield or the pneumatic system would receive a 10 CFR 50.59 review.

The inspector determined that all the current experiments, as they were being conducted, were completed with the cognizance of the reactor operators (ROs) and in compliance with the applicable procedural precautions and controls.

c. Conclusion

The program for experiment review and approval satisfied TSs and procedural requirements. The experiments were conducted in compliance with the applicable procedural controls.

3. Organization and Operations and Maintenance Activities

a. Inspection Scope (Inspection Procedure (IP) 69006)

To verify that the licensee was complying with the organizational and staffing requirements specified in NBSR TS Section 6.1; and complying with operating requirements in TS Sections 2.0, 3.0, and procedural requirements; and, to ensure that maintenance activities were being completed; the inspector reviewed selected aspects of the following:

- Current NCNR organization and staffing
- Various NIST reactor control room log sheets
- Selected NIST reactor area inspection log sheets
- Shift supervisor's instructions and special log sheets
- NBSR Reactor Shift Supervisor Logbook No. 43
- Reactor Console Logbooks Nos. 162 through 165
- Management and staff responsibilities outlined in the TSs
- Selected reactor operations shift turnover log notebook entries
- Various reactor operations records from October 2016 to the present
- NBSR Administrative Rules (AR) 1.0, "Responsibilities of Operations Personnel"
- NBSR AR 2.0, "Personnel Requirements"
- NBSR AR 9.0, "Reactor Startup and Operation"
- Selected NBSR Operating Instructions (OIs) (i.e., operating procedures)
- Selected Non-TS Maintenance Schedules for each month for the period from January to October 2018, which indicated what maintenance activities were due for completion during that month
- NBSR Emergency Instruction (EI) 0.2, "Emergency Organization and Phone Numbers," listing emergency contact information for Reactor Operations personnel
- Operations Report No. 69, "NBSR Annual Report," for the period from January 1, 2016, through December 31, 2016, issued April 25, 2017
- Operations Report No. 69 (sic), "NBSR Annual Report," for the period from January 1, 2017, through December 31, 2017, issued April 2, 2018

b. Observations and Findings

(1) Organization

The licensee's organizational structure remained consistent with the requirements of TS Section 6.1 and Figure 6.1. The inspector found that the various management and supervisory personnel in the Reactor Operations Group met or exceeded the minimum qualifications specified in the TSs with regard to education and experience. It was noted that the person filling the Chief, Reactor Operations position had retired in September. Another person in the organization with the proper qualifications had been appointed the Acting Chief, Reactor Operations until a decision was made about a permanent replacement.

In discussing staffing with management personnel, the inspector determined that there were 23 qualified SROs at the facility (as noted above) who were assigned to the various operating crews, or in management positions, or working in the Reactor Engineering group. Through interviews with operations personnel, the inspector determined that there were four operating crews at the facility who worked rotating shifts. Additionally, there was a fifth "day shift" crew composed of individuals who normally only worked during the weekdays, but also provided coverage on occasion when individuals from the other crews were unavailable. Each crew was typically staffed with three individuals who were licensed SROs. New hires, while in operator training, were also assigned to one of the four crews.

Through a review of selected entries in the console logbooks for the period from October 2017 to the present and through observations of operations crew personnel, the inspector verified that staffing during routine reactor operation was as required and appeared to be adequate. It was also noted that a list of reactor facility personnel by name and telephone number was available to the ROs in the control room and was updated at least annually as required by TS Section 6.1.3. The list was last updated on July 7, 2018.

(2) Operations

The inspector observed routine reactor operations on various occasions during the inspection. Through these observations and reviews of logs and related records, the inspector noted that operations were conducted in accordance with facility procedures as required. The logs and records were clear and provided an indication of ongoing activities. Direct observation and records review also demonstrated that shift staffing during reactor operation was being maintained as required by TS 6.1.3.

The records reviewed showed that operational conditions and parameters were consistent with TS and procedural requirements and that these conditions and requirements were satisfied as well. Reactor startup procedure, NBSR OI 1.1, required verification of each of the limiting conditions for operations specified in TSs 3.1 through 3.9 prior to startup. These verifications were being completed and recorded as required and as documented on reactor control room and reactor area log sheets and in the Console Log Books. The inspector noted that various other procedural requirements were also being met.

Through logbook review and direct observation, the inspector also verified that shift turnover briefings were held prior to each shift change. It was noted that activities of the previous shift, and events or job evolutions scheduled for the upcoming shift, were discussed in detail. A status board was also maintained in the Control Room to ensure all operators were aware of ongoing work and current plant conditions. The records kept and the briefings that were given ensured that the operators were aware of the current conditions in the facility and what was planned for the upcoming shift.

(3) Maintenance

Because the reactor was operated continuously during the inspection, the inspector was unable to observe any in-progress maintenance activities. However, the inspector was able to review various maintenance records, console logbooks, and data sheets which indicated that routine maintenance activities were conducted at the required frequency and in accordance with the applicable procedure or equipment manual. Maintenance activities ensured that equipment remained consistent with the safety analysis report and TS requirements. Major preventative and corrective maintenance operations having safety significance were being included in the facility Annual Reports submitted to the NRC as required by TS 6.7.1(3).

c. Conclusion

The established organization was consistent with TS 6.1 requirements and the operations staffing level appeared to be adequate for the current level of operations. Acceptable shift staffing was being maintained and operations were being conducted in accordance with procedures. The maintenance program was being conducted and documented as required by procedure.

4. Review and Audit and Design Change Functions

a. Inspection Scope (IP 69007)

The inspector reviewed the following to ensure that the requirements of TS Section 6.2 and 10 CFR 50.59 were being implemented effectively:

- NCNR SEC meeting minutes for April 2017 through the present (Meeting Nos. 383 through 386)
- NBSR Procedure No. NBSR-0007-DOC-04, "Engineering Manual," Revision 4, which included procedures and instructions for completing changes at the facility
- 2017 reactor audit conducted in accordance with TS 6.2.4, "SEC Audit Function," (1-4) by the NCNR Audit Subcommittee of the SEC, dated October 17, 2017
- "2017 Annual [Audit] Report of the Safety Assessment Committee," audit conducted during October 24-26, 2017, and report dated March 7, 2018
- NCNR SEC Charter, approval dated June 16, 2016
- NBSR Engineering Change Request/Engineering Change Notice (ECR/ECN) No. 894, "Replacement Pressure Relief Valve (PRV) and Corresponding Piping Changes," ECR Level II review dated January 15, 2015, and ECN Level II review and approval dated January 22, 2015, (with the associated 10 CFR 50.59 Evaluation) – Closed out as of April 2, 2018
- NBSR ECR/ECN No. 952, "Technical Specification Change for Low Power Testing," ECR Level II review dated April 15, 2016, and ECN Level II review and approval dated April 15, 2016 – Closed out as of March 6, 2018
- NBSR ECR/ECN No. 1048, "Loss of Primary Coolant Procedures," ECR Level II review dated September 27, 2017, and ECN Level II review and

approval dated September 27, 2017, (with the associated 10 CFR 50.59 Evaluation) – Closed out as of March 30, 2018

- Facility “NBSR Annual Reports,” for the past 2 years (as referenced in Paragraph 3 above)

b. Observations and Findings

(1) Review and Audit Functions

The inspector reviewed the charter of the SEC required by the TSs. It was noted that the charter delineated the committee’s membership, organization, and responsibilities, as well as quorum and meeting requirements. The charter also authorized the formation of subcommittees to assist the SEC. Four subcommittees had been organized for that purpose including: (1) the NCNR Audit Subcommittee, (2) the BES, (3) the Irradiation Subcommittee, and (4) the Procedure Review Subcommittee (PRS). A charter had been developed for each subcommittee and the various charters had been reviewed and approved by the SEC.

Records of the meetings held by the SEC from April 2017 through the date of the inspection were reviewed. The meeting minutes showed that meetings were held at least semiannually as required by the SEC Charter and reviews of proposed changes and experiments were completed by the SEC or by a designated subcommittee. The minutes also indicated that the SEC provided appropriate guidance and direction for reactor operations and ensured suitable use and oversight of the reactor.

A review of audit records indicated that the SEC Audit Subcommittee conducted an annual audit of the safety program at the facility in accordance with TS Section 6.2.4. The audits appeared to be appropriate. The audits were reviewed by the full SEC and licensee management responded to the subcommittee’s findings and recommendations. In addition, corrective actions were taken as warranted.

Other records reviewed by the inspector showed that, as required by TS Section 6.2.5, a SAC was convened annually to conduct an independent audit. The 2017 audit was conducted by individuals from various Research and Test Reactors around the United States including representatives from the University of Maryland, Rhode Island Nuclear Science Center, University of Massachusetts - Lowell, and Massachusetts Institute of Technology. The SAC audit provided good insight into the licensee’s program and made various worthwhile recommendations for program improvement. The licensee responded to the findings and took actions/corrective actions as needed.

(2) Design Change Functions

The inspector reviewed selected requests for changes to the facility (i.e., changes to structures, systems, or components (SSCs)) that had

been proposed within the last 2 years. At NIST these change proposals were designated as ECRs. Each ECR documented what was proposed to be changed, the facility drawings that would need to be changed, the procedures that would require revision, and any tests or measurements that would need to be completed following the change. In order to track the change requests, they were numbered sequentially during the year. These were screened to determine whether or not a 10 CFR 50.59 review would be required. Based on the safety significance and the 10 CFR 50.59 screen results, the changes were classified as either Level I (Minor) or Level II (Major). All Level II ECRs required a 10 CFR 50.59 review which often resulted in the completion of a 10 CFR 50.59 evaluation.

Once an ECR was approved indicating that the change project could move forward, the associated ECN was implemented which contained various sections. The sections detailed the design description, safety considerations and analysis, a safety evaluation, and the 10 CFR 50.59 screening or review criteria results.

A review of selected ECRs and ECNs demonstrated that changes to SSCs, as well as certain procedures, were acceptably documented and reviewed in accordance with NRC requirements and the licensee's guidelines. It also indicated that the work and the required document revisions were being completed as necessary. It was noted that the changes were being tracked to completion by the licensee. One change package reviewed by the inspector met one of the criteria of 10 CFR 50.59(c)(2), which would require a change to the TSs and, therefore, required a license amendment from the NRC. The licensee submitted a license amendment request to the NRC for this change. The license amendment was subsequently approved as noted in a letter from the NRC to the licensee dated December 15, 2017.

c. Conclusion

The facility SEC was meeting as required and reviewing the topics outlined in the TSs. Independent annual audits were being conducted by a SAC as required. The licensee's design change program satisfied NRC requirements.

5. Procedures

a. Inspection Scope (IP 69008)

The inspector reviewed the following to ensure that the requirements of TS Section 6.4 were being met concerning written procedures:

- Procedure change, review, and approval process
- NBSR AR 5.0, "Procedures and Manuals," Revision A, dated April 25, 2016
- NBSR-0005-CH-00, "Charter for the NCNR Safety Evaluation Committee Procedure Review Subcommittee," approval dated June 16, 2016

- NCNR SEC meeting minutes for April 2017 through the present (Meeting Nos. 383 through 386)
- Facility “NBSR Annual Reports,” for the past 2 years (as referenced in Paragraph 3 above)

b. Observations and Findings

Written procedures for the activities listed in TS Section 6.4 were available as required. Those activities included normal reactor operations, abnormal operations, emergency conditions involving the potential or actual release of radioactivity, radiation protection, site emergency actions, and fuel handling. The inspector noted that the licensee had completed reformatting nearly all procedures associated with operation of the reactor so that they were all in a standard format. It appeared that, although this project required a great deal of time and effort by all the groups involved, it has been beneficial for the facility.

In 2014, the licensee established a PRS which reported to the SEC to review all the reformatted and revised procedures and any new procedures that might be developed. The inspector verified that the revised procedures had been reviewed by the SEC PRS as required. The procedures were then approved by the Chief of Reactor Operations or the Chief of Reactor Operations and Engineering as required in the TSs. The inspector also verified that the official, approved copies of reactor operations procedures were kept in the control room as stipulated.

c. Conclusion

The procedure revision, control, and implementation program satisfied TSs requirements.

6. Fuel Movement

a. Inspection Scope (IP 69009)

The inspector reviewed selected aspects of the following to verify that fuel movement and handling was being conducted as required by TS Sections 3.9 and 5.3:

- Reactor Console Logbooks Nos. 162 through 165
- NBSR Reactor Shift Supervisor Logbook No. 43
- Core reload/refuel and core defuel/refuel verification and sign-off sheets for Core Nos. 634 through 643 which were completed to ensure accurate records were maintained in the Control Room, at the reactor top, and in the storage pool room
- NBSR OI 6.1, “Fueling and Defueling Procedures,” Revision C
- NBSR OI 6.2, “Operation of Fuel Transfer System,” Revision F
- NBSR OI 3.3, “Operation of the Storage Pool Cooling System,” Revision A

b. Observations and Findings

Licensee procedures and operator instructions provided approved methods to move and handle fuel consistent with the provisions of the TSs and the licensee safety analysis. The inspector reviewed the core loading and fuel handling records for recent refueling cycles and found them to be complete and properly documented. Fuel movement, fuel loading/reloading, and fuel examination records documented that fuel was moved and controlled as required. The records also showed that the fuel movements were verified by various individuals as required and that fuel elements were maintained in the authorized and designated locations. Records further showed that fuel handling and monitoring equipment was operable. Personnel were knowledgeable of the procedural requirements that ensured criticality control and fuel integrity.

c. Conclusion

The licensee maintained and followed procedures which effectively implemented TS requirements for fuel handling.

7. Surveillance

a. Inspection Scope (IP 69010)

To determine that surveillance activities and calibrations were being completed as required by TS Section 4.0, the inspector reviewed selected aspects of:

- Reactor Console Logbooks Nos. 162 through 165
- Selected TS Surveillance Schedules for each month for the period from January to October 2018, which indicated what surveillance activities were due for completion during that month
- Selected NIST reactor area inspection log sheets (completed every shift during routine operation) for the past 12 months
- Selected NIST reactor control room log sheets (data taken every hour during routine operation) for the past 12 months
- Selected NBSR Instrument Test Procedures and TS Procedures
- OI 1.1 CL-A, "Reactor Startup Checklist (Shutdown >24 hours)," Revision J
- OI 1.1 CL-B, "Reactor Startup Checklist (Shutdown <24 hours)," Revision A
- Facility "NBSR Annual Reports," for the past 2 years (as referenced in Paragraph 3 above)

b. Observations and Findings

The inspector reviewed various surveillance and calibration records. The completion and results of these activities were tracked by the Chief of Reactor Operations, as well as by operations personnel. Tracking was done by means of the "TS Surveillance Schedule," which was revised and updated as the tasks were completed. A new surveillance schedule was issued monthly. A review of the monthly surveillance schedules, console logbooks, and related data recorded on the appropriate forms indicated that the surveillances and calibrations were completed at the frequency specified in the TSs and in accordance with procedure. If a surveillance activity could not be completed within the established time frame, the reason for the delay was typically documented in the logs or records. All results reviewed by the inspector were within TSs or procedurally prescribed parameters.

c. Conclusion

The surveillance program was being conducted as specified by TS requirements.

8. Transportation Activities

a. Inspection Scope (IP 86740)

The inspectors reviewed the following documents to determine compliance with NRC and DOT regulations governing the transport of radioactive material as specified in 10 CFR Part 20 and 10 CFR Part 71, and 49 CFR Parts 171–178:

- Licenses of shipment recipients
- Material transfer request forms for 2017 and to date in 2018
- Radioactive material shipment records for 2017 and to date in 2018
- Training records for those designated as "shippers"

b. Observations and Findings

The inspectors reviewed records of shipments of radioactive material made during 2017 and to date in 2018. Through this review and discussions with licensee personnel, the inspectors determined that the licensee had shipped various types of radioactive material since the previous inspection in this area. The records indicated that the radioisotope types and quantities involved were calculated and dose rates measured as required. The records also indicated that the shipping containers were appropriate and had been labeled if required. Appropriate surveys were completed on radioactive material that was received from offsite. The radioactive material shipping records reviewed by the inspectors had been completed and maintained as required by NRC and DOT regulations.

The inspectors verified that the licensee was maintaining copies of consignees' radioactive material possession licenses as required. If the current copy of the license was not available at NCNR, the licensee was aware that they were

required to contact the consignee and obtain a current copy before a shipment could be made.

The licensee also maintained on file the certificates of compliance pertaining to those shipping containers that were used to ship radioactive material as required. In addition, the inspectors verified that the licensee staff members assigned to complete and/or review the shipping paperwork were trained and that refresher training was being completed biennially as required by the International Civil Aviation Organization and DOT.

c. Conclusion

The program for transportation of radioactive materials satisfied DOT and NRC regulations.

9. Emergency Preparedness

a. Inspection Scope (IP 69011)

In order to verify compliance with the NBSR E-Plan dated December 2008 (as amended July 1, 2017), the inspector reviewed selected aspects of:

- Emergency preparedness training records for 2016 and 2017
- Selected NIST reactor area inspection log sheets for the past 12 months
- Assistance provided by support groups (i.e., NIST Fire Department (FD), NIST Police Department (PD), and law enforcement officials from Montgomery County, Maryland)
- Records documenting annual evacuation drills and the latest biennial emergency exercise
- Documentation of inventories of emergency response supplies, equipment, and instrumentation
- NBSR EI Manual (containing the E-Plan implementing procedures)
- NBSR EI Procedure 0.2, "Emergency Organization Phone Numbers"
- NBSR EI Procedure 0.3, "Emergency Classification and Criteria"
- NBSR EI Procedure 4.4, "Emergency Equipment"

b. Observations and Findings

The E-Plan in use at the reactor and support facilities was the same as the latest version submitted to the NRC. The E-Plan was being audited and reviewed biennially as required. It was noted that operators were required to review the emergency procedures and be cognizant of their responsibilities in case of an emergency. The inspector verified that operators were reviewing the emergency procedures and understood their duties in response to emergency conditions.

Communications capabilities were checked periodically and phone numbers for the various support organizations were verified annually. The inspector conducted an onsite tour of the licensee's Emergency Support Center and determined that communication equipment, radiological response supplies, and radiation detection equipment were available as stipulated.

The most recent biennial emergency exercise was conducted February 1, 2018. A critique was held following the exercise to discuss those things that were done well and how to correct the problems that occurred. The inspector noted that three emergency drills were conducted since the last NRC inspection, which is more frequent than annual requirement in the E-Plan.

Emergency preparedness and response training for NBSR personnel was being completed as required. This was accomplished through the initial training for incoming personnel and the refresher training provided for all NCNR employees. The licensee's health physics group conducted biennial emergency response training for the NIST FD and PD personnel, as well. The inspector verified that the last training for these groups had been conducted during June and July 2018.

The inspector reviewed the results of selected emergency equipment inventories required by Section 8.5 of the E-Plan. It was noted that the emergency equipment in the lockers located in the A-wing front lobby/break area, in Basement Level 2, and in the C-200 area had been inventoried annually.

The inspector verified that the memorandum of understanding between Montgomery County and NIST concerning enforcement, remained in effect.

During the inspection, the inspector and a licensee representative visited the NIST Emergency Services building which housed the PD and FD offices and the central Dispatch Center. The inspector met with a PD Chief and a FD Captain and discussed the actions each group would take in response to an emergency at the NCNR. Each group understood their respective roles and responsibilities. There appeared to be a good working relationship between the NCNR and these support groups.

c. Conclusion

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

10. Exit Interview

The inspection scope and results were summarized on October 18, 2018, with members of licensee management. The inspectors described the areas inspected and discussed 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

T. Barvitskie	Chair of the Irradiation Subcommittee
P. Brand	Chief, Reactor Engineering and Chair, Hazards Review Committee
D. Brown	Leader, Reactor HP Group and Senior Reactor Health Physicist
F. Clark	Reactor Supervisor/Senior Reactor Operator
R. Dimeo	Director, NCNR
D. Flynn	Acting Chief, Reactor Operations
B. Kirby	Chair of the Beam Experiment Subcommittee
S. MacDavid	Engineering Technician
T. Newton	Chief, Reactor Operations and Engineering; and, Deputy Director, NCNR
D. Pierce	Chair, Safety Evaluation Committee
R. Strader	Quality Assurance Program Manager
R. Sprow	Reactor Supervisor/Senior Reactor Operator

Other Personnel

K. Black	Shift Captain, Fire Protection Group, Emergency Services Division, Office of Facilities and Property Management, NIST
E. Perez	Chief, Police Department, Emergency Services Division, Office of Facilities and Property Management, NIST

INSPECTION PROCEDURES USED

IP 69003:	Class I Research and Test Reactor Operator Licenses, Requalification, and Medical Examinations
IP 69005:	Class I Research and Test Reactors Experiments
IP 69006:	Class I Research and Test Reactors Organization and Operations and Maintenance Activities
IP 69007:	Class I Research and Test Reactors Review and Audit and Design Change Functions
IP 69008:	Class I Research and Test Reactor Procedures
IP 69009:	Class I Research and Test Reactors Fuel Movement
IP 69010:	Class I Research and Test Reactors Surveillance
IP 69011:	Class I Research and Test Reactors Emergency Preparedness

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

LIST OF ACRONYMS USED

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
AR	Administrative Rule
BES	Beam Experiment Subcommittee
DOT	U.S. Department of Transportation
ECN	Engineering Change Notice
ECR	Engineering Change Request
ECR/ENC	NBSR Engineering Change Request/Engineering Change Notice
EI	Emergency Instruction
E-Plan	Emergency Plan
FD	Fire Department
IP	Inspection Procedure
NBSR	National Bureau of Standards Reactor
NCNR	NIST Center for Neutron Research
NIST	National Institute of Standards and Technology
No.	Number
NRC	U.S. Nuclear Regulatory Commission
OI	Operating Instruction
PD	Police Department
PRS	Procedure Review Subcommittee
RO	Reactor Operator
SAC	Safety Assessment Committee
SEC	Safety Evaluation Committee
SRO	Senior Reactor Operator
SSCs	Structures, Systems, or Components
TS	Technical Specification