

July 29, 2010

Dr. Robert Dimeo, Director
NIST Center for Neutron Research
National Institute of Standards and Technology
U.S. Department of Commerce
100 Bureau Drive, Mail Stop 8561
Gaithersburg, MD 20899-8561

SUBJECT: NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY - NRC
ROUTINE INSPECTION REPORT NO. 50-184/2010-201

Dear Dr. Dimeo:

From June 28, 2010 through July 1, 2010, the U.S. Nuclear Regulatory Commission (NRC, the Commission) conducted an inspection at National Institutes of Standards and Technology Center for Neutron Research. The inspection included a review of activities authorized for your facility. The enclosed report documents the inspection results, which were discussed on July 1, 2010, with members of your staff.

This inspection was an examination of 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. 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 concern or noncompliance with NRC requirements was identified. No response to this letter is required.

In accordance with Title 10 of the *Code of Federal Regulations* Section 2.390 a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (Agencywide Document Access and Management System (ADAMS)). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>.

R. Diemo

-2-

Should you have any questions concerning this inspection, please contact Patrick Isaac at 301-415-1019 or by electronic mail at Patrick.Isaac@nrc.gov.

Sincerely,

/RA/

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

Docket No. 50-184

License No. TR-5

Enclosure:
As stated

cc w/encl: See next page

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-2-

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National Institute of Standards and Technology
cc:

Docket No. 50-184

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Dr. David Sean O'Kelly, Chief Reactor Operations
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Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

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

Docket No: 50-184

License No: TR-5

Report No: 50-184/2010-201

Licensee: National Institute of Standards and Technology

Facility: National Bureau of Standards Reactor

Location: Gaithersburg, MD

Dates: June 28, 2010 - July 1, 2010

Inspector: Patrick J. Isaac

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

EXECUTIVE SUMMARY

National Institute of Standards and Technology
National Bureau of Standards Reactor
NRC Inspection Report No. 50-184/2010-201

The primary focus of this routine, announced inspection was the onsite review of selected aspects of the National Institute of Standards and Technology (NIST) licensee's Class I research reactor facility safety programs including review and audit and design change function; fuel movement; emergency preparedness; radiation protection; effluent and environmental monitoring; and transportation activities. The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with U. S. Nuclear Regulatory Commission (NRC) requirements.

Review and Audit and Design Change Functions

- Within the scope of the inspection, the licensee's programs for overall safety review, review of new experiments, and review of changes to the facility were found to be in conformance with Technical Specifications (TS), regulatory requirements, and NIST procedures.

Fuel Movement

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

Emergency Preparedness

- Emergency preparedness practices were being maintained in accordance with regulatory requirements and the licensee's commitments.

Radiation Protection

- Radiation protection practices were found to be in compliance with regulatory requirements and As Low As Reasonably Achievable (ALARA) principles. Surveys were completed as required, postings met regulatory requirements, personnel dosimetry and radiation monitoring programs were maintained as required

Effluent and Environmental Monitoring

- Effluent monitoring verified that releases were in compliance with license and regulatory requirements. Environmental monitoring was performed in accordance with TS requirements; no adverse environmental impact was observed.

Transportation Activities

- Radioactive material shipments and receiving were performed in accordance with facility procedures and NRC and Department of Transportation (DOT) regulations.

REPORT DETAILS

Summary of Facility Status

The National Institute of Standards and Technology (NIST, the licensee) Center for Neutron Research (NCNR) reactor, a 20-megawatt 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. During the inspection, the reactor was operated continuously on a 24-hour per day basis.

1. Review and Audit and Design Change Functions

a. Inspection Scope (IP 69007)

The inspector reviewed the following to ensure that the requirements of Technical Specifications (TS) Sections 7.2, Safety Evaluation Committee (SEC), and 7.3, Safety Audit Committee (SAC), and Title 10 of *Code of Federal Regulations* Section 50.59 were being implemented effectively:

- NIST Annual Report # 62 for the NBSR, dated March 26, 2010
- NCNR SEC 2009 Reactor Audit
- NBSR-0004-DOC-00, NCNR SEC Charter, dated July 28, 2008
- Charter of the Beam Experiment Subcommittee of the NBSR SEC, dated March 29, 2005
- NCNR SEC Committee Minutes for Meeting No. 369
- NBSR-0003-DOC-05, Guidelines for Completing Engineering Change Notices (ECN)
- NBSR Engineering Change Request (ECR) No. 573, dated February 28, 2010
- NBSR ECN No. 573, dated May 11, 2010
- NBSR ECN No. 579, Replacement of Reactor Supply Ventilation, dated April 09, 2010
- NBSR ECN No. 555, Relocating Valves on C100 North Wall, approved April 15, 2009
- NBSR ECN No. 562, Replacement of the Main Air Dryer, approved August 10, 2009
- Building 235, Reactor Mechanical Room Modification Study, dated November 14, 1997
- ECR No. 555, dated March 27, 2009
- ECR No. 562, dated June 30, 2009
- Engineering Change Status, dated March 02, 2010

b. Observations and Findings

The inspector interviewed the chairman of the NBSR Hazard Review Committee who is also the Chief Reactor Engineer, being assured that the level of oversight provided by the committees was in accordance with TS and 10 CFR Section 50.59 requirements for both in-reactor and beam experiments.

The inspector also met with the Quality Assurance Engineer who managed the engineering change process. They briefly reviewed a sample of ECNs produced over the past 12 months with an emphasis on the 10 CFR Section 50.59 screening process. The inspector found no issues with the engineering change review process nor the decisions documented in the ECNs.

c. Conclusion

Within the scope of the inspection, the licensee's programs for overall safety review, review of new experiments, and review of changes to the facility were found to be in conformance with TS, regulatory requirements, and NIST procedures.

2. Fuel Movement

a. Inspection Scope (IP 69009)

The following documents were reviewed to verify safe handling, storage, inspection, and use of reactor fuel elements in compliance with TS Sections 3.7, Fuel Handling and Storage, 3.8, Fuel Handling Within the Reactor Vessel, and 7.4 (6), [Procedures for] handling of irradiated and unirradiated fuel elements:

- Operating and Refueling Procedures for the NBSR
- Operating Instruction OI 6.1, Fueling and Defueling Procedures, issued December 14, 2006
- Operating Instruction OI 6.2, Operation of the Fuel Transfer System, issued July 27, 2009
- Core Loading 599, dated June 8, 2010
- Core Loading 598, dated April 12, 2010
- Core Loading 595, dated November 10, 2009
- NIST Final Loading Sheets (Shipments TR-5-09-1-2-3), dated October 1, 2009
- Package Quality Assurance Checks for New Fuel, dated January 13, 2009

b. Observations and Findings

The inspector reviewed the core loading designs and fuel handling records for the previous year and found them to be complete and properly documented. Procedures governing fuel handling activities were found to meet the requirements of the TS cited above. The fuel handling records reviewed indicated that the written procedures were followed.

c. Conclusion

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

3. Emergency Preparedness

a. Inspection Scope (IP 69011)

The inspector reviewed the following to determine if the licensee's emergency preparedness program was maintained in a state of operational readiness since the last inspection and to determine if the licensee's emergency preparedness program and changes to the program met 10 CFR Section 50.54(q) regulatory requirements and the licensee's commitments:

- NBSR Emergency Plan (EP), dated September 2008
- NBSR Emergency Instructions, dated November 15, 2008
- Content of Emergency Cabinets
- Memorandum re: Communication Check, dated October 15, 2009
- Memorandum re: Emergency Drill, dated December 17, 2009
- NIST Emergency Response Personnel Training, dated May 2009
- 2009 Refresher Training for NIST Emergency Responders

b. Observations and Findings

The inspector determined if revisions to the EP and implementing procedures were made in accordance with 10 CFR Section 50.54(q) and the licensee's administrative controls; if implementing procedures were consistent with the EP requirements. Through a NIST Fire Station and reactor area inspection tour with facility staff, the inspector verified that key emergency response facilities, instrumentation, and supplies were readily available and maintained as required by the EP; that the licensee's key emergency response personnel could adequately implement the EP and implementing procedures; that agreements for assistance from offsite organizations were understood and could provide the needed support in an emergency as specified by the EP; if emergency alarms were operable and maintained by procedures; if the licensee conducted exercises, drills, and training as required by the EP.

c. Conclusion

Emergency preparedness practices were being maintained in accordance with regulatory requirements and the licensee's commitments.

4. Radiation Protection

a. Inspection Scope (IP 69012)

The inspector reviewed selected aspects of the following to verify compliance with 10 CFR Part 20, TS Section 5.7, and procedural requirements:

- "Duty Health Physics (HP) Weekly Data Survey" for 2009 and 2010

- Report on Compliance with the Clean Air Act Limits for Radionuclide Emissions from the COMPLY Code, dated January 21, 2010
- Report to SEC – Personnel Exposure Summary for the NCNR for Calendar Year 2009
- NIST Health Physics Instrument Calibration Form, dated June 25, 2010
- NIST Health Procedures for NBSR Operations, dated May 1, 2008
- Health Physics Instruction HPI 3.1, Reactor in Plant Monitoring Summary, dated December 1993
- Selected Thermoluminescent Detector (TLD) Monitoring Records, 2008
- Personnel Dosimetry Summary, 2009

b. Observations and Findings

The inspector reviewed the postings at the entrances to various controlled areas throughout the facility. The postings were acceptable and indicated the radiation hazards present. Copies of current notices to workers, required by 10 CFR Part 19, were posted near the racks where personnel dosimeters were stored.

An examination of the records for the calendar year 2009 showed that all personnel exposures were well within NRC limits. All but two monitored NCNR staff and guests received an annual Total Effective Dose Equivalent (TEDE) of less than 0.5 rem, or less than ten percent of the regulatory limits. The highest two exposed individuals received 0.64 and 0.60 rem respectively.

The inspector interviewed NIST Safety, Health and Environment (SH&E) Division personnel who calibrates the portable survey meters typically used at the NCNR. The calibration stickers on selected portable survey meters, friskers, and area radiation monitors (ARMs) in use at the facility were all current.

c. Conclusion

Radiation protection practices were found to be in compliance with regulatory requirements and ALARA principles. Surveys were completed as required, postings met regulatory requirements, personnel dosimetry and radiation monitoring programs were maintained as required.

5. Effluent and Environmental Monitoring

a. Inspection Scope (IP 69004)

The inspector witnessed effluent processing operations and reviewed the following to verify compliance with the requirements of 10 CFR Part 20 and TS Section 5.9, Environmental Monitoring:

- NIST Environmental Sample Analysis Results for 2010
- NIST Environmental Sample Analysis Results for 2009
- Calendar Year 2010 – Liquid Radioeffluent Releases, dated June 28, 2010

- Gaseous Release Logs for 4th Quarter 2009 and 1st Quarter 2010
- Report on Compliance with the Clean Air Act Limits for Radionuclide Emissions from the COMPLY Code – VI.6, dated January 21, 2010
- Report on Compliance with the Clean Air Act Limits for Radionuclide Emissions from the COMPLY Code – VI.6, dated January 27, 2009
- Report on Compliance with the Clean Air Act Limits for Radionuclide Emissions from the COMPLY Code – VI.6, dated March 03, 2009
-

b. Observation and Findings

The licensee collected and analyzed water and vegetation samples from the environment surrounding the facility in compliance with TS 5.9. Data showed that the dose in the controlled area surrounding the exterior walls of the NCNR met the dose limits of 10 CFR Section 20.1301.

Liquid waste from reactor drains, primarily humidity removed from environmental air supplied for ventilation, was collected in tanks for batch release after sampling and analysis. Release concentrations, measured prior to dilution by a factor of 120 with other site effluents, were below 10 CFR Part 20 limits.

The inspector reviewed the environmental soil, water, and vegetation samples that were collected and analyzed during 2009. These samples had all been collected and analyzed within the appropriate time frame required by procedure. There were no indications of radioactivity from the licensee's operation adversely impacting the environment.

c. Conclusion

Effluent monitoring verified that releases were in compliance with license and regulatory requirements. Environmental monitoring was performed in accordance with TS requirements; no adverse environmental impact was observed.

6. **Transportation**

a. Inspection Scope (Inspection Procedure [IP] 86740)

The inspector reviewed the following to verify compliance with NRC (10 CFR Parts 20 and 71 and DOT 49 CFR Parts 171 through 178) regulations:

- Records of fresh fuel shipments on March 24, 2010, April 12, 2010, and May 26, 2010, including: shipping documentation, health physics surveys, and QA checks
- NIST Health Physics (HP) Support Plan for Receipt, Use and Shipment of NAC International Legal-Weight Truck (LWT) Spent Fuel Cask, dated September 22, 2009
- Records of spent fuel shipment TR-5-09-1-2-3 for cask no. 2, including: shipping documentation, health physics surveys, and QA checks

- External Truck Radiological Survey Form, dated September 30, 2009
- QA program approval for Radioactive Material packages No. 0390, Rev. 9, dated September 11, 2008
- NIST Packaging and Shipping QA Program for 10 CFR Part 71 Transport of Radioactive Materials, Rev. 4, dated July 2008
- Type B and COC Package QA Audit, dated March 3, 2010 through March 5, 2010
- Certificate of Compliance #9246 for ST Packages dated January 30, 2008
- Certificate of Compliance #9255 for NAC-LWT spent fuel cask
- NBSR-0002-CL-00 Fuel Acceptance Procedure (checklist), dated April 20, 2009
- Reference Procedure 35, Removing elements from type ST package, reviewed by facility February 1, 2010
- Certificates of Training for DOT, NRC, and International Air Transport Association (IATA) Requirements
- Training Records for Shipment of Radioactive Materials

b. Observation and Findings

During the inspection, a fresh fuel shipment was received. New fuel arrived during the inspection, allowing the inspector to observe implementation of fuel receipt procedures and integration of activities by responsible personnel. Operations personnel were observed performing a receipt inspection. All personnel appeared knowledgeable of their roles and functions.

The inspector compared the above records to the regulatory requirements in 10 CFR Parts 20 and 71 as well as 49 CFR 171-178. The records of spent and fresh fuel shipments indicated that the shipments had been performed in accordance with DOT regulations. The accompanying health physics surveys confirmed that radiation levels did not exceed the limits in 10 CFR Part 20. The QA program was in accordance with 10 CFR Part 71 and the records of shipments indicate that it was followed.

c. Conclusion

Radioactive material shipments and receiving were performed in accordance with facility procedures and NRC and DOT regulations.

7. Exit Interview

The inspection scope and results were summarized on July 1, 2010, with members of licensee management. The inspector described the areas inspected and discussed the inspection findings. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

D. Brown	Senior Health Physicist
P. Brand	Chief of Reactor Engineering
T. Myers	Chief, Reactor Operations
S. O'Kelly	Chief of Operations and Engineering

INSPECTION PROCEDURES USED

IP 69007	Class 1 Research and Test Reactor Review and Audit and Design Change Functions
IP 69009	Class 1 Research and Test Reactor Fuel movement
IP 69011	Class 1 Research and Test Reactor Emergency Preparedness
IP 69012	Class 1 Research and Test Reactor Radiation Protection
IP 69004	Class 1 Research and Test Reactor Effluent and Environmental Monitoring
IP 86740	Transportation

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Discussed

None

Closed

None

LIST OF ACRONYMS USED

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ADAMS	Agencywide Document Access Management System
CFR	<i>Code of Federal Regulations</i>
HP	Health Physicist
IP	Inspection Procedure
NBSR	National Bureau of Standards Reactor
NCNR	NIST Center for Neutron Research
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
PARS	Publicly Available Records
Rev.	Revision
TS	Technical Specification