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U.S. HUCLEAR REG. COMMISSION

4623 Glenbrier Road Toledo, Ohio 43614 April 4, 1980

Materials Branch Division of Materials and Fuel Cycle Facility Licensing U. S. Nuclear Regulatory Commission Washington, D.C. 20555

Gentlemen:

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Enclosed is a report on the Radiation Survey of the Co-60 facility at Emma L. Bixby Hospital in Adrian, Michigan, following the installation of a Neutron Products, Inc. Model Number NPI-20-3600W, Serial Number T-414, containing 3490 curies as of March 1, 1980 installed in an AECL Model Eldorado Super G Teletherapy Unit Serial No. 2 on March 8, 1980.

If there are any questions concerning this report, please contact me.

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Respectfully, Joe P. Windham, M.D.

Joe P. Windham, Ph.D. Certified Radiological Physicist

JPW/ps CC: Bixby Hospital

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INSPECTION AND ENFORCEMENT 8902270600 880310 REG3 LIC30 21-03194-04 PNK PNU

RADIATION PROTECTION SURVEY

AT

CO-60 FACILITY

Emma L. Bixby Hospital Adrian, Michigan

- A. This part of the report covers the head protection survey with the beam "off," room protection with the beam "on," wipe test, and direct beam calibration of the AECL Super G Teletherapy Unit. Reference is made to NRC Byproduct Material License No. 21-031-94-04.
 - 1. Protection of Source Housing.

A radiation survey of the teletherapy head was made with the source in the "off" position. The readings were taken at 1 meter from the source at the 8 prime compass points in each of the three mutually perpendicular planes. See attached data sheet. With these 18 8ndependent measurements, the average leakage value was 1.69 mF'hr at 1 meter, the maximum value was 3.0 mR/hr.

2. Wipe Test

Wipe test samples were taken around and on the head of the Cobalt-60 unit on March 8, 1980. The results of the test are given below.

Instrument Used: Nuclear Chicago Auto Gamma Model 1184 Efficiency: 20%

Minimum Detectable Activity (MDA) 1.21 x 10^{-5} µCi for a 4 min. count.

Wipe No.	Description	Activity µCi				
1	Couch	< .005				
2	Floor	< .005				
3	Surface of Head	< .005				
4	Collimator	< .005				

3. Direct Beam Calibration

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Using a Victoreen Model 570 R Meter and a Model 621 High energy Chamber Serial No. 10187 calibrated at the regional calibration laboratory, Victoreen Instrument Division, Cleveland, Ohio, August 28, 1978, the exposure value at 100 cm source to axis distance was measured to be 65.4 R/min for the collimator at its largest setting (25 x 25 cm² at 80 cm SSD). 3924

Direct beam exposure rates in air were taken at an SAD of 80 cm for several field sizes. The results are shown below.

Direct Beam Air Exposure Rates (R/min)

Central Axis (3/8/80)

Field	S	$ze (cm^2)$	R/Min
5	x	5	90.87
8	x	8	94.99
10	х	10	95.61
12	x	12	97.45
15	x	15	99.31
18	x	18	100.96
20	x	20	101.77
25	x	25	102.18

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4. Radiation Protection Survey

A radiation survey was made at the occupied areas of this installation. The survey was made with a phantom in the primary beam and the beam directed in each of the directions shown below.



Floor

Floor

The beam is interlocked so that it can not be turned on when directed at an angle greater than 45° from the floor toward the Nuclear Medicine facility and 18° from the floor toward the control area. The directions M, N, and O correspond to the unit being pointed vertically downward toward the floor and the head being swiveled 30, 60, and 90° toward the outside wall.

The survey was conducted using an Eberline Model E-520 survey instrument calibrated January 10, 1980 at the Medical College of Ohio Radiation Safety Office. The procedure for calibration is on file with the NRC with respect to the Medical College of Ohio Byproduct Material License Number 34-13011-05. Results of the survey are shown on the attached chart. The positions on the chart are shown on the enclosed facility layout. No measurements were

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taken on the roof since it is accessible only by a ladder and the unit is interlocked so that the beam cannot be turned on when directed toward the roof.

- B. This part of the report deals with safety devices.
 - The beam "on" and "off" lights were checked and found to be operating at the following locations: (1) at the control panel; (2) over the entrance door; (3) on the teletherapy unit; and, (4) over the entrance door to the room directly below the teletherapy unit.
 - 2. A door interlock switch turns the source "off" if the entrance door to the teletherapy unit is opened. The source remains "off" until the treatment room door is closed and the control circuits reset. The door interlock was tested 10 times and found to be operating correctly. Source to "off" position was validated audibly, with a survey instrument, and the control console indicating lights.
 - 3. A door interlock switch turns the source "off" if the door to the room directly below the teletherapy unit is opened. The source remains "off" until the door is closed and the control circuits reset. The door interlock was tested 10 times and found to be operating correctly. Source to "off" position was validated audibly, with a survey instrument, and the control console indicating lights.
 - 4. The beam control mechanism was checked in the following manner: The electrical circuits were interrupted at the main switch and at the control parel while the beam was "on." In every case the source went "off" and did not return to the "on"

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when the power was restored until the proper start-up sequences of the switches was again operated. The equipment can be locked to prevent unauthorized use.

5. A timer check was performed using a stop watch. For a time setting of one minute, the time watch was 60 ± 1 sec for 5 repeated measurements. At the end of the preset time the timer ON-OFF switch returns to the "off" position and the source could be heard returning to the "off" position. The source did not return to the "on" position with repeated attempts of turning the key to the "on" position and releasing it.

6. An exposure time error of 0.01 minutes was measured.

- 7. The field size indicator was checked at 80 cm for the following field size: $5 \ge 5$, $10 \ge 10$, and $20 \ge 20$. The measured dimension at any side of the field was within one millimeter of the indicated dimension.
- 8. The Light-Radiation-Field congruence for a 10 x 10 cm² field at 80 cm SSD was checked by making a radiograph. The gammaray and light field were in good alignment (maximum misalignment was less than one millimeter).
- 9. The central axis indicator was checked in both the vertical and lateral position of the head. When the collimator is rotated, the position of the metal rod did not deviate from the central position by + 2 mm.
- 10. Emergency procedures are posted at the control area.
- A properly worded radiation sign has been mounted on the door to the treatment room.

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- 12. A proper notice bearing the conventional radiation symbol and the words, "Caution Radioactive Material, Cobalt-60 3490 Curies, March 1, 1980" is placed on the unit.
- C. Conclusions

From all of the preceding, it is concluded that the entire installation is in compliance with the pertinent regulations of the Nuclear Regulatory Commission and NRC Byproduct Material License Number 21-031-94-04.

Date of Survey: March 8, 1980 Date of Report: April 4, 1980

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Doe P. Windham, Ph.D. Certified Radiological Physicist

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TELETHERAPY HEAD RADIATION SURVEY REPORT







Maximum Reading at Contact With Head

40 mR/hr

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RADIATION SURVEY OF AREAS

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ADJACENT TO CO-60 THERAPY ROOM

(mR/hr)

Bixby Hospital Adrián, Michigan

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Background: 0.01 m R / hr

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IST. FLOOR

Emma L. Bixby Hospital Adrian, Michigan

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SECTION A -A'



BASEMENT