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Seventy-Five Years of
Service to the Community

Bringing Care &
Science to Life

Montefiore

April 8, 1985

U.S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region 1
631 Park Avenue
King of Prussia, PA 19406

Gentlemen:

An AECL Eldorado 78 (S/N 29/902) Cobalt-60 Unit was installed on D-Level at Montefiore Hospital during the weeks of March 4, 1985 and March 11, 1985. The source (S-3684) was installed on March 8, 1985 with acceptance on March 14, 1985.

Enclosed is the Survey Report for the Eldorado 78 Unit that details the results of the radiation surveys and tests performed in accordance with our NRC License #37-00865-11 and Title 10, Parts 20 and 35, Code of Federal Regulations. The tests were performed and the report prepared by Margaret S. Eddy, Radiation Safety Officer for Montefiore Hospital.

If there are any questions regarding this report please call Ms. Eddy at (412) 648-6055.

Sincerely,

Margaret S. Eddy
Margaret S. Eddy
Radiation Safety Officer
Director, Radiation Physics

MSE:kew

Encl.

RECEIVED BY	
Date..	4/23/85
Log..	Apr. 11 E
By.....	Brown
Orig. To.....	
Action Compl.	4/25/85

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At survey report

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Seventy-Five Years of
Service to the Community

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Montefiore

AECL Eldorado 78

Teletherapy Survey Report

Licensee and Location of Installation	Montefiore Hospital "D" Level 3459 Fifth Avenue Pittsburgh, PA 15213
NRC License Number	37-00865-11
Teletherapy Unit and Source	Atomic Energy of Canada, Ltd. (AECL) Eldorado 78 Teletherapy Unit S/N 29/902 Cobalt-60 Source: AECL Model C-146 S/N S-3684
Installation Date	March 5-14, 1985
Survey Dates	March 13, 16 and April 1, 1985
Nominal Activity	5280 Curies as of Nov. 5, 1984
RMM (AECL Measurement Certificate)	99.9 Rmm (+5%) as of Nov. 5, 1984 (at max field size) Decay Corrected to April 1, 1985=94.7 Rmm
Measured Output	94.9 Rmm as of April 1, 1985 (at max field size) as measured with Victoreen Model 570 R-Meter and Model 651, 100R Ionization Chamber
Measurement Equipment	Keithley #36150, S/N 19663 Calibrated: 2/85 Victoreen Model 570 R-Meter, S/N 2406 Model 621, 100R Ionization Chamber, S/N 324 Calibrated: 2/12/85 ADCL, Allegheny Singer Research Institute
Survey and Report	Margaret S. Eddy, M.S. Radiation Safety Officer

I. Radiation Survey of the Teletherapy Source Housing

The survey was performed with the teletherapy source in the "Off" position. Radiation measurements were made on a sphere 1 meter from the source at 14 separate points. The maximum radiation level recorded was 1.0 mr/hr. The average exposure level based on 14 measurements was 0.4 mr/hr. Attachment A illustrates the measurement positions.

The measurements were performed using a Keithley Model #36150 survey meter, Serial #19663, calibrated by the manufacturer in February, 1985. It is concluded that the teletherapy source housing fulfills the requirements of license condition 18-A (i).

II. Limits of Beam Orientation

- a. The Eldorado 78 is a stationary (non-rotational) unit. The source head moves vertically up and down. The source head can also rotate, but due to the shielding restrictions of the room the mercury switches in the source head were set to minimize any head rotation from 0° (-2°), the vertically downward position and 90° ($+2^{\circ}$), the horizontal position.
- b. The mercury switches were checked by swivelling the source head to -2° clockwise and 92° counterclockwise, turning the timer on and noting if the beam turned on. If the switches are operating properly, the beam should not come on beyond these angles.

The beam did not turn on at these angles, indicating that the mercury switches are operating properly.

These beam limitations satisfy the requirements of license condition 15 and 18 B (iii).

III. Radiation Survey of Areas Adjacent to the Cobalt-60 Teletherapy Room

Radiation measurements were taken in all areas adjacent to the teletherapy room. The survey was performed with a water phantom in the primary beam. A 35 X 35 cm field size, as defined at an 80 cm distance, was used. The Keithley #36150 meter was used for the measurements.

Attachment B is the table of measurements that were taken at a head angle of 0° and 90° . The maximum exposure rate measured was 0.3 mr/hr with the head at 90° . All other exposure rates were ≤ 0.09 mr/hr. Attachment C is a diagram of the teletherapy room with the adjacent areas.

The vertical head position was also varied from maximum height to 4 feet above the floor with all exposure rates ≤ 0.09 mr/hr.

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The measured radiation exposure levels and beam restrictions are in compliance with 10 CFR 20 and license conditions 15, 18 A (ii) (a) and (b).

It should be noted that during renovation of the room, the lead glass viewing window was covered with an additional 1/8" lead. Visual contact is maintained through use of a TV monitoring system. If this TV system is not operational, the Cobalt-60 Unit will not be operated.

IV. Electrical Door Interlock Test

Attachment D is the procedure for the Cobalt unit interlock system check. The interlock system was tested according to this procedure and operated properly. This test is in compliance with license condition 18B(i).

V. Teletherapy Source "On-Off" Indicators Test

Attachment E is the procedure to test the source "On-Off" indicators. The "On-Off" indicators were tested according to this procedure and operated properly. This test is in compliance with license condition 18B(ii).

VI. Teletherapy Treatment Timing Device Check

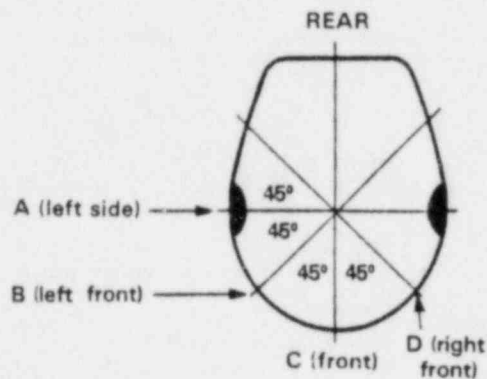
Attachment F is the procedure to test the teletherapy timer. The timer was tested according to this procedure and operated properly. This test is in compliance with license condition 18B(iv).

Attachment A

HEAD SURVEY ELDORADO 78 3/13/85

Keithley Model #36150

Top View-Showing
orientation
of Views A through D



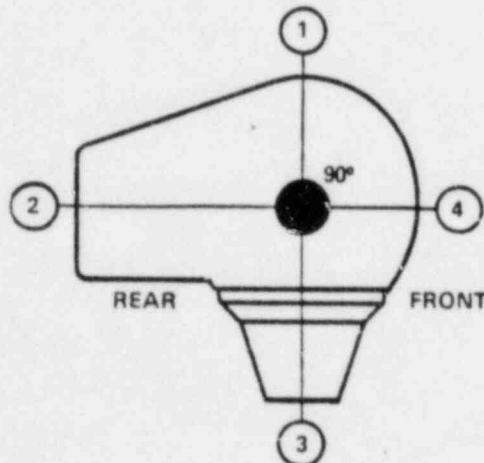
- A.1. 0.4 mR/hr
2. 0.8 mR/hr
3. 1.0 mR/hr
4. 0.6 mR/hr

- B.5. 0.3 mR/hr
6. 0.5 mR/hr
7. 0.4 mR/hr
8. 0.3 mR/hr

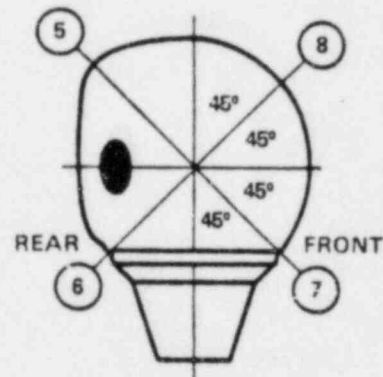
- C.9. 0.4 mR/hr
10. 0.3 mR/hr

- D.11. 0.2 mR/hr
12. 0.3 mR/hr
13. 0.4 mR/hr
14. 0.3 mR/hr

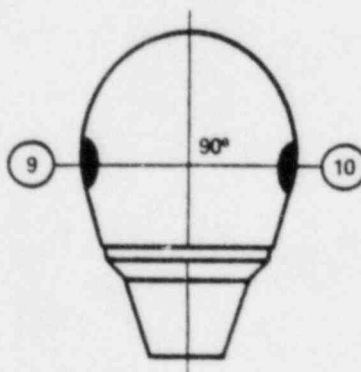
View A-Vertical
from left side



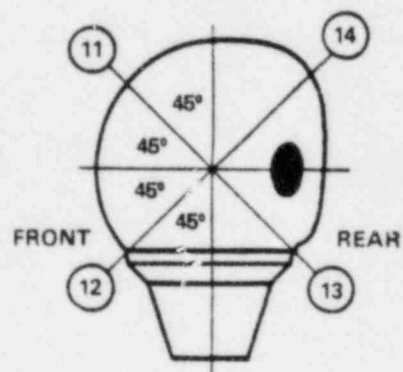
View B-Vertical
from left front



View C-Vertical
from front



View D-Vertical
from right front



Montefiore Hospital
Pittsburgh, PA

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Attachment B

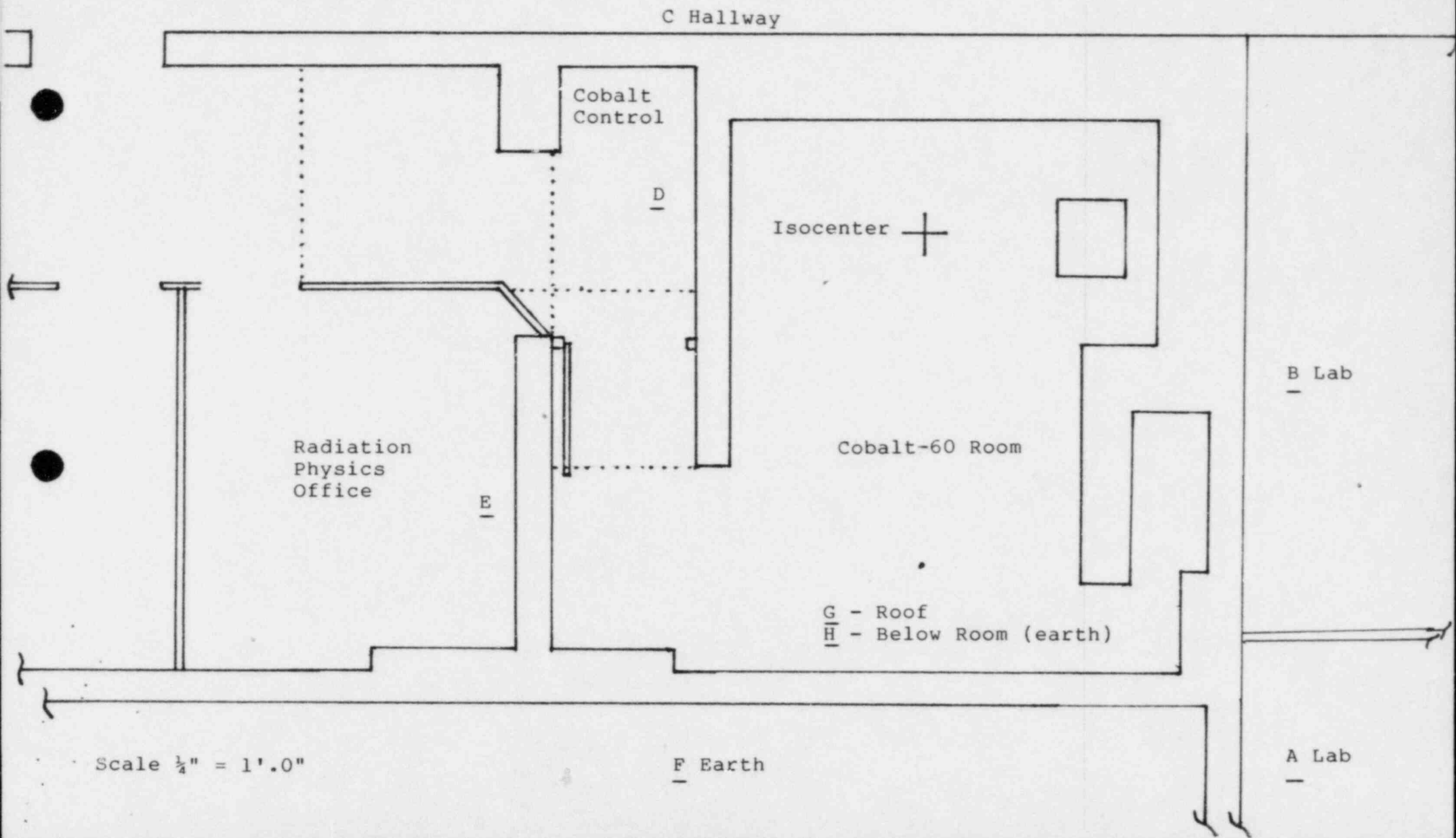
Radiation Survey of Adjacent Areas

March 16, 1985

<u>Survey Site</u>	<u>Maximum Exposure Rate (mR/hr)</u>	
	<u>Head Angle 0°</u>	<u>Head Angle 90°</u>
A - Lab	≤0.09	≤0.09
B - Lab	≤0.09	≤0.09
C - Hallway	≤0.09	≤0.09
D - Control Area (wall)	≤0.09	≤0.09
E - Radiation Physics Office	≤0.1	≤0.3
F - Northeast Wall	not measured - earth	
G - Roof	≤0.09	≤0.09
H - Below Room	not measured - earth	

Cobalt-60 Source: Model C-146 S/N S-3684
Nominal Activity: 5280 Ci as of Nov. 5, 1984
Instrument: Keithley #36150
S/N 19663
Calibrated: 2/85

Attachment C
COBALT-60 ROOM - "D LEVEL"
Montefiore Hospital



Attachment D

COBALT UNIT INTERLOCK SYSTEM CHECK

Procedure:

1. Close the adjustable collimator to its minimum opening and direct the primary beam so as to give minimum radiation levels at the treatment room door.
2. Make certain that everyone is out of the treatment room and close the treatment room door.
3. Set the treatment timer for one minute and turn the source "On".
4. When the source is completely "On" as indicated by the red source "On" light being illuminated, the green source "Off" light being off and the source rod indicator extended, open the treatment room door. DO NOT ENTER THE TREATMENT ROOM. The source should turn "Off" as indicated by the green source "Off" light only being on.
5. Close the treatment room door. The source should NOT turn "On".
6. Depress the reset button on the control. The source should NOT turn "On".
7. Turn the timer switch off. Depress the reset button. Turn the timer switch on. The source should turn "On". Allow the timer to terminate the exposure.
8. Open the treatment room door. Depress the reset button and turn the timer switch on. The source should NOT turn "On".

If opening the treatment room door does not cause the source to turn "Off" or if the source can be turned "On" with the door open or without first turning the timer switch off, the door interlock system is not operating correctly. The Cobalt 60 panel control shall be locked in the "Off" position and not used, except as may be necessary to repair or for replacement of the interlock system, until the interlock is shown to be functioning properly.

Attachment E

TELETHERAPY SOURCE "ON-OFF" INDICATORS TEST

Procedure:

1. Insert the key and turn to the "START" position. When the key is released it will snap back to the "RUN" position. The green "BEAM OFF" lights, one on the console and one on the teletherapy unit, will come on.
2. Make sure that no one is in the treatment room, close the door and turn the timer switch to "ON". The red "BEAM ON" lights, one on the console and one on the teletherapy unit, will come on. The green "BEAM OFF" lights will be on simultaneously with the red lights until the source is completely exposed. The red "BEAM ON" indicator rod in the sourcehead will also be visible.
3. Turn the timer switch off. The "BEAM ON" indicator rod will disappear, the red "BEAM ON" lights will turn off when the source is completely shielded and the green "BEAM OFF" lights will turn on.
4. It should be noted that during the drawer opening and closing process both red and green lights will be illuminated; it is only in the extreme open or closed positions that the appropriate single pilot light will be illuminated.

Attachment F

COBALT-60 TELETHERAPY UNIT

TIMER ERROR EVALUATION

Procedure:

1. Place an ionization chamber, Victoreen #621 Chamber or Baldwin-Farmer Chamber, at 80 cm from the source to the center of the chamber, on the central axis.
2. Set a 10 X 10 field on the collimator.
3. Set 0.10 minute on the timer and expose the chamber. Repeat this procedure four (4) more times, for a total of five (5) exposures of 0.1 minute each.
4. Read the chamber after the fifth exposure and record the results. Reset the chamber to zero.
5. Set 0.50 minute on the timer and expose the chamber.
6. Read the chamber and record the results.
7. Use the following equation and exposure results to evaluate the timer error:

$$e = \frac{R_n(t/n) - R_t}{nR_t - R_n(t/n)} * t$$

Where: t = Time of single exposure

n = number of multiple exposures

t/n = Time of each multiple exposure

$R_n(t/n)$ = exposure reading for n exposures of t/n minutes per exposure

R_t = exposure reading for single exposure of t minute

Attachment F (cont)

COBALT-60 TELETHERAPY UNIT

TIMER ERROR EVALUATION

$$e = \left[\frac{R_{n(t/n)} - R_t}{nR_t - R_{n(t/n)}} \right] * t$$

$$\begin{aligned} t &= 0.5 \text{ minute} \\ n &= 5 \text{ exposures} \\ t/n &= .1 \text{ minute} \\ R_{n(t/n)} &= 54.5 \\ R_t &= 60.5 \end{aligned}$$

$$e = \frac{54.5 - 60.5}{5(60.5) - 54.5} * 0.50 = -0.012 \text{ min}$$

To correct for the timer error, 0.01 minute must be added to the calculated time to give the total treatment time.

BETWEEN: William O. Miller, Chief
License Fee Management Branch
Office of Administration -

John E. Glenn, Chief
Nuclear Materials Section B
Division of Engineering and
Technical Programs

LICENSE FEE TRANSMITTAL

No Fee
Needed - Survey

A. REGION I

1. APPLICATION ATTACHED

Applicant/Licensee:

Application Dated:

Control No.:

License No.:

Montefiore Hospital Association

of Western Pennsylvania

4/8/85

03875

37-00865-11

2. FEE ATTACHED

Amount:

Check No.:

3. COMMENTS

Signed

Brenda Platchek

Date

4/17/85

B. LICENSE FEE MANAGEMENT BRANCH

1. Fee Category and Amount:

2A - no fee due - to survey

2. Correct Fee Paid. Application may be processed for:

Amendment

Renewal

License

Signed

Frances Brown

Date

4/23/85