U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-184/91-01

Docket No. 50-184

License No. TR-5

Licensee: U.S. Department of Commerce
National Institute of Standards and Technology
Gaithersburg, Maryland 20899

Facility Name: National Bureau of Standards Reactor (NBSR)

Inspection At: Gaithersburg, Maryland

Inspection Conducted: February 25-27, 1991

Inspectors: T. Dragoun, Project Scientist, Effluents Radiation Protection Section (ERRS) — date: 3/25/91

Approved by: for R. Bores, Chief, ERPS, Facilities Radiological Safety and Safeguards Branch, Division of Radiation Safety and Safeguards — date: 3-25-91

Inspection Summary: Inspection on February 25-27, 1991 (Inspection Report No. 50-184/91-01)

Areas Inspected: Routine, announced safety inspection of the radiation safety program including: organization, personnel dosimetry, maintenance and calibration of survey meters, training, and routine radiation surveys.

Results: No violations were identified.

DETAILS

1.0 Individuals Contacted

J. M. Rowe, Chief, Reactor Radiation Division
T. Raby, Deputy Chief, Reactor Radiation Division
T. Hobbs, Chief, Health Physics Unit
L. Slaback, Supervisory Health Physicist

All of the above individuals attended the Exit Interview on February 27, 1991. Additional licensee personnel were contacted during this inspection.

2.0 Purpose

The purpose of this routine, announced inspection was to review the following elements of the radiation protection program:

- Organization and Staffing
- Personnel Dosimetry
- Maintenance and Calibration of Survey Meters
- Radiation Worker Training
- Routine Radiation Surveys

3.0 Facility Tour

The inspector toured the various areas in the Reactor (Building #235) and the outside cooling tower. The licensee is nearing completion of a major modification that will make cold neutrons traveling at about 100 meters/second available for experiments. Some of the thermalized neutrons from the reactor core are moderated in a cryogenic fluid and fed through special glass guide tubes into a new building called the "Guide Hall". Various experimental stations have been set up in the Guide Hall. The licensee stated that each experiment has been analyzed for personnel hazards and no significant neutron activation of structural material is anticipated. Special seals are provided where the guide tubes penetrate containment to maintain the integrity of containment. Shutters are provided at the reactor end of the guide tubes to shut off the neutron flux. Each experimental station is also equipped with a shutter which can be closed to allow the experimenter's access to the experimental equipment.

Use of radiation and contamination warning signs along with warning ropes was adequate. Portable survey meters have been permanently placed in several locations in the reactor building for use by occupants in the area. There are frisking stations located at the egress from each area. A few frisking stations have been replaced with the latest computer-controlled personnel contamination monitors. In addition, a sensitive walk-through portal monitor was installed at the exit from the radioisotope laboratories. The inspector commended the licensee for the

effort to improve contamination controls but noted that is possible for personnel could circumvent the frisking stations. The licensee stated that the use of physical barriers or other reminders to personnel would be evaluated. Access to high radiation areas (> 100 mrem/hr) was controlled by the reactor operators who issue special keys required to unlock the areas. One of two high radiation areas, the "process room", was open to allow workers to find the source of a tritium leak in the reactor coolant heat exchanger. An independent survey of the room by the inspector confirmed the licensee's dose rate measurements.

Housekeeping was generally adequate considering that many areas involved temporary experimental setups. Some clutter was noted in the radioisotope laboratories which is receiving licensee attention. No fire hazards from combustible material accumulations was noticed. No personnel hazards were observed.

4.0 Organization and Staffing

The Health Physics (HP) Unit is under the Occupational Health and Safety Division which is organizationally separated from the group that operates the reactor. This is a good arrangement and isolates the HPs from day-to-day pressures associated with reactor operations. The HP Unit consists of two groups: Laboratory HP which oversees the linear accelerator and provides support activities such as dosimetry and survey equipment; and Reactor HP which supports reactor operations and the environmental controls program.

The Reactor HP group is headed by a Supervisory HP and consists of four professional HPs and four HP technicians. The size of the staff was adequate considering the size of the program. Each week a Designated Health Physicist and a Designated Health Physics Technician are assigned responsibility to complete a standard list of tasks. These assignments are rotated to different personnel each week. In addition, each technician is assigned the responsibility for completing routine surveys in his part of the facility. This does not change so that technicians became very familiar with conditions in their assigned area.

All routine HP activities are carried out according to written procedures. The "Health Physics Procedures" provide the general policies and safety objectives established by management. The "Health Physics Instructions" are detailed procedures that provide specific requirements. The inspector noted that procedures are adequate but had not been revised for up to 10 years. However, the licensee is currently conducting a review/evaluation of all HP procedures.

Interviews with the HP staff indicated that personnel are knowledgeable and capable of performing their assigned responsibilities. The inspector concluded that the HP program is well organized, the staff is motivated, and excellent support by all levels of management was evident.

5.0 Personnel Dosimetry

The licensee uses two services to provide personnel dosimetry, the U.S. Navy in Bethesda, MD and the U.S. Army in Lexington, KY. Both programs are NVLAP accredited in 8 exposure categories. One HP in the HP Laboratory group is responsible for administering the program. The Navy supplied dosimetry uses the standard Harshaw four-chip TLD badge while the Army supplies the standard Panasonic UD80x four-chip TLD badge. The licensee indicated that the Navy badge will be used exclusively in the future.

Dosimetry is processed twice in a calendar quarter. If the report indicates that an individual has received 50 mrem or more, the individual and his supervisor receive a written notice. All exposure data is then added to a computer database which can be accessed via a Local Area Network (LAN). This provides easy access by any authorized on site personnel. A separate exposure report is sent to the Supervisory HP who checks the data for anomolies and compares it with self-reading pocket dosimeter results which are recorded weekly. He also analyzes the data for trends and prepares a report for the Safety Evaluation Committee.

The inspector reviewed the exposure records for selected personnel over the past 10 years. It appeared that since about 1985 there has been a downward trend in exposure. The inspector noted that no termination exposure reports are provided per 10 CFR 20.408. However, the licensee is exempt from this requirement since the facility was licensed prior to 1970 as described in 10 CFR 50.21. No violations or weaknesses were observed in this area.

6.0 Maintenance and Calibration of Survey Meters

The inspector toured the survey meter calibration facility, reviewed calibration procedures, interviewed technicians performing calibrations and reviewed calibration records. Instruments in need of repair are sent off-site. Only calibrations are performed on site. Calibrations are performed semi-annually on gamma and neutron meters. Response to beta radiation is checked but not calibrated.

The inspector noted that the calibration of the latest microprocessor controlled digital readout instruments (e.g. Victoreen Model #VIC-450) did not include as found/as left data nor two calibration points per range. The licensee stated that experience has shown that there is no drift in this equipment, hence no need to record "as-found" readings. In addition, the manufacturer has only provided one calibration adjustment that affects all ranges but has not provided calibration procedures. The inspector stated that since there is absolute reliance on these instruments in the field, the calibration procedure should reflect generally accepted industry practice such as provided in ANSI Standard N323. The licensee stated that a calibration procedure for this meters will be developed. This matter will be reviewed in a future inspection (91-01-01).

7.0 Radiation Worker Training

Radiation worker training is provided on-site by the Reactor HP group. Initial training consists of two hours of classroom followed by a tour of the facility. During the tour, the HP instructor discusses the warning signs and use of friskers and survey meters. Handouts are provided with information tailored to the specific job of each group of workers.

An instructor provided the inspector with a quick demonstration of the training materials. All material required by 10CFR19.12 was included. The handout material for "Radiation Workers/Guest Workers" was extensive and provided copies of all pertinent policies, procedures, forms, and lists of do's and dont's. The written exam consisted of 35 questions. The inspector concluded that the training is adequate.

8.0 Routine Radiation Survey

Procedure HPI3-3 "Reactor Survey Operations" provides instructions on how to do a survey while procedure HPI4-4 "Laboratory Health Physics Monitoring" gives the schedule which is usually weekly. The HP technician assigned to the area completes the survey under direction of the Designated Health Physicist for that week.

Surveys consist of dose rate measurements, smear checks, for loose contamination, and laboratory fume hood air flow measurements. There are no grab samples to check for airborne activity. The Supervisory HP stated this is because the Reactor Building is continuously monitored by tritium detectors and Continuous Air Monitors.

Survey results are kept in tabular form rather than displayed on floor plan maps. The inspector noted that this method of record keeping made it difficult to assess the extent and exact location of radiological problems. The Supervisory HP stated that this system works well since the same HP technician is always surveying the same building areas. The inspector stated that these surveys constitute a legal record of radiological conditions as specified in 10CFR20.401 and should be "readable" by anyone. The inspector requested that the licensee review the record keeping practices.

9.0 Exit Interview

The inspector met with the licensee personnel denoted in Section 1.0 at the conclusion of this inspection on February 27, 1991. The scope and findings of the inspection were presented at that time.