U.S. NUCLEAR REGULATORY COMMISSION REGION I

Report No. 070-00398/87-001

Docket No. 070-00398

License No. SNM-362 Priority 3 Category E1A

Licensee: U. S. Department of Commerce

National Bureau of Standards

Gaithersburg, Maryland 20899

Facility Name: National Bureau of Standards

Inspection At: Gaithersburg, Maryland

Inspection Conducted: March 12, 1987

Inspectors: C. T. Oberg, Health Physicist, DRSS

Approved by: faurence f. Tredman for John R. White, Chief NMSSC, NMS&SB, DRSS

Inspection Summary: A special announced inspection on March 12, 1987, (Report No. 070-00398/87-001) to review an incident involving the receipt of a shipment of byproduct material from Canada with a package surface radiation level in excess of the U.S. DOT limits.

Areas Inspected: Receipt of Materials, Personnel Protection - External, and Notification and Reports as these apply to the incident.

Results: Within the scope of this inspection, no violation were identified.

DETAILS

1.0 Persons Contacted

*Mr. Lester A. Slaback, Jr., Supervisory Health Physicist *Mr. Dan Golas, Radiation Chemist

* Present at both entrance and exit interviews.

2.0 Purpose

This inspection was conducted to review an incident in which the licensee, the NBS, received a shipment of byproduct material with an outer package surface radiation level in excess of U.S. DOT Regulatory Limits.

3.0 Receipt of Material

3.1 Measured Radiation Levels

On February 23, 1987, at approximately 3:45 p.m. a package containing Mo-99 was received and surveyed by the U. S. Department of Commerce, NBS, Gaithersburg, MD, in accordance with U.S. NRC requirements. The radiation level on contact with the bottom of the package was measured and verified to be about 350 mR/hr with two different survey instruments. At one meter from the bottom of the package, the Transportation Index (TI) was measured to be 3.0. When received, the sides and top of the package were measured to be about 20 mR/hr on contact with a TI of about 0.6.

No violations were identified.

3.2 Shipment Details

The Mo-99 was shipped from the AECL, Kanata, Ontario, Canada site at 2:53 p.m. on February 20, 1987. The quantity of Mo-99 was measured by the AECL and calculated to be 133.8 millicuries per milliliter of solution at 12:00 noon EST on February 24, 1987. The form of the Mo-99 was Na₂MoO₄ dissolved in a 4.9 milliliter solution of 0.5N

HNO3. The total quantity of radioactive Mo-99 was 656 millicuries.

No violations were identified.

3.3 Packaging

The NBS purchased the Mo-99 for the preparation of standard reference material. They had supplied the AECL with 60 milliliter glass bottle for the Mo-99 solution and a two section lead shield to accept the bottle. At the time that the NBS forwarded the bottle and shield, they advised the AECL that the top and the bottom of the shield were not as thick as the sides. The void space within the shield

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contained sponge rubber discs to protect the glass bottle against normal transportation effects and handling. Outside dimensions of the shield are approximately 5.5 inches in diameter by 7.25 inches in height. The outer packaging supplied by the AECL for this shield was standard packaging made to accept AECL Mo-99/Tc-99m generators that measure about 10 inches in height. This packaging is constructed of two similar pieces (top and bottom) of molded styrofoam contained in a snug fitting cardboard box. The styrofoam is also designed to accept the folding handle on the generator shield body. The folded handle acts as additional bracing for the generator during shipment. The external dimensions of the final package are about 15.75 inches on a side.

This packaging was not designed to adequately accomodate the lead shield sent to the AECL by the NBS. Some additional internal bracing or packing was necessary.

No violations were identified.

3.4 Package Damage

The inspector examined the Styrofoam packaging and observed that the bottom half had been crushed and depressed a depth of about one inch. The Styrofoam was cracked at the bottom. Some of the Styrofoam internal structure had been broken. The external top and bottom section of the Styrofoam halves were originally constructed as dished or indented about 0.25 inches to allow for placement of additional shielding that might be necessary and for the repository of enclosed shipping documents. The indentation in the bottom half of the package had collapsed to the internal bottom of the containing cardboard box.

The outer cardboard box effectively contained the lead shield and integral radioactive material preventing separation or loss of the material from the package.

No apparent leaks or loss of solution were observed or determined from the package or the shield. A portion of the solution was subsequently removed by the licensee and used for its intended purpose.

No violations were identified.

3.5 Additional Information

According to NBS personnel, they were informed by the AECL that the bottom of Mo-99/Tc-99m generator packages are not normally surveyed prior to shipment. This is because of the generator bottom shield thickness plus additional shielding placed at the bottom of the package. The radiation levels at the sides and top of the routine

OFFICIAL RECORD COPY IR NBS - 0005.0.0 05/28/87 and standard generator package are within the regulatory limits but are always higher than levels at the bottom of the package. Therefore, the AECL does not routinely survey the bottom of generator packages.

Apparently because this Mo-99 shipment was contained in a standard generator package a radiation survey of the bottom was not performed. Radiation levels measured prior to shipment were recorded as 60 mR/hr at the surface of the package and the TI was documented as 3.0.

This was the first time fission Mo-99 had been purchased and obtained from the AECL by the NBS. Previous orders had been placed with NEN about annually over the past 3 to 6 years. The Mo-99 had been shipped similarly but with additional shielding and adequate packaging to properly retain the shield and contents.

No violations were identified.

4.0 Personnel Protection - External

The inspector questioned NBS personnel with regard to possible exposure because of the radiation level from the package. NBS personnel did not believe that their personal exposures would be significantly different than usual but they would advise Region I if their processed badge results exhibited exposure to levels of radiation significantly greater than routinely observed.

When questioned regarding their routine receipt of this type of package, NBS personnel informed the inspector that Federal Express (Fed. Exp.) usually delivers these to the NBS facilities. However, on Monday morning, February 23, 1987, the area was blanketed with a severe snow storm and although Fed. Exp. attempted to deliver this package, no one was available at the NBS receiving dock. The Fed. Exp. driver returned the package to the staging area at their terminal. Later that day, NBS personnel went to the Fed. Exp. terminal and picked up the package. NBS personnel believed that there was no excessive handling of the package, that it was in a staging area while at the Fed. Exp. terminal and that unless the package was set on its side or top, there was possibly no significant exposure to either personnel within the transportation system or to the public.

No violations were identified.

5.0 Notification and Reports

The inspectors determined that the licensee had made the proper notifications and reports as required to the NRC, Region I; to the shipper, the AECL; and the carrier, Fed. Exp. within 24 hours of the identification of the high radiation levels.

No violations were identified. OFFICIAL RECORD COPY IR N

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6.0 Exit Interview

The inspector reviewed his findings with the individuals identified in Section 1.0 of this report. The inspector explained that to him it appeared that the licensed material and shield were improperly packaged and surveyed by the shipper, AECL, and that the damage to the package occurred while it was in the transportation system as a result of exposure to normal transportation conditions and handling.

No violations were identified for this licensee.

The incident will be reviewed with the Atomic Energy Control Board of Canada.