U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Report No. 50-184/82-02

Docket No. 50-184

License No. TR-5 Priority -- Category E

Licensee: U.S. Department of Commerce
National Bureau of Standards
Washington, D.C. 20234

Facility Name: NBS Reactor

Inspection at: Gaithersburg, Maryland

Inspection conducted: September 8-10,-1982

Inspector: J. Roth for 9/28/82
W. W. Kinney, Project Inspector date signed

Approved by: R Keimig 9-28-82
R. R. Keimig, Chief, Reactor Projects Branch No. 2 date signed

Inspection Summary:

Inspection on September 8-10, 1982 (Report No. 50-184/82-02)

Areas Inspected: Routine, unannounced inspection by a region-based inspector (20 hours) of: licensee action on previous inspection findings; facility operations; organization; logs and records, review and audit; surveillance; and procedures.

Results: One violation was identified (failure to instruct worker in 1) precautions and procedures and 2) in purposes and functions of protective devices used to minimize personal exposure to radioactive material and radiation as required by 10 CFR 19.12 - Paragraph 3).

DETAILS

1. Persons Contacted

* R. S. Carter, Chief, Reactor Radiation Division
* T. M. Raby, Chief, Reactor Operations
  J. F. Torrence, Deputy Chief, Reactor Operations
  J. H. Nicklas, Chief, Engineering Services
  J. Arras, Supervisory Health Physicist

The inspector also interview reactor supervisors, reactor operators, and electronics personnel during the course of the inspection.

* denotes those present at the exit interview.

2. Licensee Action on Previous Inspection Findings

(Closed) Followup Item (184/79-01-01): This item concerned coordination of emergency plans and procedures for protection of the public with the Maryland Division of Radiation Control.

The licensee completed the comprehensive revision of the Emergency Plan for the National Bureau of Standards (NBS) Reactor. This Emergency Plan was submitted to the NRC on September 3, 1982 and is currently under review.

The Emergency Planning Zone (EPZ) defined in this plan does not necessitate off-site agencies' involvement for any postulated accidents since members of the general public would not be affected. The EPZ is the Reactor Site which is the area surrounding the reactor within a radius of 400 meters from the reactor stack, and this area is entirely within the NBS grounds.

In the Emergency Plan, the licensee stated, "Based on the staff level of the NBSR facility and that of the NBS Emergency Support Organizations, as augmented by the U.S. National Naval Medical Center, the NBSR Emergency Organization has the capability of functioning around-the-clock for a protracted period of time in the event of a severe radiological emergency."

Even though the Maryland Division of Radiation Control would not be directly involved in any emergencies at the NBS reactor, the licensee has coordinated with them and has indicated NBS would keep them appropriately informed of emergency situations.

This item is closed contingent upon NRC acceptance of the Plan.

(Closed) Followup Item (184/81-01-01): During the April 22-23, 1981, inspection, the licensee was revising health physics procedures to incorporate action levels and to define the actions to be taken.

During this inspection, the inspector found that Health Physics Procedure No. 5.3, "Environmental Monitoring," issued April 22, 1982, included a section entitled, "Action Levels and Responses." This section incorporated environmental sample value action levels and the responsive action to be taken. The inspector also found that procedure H.P. 2.7, "Contamination Control," defines maximum allowable contamination levels for contamination clearance, removal from a contaminated control zone, and for skin surfaces. Procedure H.P. 3.1, "Radiation Surveys" has contamination and radiation limits for restricted areas and contamination control zones.

(Closed) Unresolved Item (184/81-02-01): During a special inspection, the inspector found that there was no guidance for operators on refill of the reactor vessel following refueling or an inadvertent moderator drain, which would describe alternate fill paths, flow rates, precautions, etc.

During this inspection, the licensee stated that they reviewed their procedures for refilling the reactor following refueling or an inadvertent moderator drain. They determined that their normal procedures provided adequate guidance for operators to refill the reactor vessel. When a situation prevents refilling of the vessel using the normal procedure, the licensee will rely upon the trained reactor operators and supervisors to devise alternate refill paths depending on the situation encountered.

(Closed) Followup Item (184/81-02-02): During a special inspection, the inspector discussed corrective actions and/or planned actions by the licensee to prevent the recurrence of reactor vessel drainage while the reactor is unattended.

The actions discussed during the special inspection are listed below. The review performed during this inspection is discussed after each item.

-- Implementation of a shutdown checklist (includes valve position checks). The licensee prepared Operation Instruction No. 1.3, "UNATTENDED FACILITY CHECK LIST," and issued the check list on August 4, 1981. This checklist included closure of valves and observation of liquid levels in the reactor vessel, heavy water storage tank, and heavy water Emergency Tank for two hours. The licensee implement s the checklist prior to leaving the reactor unattended.

-- Two hour earlier shutdown on Friday evenings when the reactor is to be unattended for the weekend (verify stable conditions). As indicated above the licensee shuts down and observes the liquid levels for two hours to verify stable conditions.

-- Possible low vessel annunciator for building master alarm. The licensee placed the level/T-3 alarm in the system which alarms in the continuously manned guard office. Activation of this alarm is included in the aforementioned checklist.

3. Facility Operation

Upon arrival at the site on September 8, 1982, the inspector toured the facility immediately after an entrance interview. The reactor was operating, therefore, the process equipment areas in the process room could not be inspected.

The areas were in a resonable state of orderliness. The basement levels had materials stored in them. The first floor area appeared to be a location of experimental activity with much equipment about. The second floor and the control room area were kept in an orderly manner.

The inspector observed the activities involved in an experimenter irradiating a sample using the RT-3 pneumatic tube. The experimenter placed his sample in the rabbit while working at a sending and receiving station. This station was located in a radiological hood of a radiological laboratory in the reactor basement. The experimenter irradiated the sample for three minutes using automatic timing and control devices.

The experimenter performed two acts which are considered poor radiation protection practices. He used his fingers to push the irradiated sample into a pig and he inserted his head into the radiological hood while working with the sample at the sending/receiving station.

The licensee measured the contact radiation coming from the sample at the inspector's request. The sample had a surface reading of 700 mR/hr gamma. Handling a sample with these radiation levels with the fingers is poor practice. The licensee had a reactor operator working with the experimenter but, the operator was unable to stop the experimenter from pushing the sample into the pig with his fingers, since the act was performed unexpectedly and very quickly.

Also, the experimenter defeated the purpose of the hood, which is to protect workers from radioactive contamination, especially airborne contamination. According to the licensee, the air inside the hood was not contaminated, and personnel often have to place their heads inside hoods. The licensee pointed out that there is a radiation detector/alarm in the hood. On questioning by the inspector, the licensee noted that the alarmed instrument does not monitor for airborne radioactive contamination. As such, this is also poor practice.

The inspector inquired about the health physics training which had been given to the experimenter. The licensee indicated that the Health Physicists had not yet trained this experimenter. The licensee further indicated that they relied heavily on the various organizations

which employ the experimenters to train the experimenters in radiation protection. The experimenter had received operational training from an NBS reactor supervisor. However, the experimenter's poor radiation protection practices demonstrated lack of adequate training.

10 CFR 19, NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS; INSPECTIONS, require in paragraph 19.12, Instructions to workers, that licensees instruct workers in radiation protection. Licensees must assure that all workers using their facilities are properly instructed in personal radiation protection. The licensee's failure to train this experimenter in precautions or procedures and in the purposes and functions of protective devices, such as sample handling tools and radiological hoods, used to minimize his exposure to radioactive material and radiation is a violation (184/82-02-01).

4. Facility Organization

The organizational positions and the incumbents providing management and operational control of the reactor are shown below.

Position	Incumbent
Chief, Reactor Radiation Division	R. S. Carter
Chief, Reactor Operations	T. M. Raby
Deputy Chief, Reactor Operations	J. F. Torrence
Reactor Supervisors	R. Beasley
	N. Bickford
	A. Chapman
	H. Dilks
	J. Ring
	R. Stiber

The incumbents of the positions meet the qualifications listed in Technical Specification 7.1, Organization.

The licensee operates the reactor continuously using a four shift schedule. The licensee currently has 12 reactor operators, including the reactor supervisors. There are one reactor supervisor and two reactor operators on each shift. On the four shift schedule used, operators working on the day shift must work more than 40 hours during the week to provide continuous operation. Usually, additional operators, beyond the 12 operators assigned to the four shifts, provide day shift relief as well as relief for vacations and sickness. The licensee has a budgeted allotment of 14 operators because of this, and they are attempting to hire additional operators. The crew complement for each shift is in accord with Technical Specification 7.1c.

No violations were identified.

5. Logs and Records

The following logs were reviewed for January 1 through September 8, 1982.

-- Shift Supervisor's Log
-- Preventative Maintenance Log
-- Maintenance Log

There were two scrams of the reactor, thus far, in 1982. One, on July 27, 1982, was caused by a momentary loss of site electrical power tripping a primary coolant pump. The second, on September 2, 1982, was caused by a nuclear instrument failure. The ground for a new 10 volt regulated instrument electrical supply was such that "noise" from lighting caused the instruments to give erroneously high readings, and this caused the reactor scram. During the reactor startup after this scram, loss of electrical power caused the coolant pumps to trip and the reactor scrammed again. The licensee grounded the 10 volt regulated instrument electrical supply in a manner to avoid similar problems in the future.

No violations were identified.

6. Review and Audit

a. Hazards Evaluation Committee

The inspector reviewed the following Hazards Evaluation Committee meetings held during 1982.

		Present		
Meeting No.	Date	Members	Alternate Members	Others
240	January 20	6	1	2
241	February 11	5	2	1
242	March 17	5	2	3
243	March 22	6	1	4
244	April 7	5	1	2
245				
246	May 19	5	2	2
247	June 16	4	3	3
248	July 21	5	1	2
249	August 25	5	-	2

The minutes showed the committee reviewed procedures, experimental proposals, Safety Analysis Review questions, Equipment Change Notices, proposed Technical Specification Changes, and the revised Emergency Plan. These minutes demonstrated that the Hazards Evaluation Committee was meeting Technical Specification 7.2, Hazards Evaluation Committee.

No violations were identified.

b. Safety Review Committee

The inspector reviewed the 1979, 1980, and 1981 Safety Review Committee reports. The same three members were on the Safety Review Committee for these three annual meetings. The committee was at the facility on September 11-12, 1979; October 28-29, 1980; and September 30 - October 1, 1981.

The reports showed the committee audited the NBSR facility operation and the performance of the Hazards Evaluation Committee. The reports did not always reflect the action the licensee took regarding Safety Review Committee findings and recommendations. Also, the licensee did not prepare any documents to list any actions they took to satisfy these findings and recommendations. Upon inquiry, the licensee indicated that the Safety Review Committee findings and recommendations from the previous year were always covered during the annual meeting even if this was not documented in the report. This will be reviewed during a subsequent inspection. (184/82-02-02)

No violations were identified.

7. Surveillance

The inspector reviewed the records for the following Technical Specification 5.0 Surveillance Standards.

Surveillance	T.S.	Frequency	Performed
Confinement Closure System Functional Test	5.1.a.	Quarterly	1/4/82; 3/22/82; 4/29/82; 6/8/82; 7/12, 19, 26/82; 8/9, 16, 23, 29/82
Channel Test of Confinement System Closure Trip	5.1.b.	Quarterly	Same as above
Channel Test of Confinement System Closure Trip using Radiation Source	5.1.b.	Annually	3/18/82 & 4/29/82
Reactivity Worth of Each Shim Arm and the Regulating Rod	5.4.a.	Annually	9/21/78 2/25/80 3/16/81 3/22/82

Withdrawal and Insertion Speeds of Each Shim Arm and the Regulating Rod	5.4.b.	Semi-annually	7/14 & 12/19/78 7/13/79 2/18 & 8/23/80 2/5 & 8/28/81 3/12 & 8/4/82

The inspector questioned the licensee regarding the reason that Surveillance Standards 5.4.a was not performed between September and December 1979 as required. The licensee explained that one of the shim arms expanded and wouldn't pass through its guide properly. The reactor was shutdown from August 8, 1979, to February 27, 1980, to replace all four shim arms. The surveillance tests for the arms were performed in late February 1980. The inspector reviewed the procedure used monthly to verify the operability of the N-16 monitor on the secondary cooling water. The procedure used to calibrate this monitor annually with an external source was also reviewed. The procedures appeared to be comprehensive with appropriate sections for initials to show that the procedural steps were accomplished.

No violations were identified.

8. Procedures

The inspector reviewed the following procedures

Procedure No.	Title	Issue Date
O.I. 1.1	Reactor Startup	3/19/76
O.I. 1.2	Reactor Normal Operation	3/19/76
O.I. 2.1	Operation of Primary Coolant System	4/15/76

Each of the procedures had three sections: 1) Initial Conditions; 2) Limitations and Precautions; and 3) Procedures. Checklists were incorporated into the procedures to assure instructions were accomplished as required. Spaces for initials of the performing operator were included in the checklists. The procedure for operation of the primary coolant system included a section on instrumentation readings such as vessel levels, flow rates, and temperatures.

The operating procedures appeared to be comprehensive and well prepared. The procedures were approved by the Deputy Chief of Reactor Operations.

The inspector requested to see the emergency procedures which satisfy 10 CFR 70.24(a)(3). The licensee showed the inspector procedures which were posted by the monitoring system instruments and alarms. The inspector stated that these procedures should be included with the other Emergency Procedures. The licensee indicated they would consider this and assure that the requirements of 10 CFR 70.24(a)(3) are satisfied during their evacuation drills. This will be reviewed during a subsequent inspection. (184/82-02-03)

No violations were identified.

9. Exit Interview

The inspector met with licensee representatives (denoted in paragraph 1) at the conclusion of the inspection on September 10, 1982. The inspector presented the scope and findings of the inspection.

On September 14, 1982, in a telephone conversation with Dr. R. S. Carter and Mr. T. M. Raby, the inspector identified the situation involving the experimenter and the licensee's failure to provide radiation protection training as a violation of 10 CFR 19.