

February 9, 2000

Dr. J. M. Rowe, Director  
Center for Neutron Research  
National Institute of Standards and Technology  
U. S. Department of Commerce  
Gaithersburg, MD 20899

SUBJECT: NRC ANNOUNCED INSPECTION REPORT NO. 50-184/2000201

Dear Dr. Rowe:

This refers to the inspection of outage activities conducted on January 3-7, 2000 at the National Bureau of Standards Reactor. The enclosed report presents the results of that 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 concern or noncompliance to NRC requirements was identified. No response to this letter is required.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be placed in the NRC Public Document Room on the ADAMS System.

Should you have any questions concerning this inspection, please contact Mr. Thomas Dragoun at (610) 337-5373.

Sincerely,

**/RA/**

Ledyard B. Marsh, Chief  
Events Assessment, Generic Communications  
and Non-Power Reactors Branch  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

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

Enclosure: NRC Inspection Report No. 50-184/2000201

cc w/enclosure: See next page

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U. S. NUCLEAR REGULATORY COMMISSION

Docket No: 50-184

License No: TR-5

Report No: 50-184/2000201

Licensee: U. S. Department of Commerce

Facility: National Bureau of Standards Reactor

Location: National Institute of Standards and Technology  
Gaithersburg, Maryland 20899

Dates: January 3-7, 2000

Inspector: Thomas F. Dragoun

Approved by: Ledyard B. Marsh, Chief  
Events Assessment, Generic Communications and  
Non-Power Reactors Branch  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

## EXECUTIVE SUMMARY

This announced inspection included onsite review of maintenance activities including removal of fuel from the reactor core and replacement of shim arms.

The precautions used during the work were acceptably directed toward the protection of public health and safety, worker health and safety, and in compliance with NRC requirements.

### FUEL MOVEMENT

Fuel movement was conducted in accordance with regulatory requirements.

### SHIM ARM REMOVAL

Shim arm removal was conducted safely and in accordance with requirements.

## Report Details

### Summary of Plant Status

During the inspection, the reactor had been shut down and cooled down for two weeks in anticipation of defueling and maintenance.

#### 1. FUEL MOVEMENT

##### a. Scope (IP 60745)

The inspector reviewed selected aspects of:

- personnel qualifications
- supervisory oversight
- fuel handling procedures
- recordkeeping
- radiological controls

##### b. Observations and Findings

Core off-loading was delayed by binding in a fuel transfer arm spacer. The clearance was increased by polishing the metal.

Fuel was moved by experienced SROs or new SROs under direct supervision. One shift supervisor coordinated all activities. Updated, detailed procedures were available and followed for these activities. The fuel transfer control panel, which had been modified and equipped with a programmable logic controller, functioned well. Communications between the control room, reactor top, and spent fuel pool were clear. The crew was able to transfer 4 to 5 fuel elements each hour which included a wait time for the heavy water to drip off the element. TS requirements in Section 3.1 (Confinement System) and 3.7 (Fuel Handling and Storage) were satisfied.

Identification and storage location of elements were properly recorded. The fuel transfer list signed by the Chief Nuclear Engineer was current. The good clarity of the spent fuel pool water facilitated grappling the elements and identifying the serial numbers. Reactor system components were red-tagged as required by the refueling procedure and logged out of service.

A duty HP was identified to remain in the building as required by the procedure. An RWP was available. Contamination controls were appropriate. Airborne activity was monitored using the permanent building on-line system and attaching an air sample line extended to the work area. A new, alarming portable airborne tritium monitor sampled the air at the reactor top. The installed area radiation monitors were operable as required. An adequate supply of portable survey meters were on hand. No abnormal conditions were detected.

c. Conclusions

Fuel movement was conducted in accordance with regulatory requirements.

2. SHIM ARM REMOVAL

a. Scope (IP 39745)

The inspector reviewed selected aspects of:

- administrative controls and procedures
- radiological controls

b. Observations and Findings

Staff performing the shim arm removal indicated that they reviewed video tapes of this work done previously as part of their preparations. This periodic maintenance is performed about every four years. An updated special procedure with check lists was issued on January 4, 2000, and was in use. Disassembly of the shim arm drive mechanisms were performed by SROs under direction of a senior SRO. Personnel were rotated in the work zone for training and experience. The senior SRO in charge had additional detailed hints and precautions that supplemented the work procedure. The inspector noted that these should be recorded and made available for future work.

Shim arms were extracted through floor openings in the reactor head area using a remotely controlled crane and video cameras. The confinement building was evacuated except for worker and observer personnel who remained behind temporary radiation shields.

The HP stated that a historical review of this work indicated that the maximum personal exposure had been 40 millirem. Similar radiological conditions and controls were anticipated for the current work. Monitoring at the cramped shim arm drive mechanism openings indicated a local concentration of airborne tritium in excess of one DAC. The RSO stated that a dose would be assigned to workers based on bioassay results.

Radiological controls, safety precautions, and attention to ALARA during the various phases of the work were appropriate. Personnel monitoring satisfied regulatory requirements. Control of high radiation areas was proper. The HP staff provided continuous radiation monitoring and oversight during the hazardous portions of the work.

c. Conclusions

Shim arm removal was conducted safely and in accordance with requirements.

## PARTIAL LIST OF PERSONS CONTACTED

### Licensee

D. Brown, Nuclear Engineer  
W. Mueller, Senior Reactor Operator  
T. Raby, Chief, Reactor Operations and Engineering  
J.M. Rowe, Director, Center for Neutron Research  
L. Slaback, Supervisory Health Physicist

### INSPECTION PROCEDURES USED

IP 60745	CLASS I NON-POWER REACTOR FUEL MOVEMENT
IP 39745	CLASS I NON-POWER REACTORS ORGANIZATION AND OPERATIONS AND MAINTENANCE ACTIVITIES

### ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

None

### Closed

None

### LIST OF ACRONYMS USED

DAC	derived air concentration
HP	Health Physicist
IP	Inspection procedure
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
RSO	Radiation Safety Officer
RWP	Radiation Work Permit
SRO	Senior Reactor Operator
TS	Technical Specifications