

## COBALT-60 TELETHERAPY SURVEY REPORT

Following Source Replacement on 22-November-1985

24-November-1985

### 1. Administrative Information:

- A. Licensee: U. S. Naval Hospital, San Diego, CA 92134-5000
- B. License Number: USNRC By-product Material License No. 04-01369-01
- C. Person Conducting Survey: Richard L. La Fontaine, LCDR MSC USN, Certified by the American Board of Radiology in Radiological Physics
- D. Reason for Survey: Replacement of Cobalt-60 source
- E. Date of Source Replacement: 22 November 1985
- F. Date of Survey: 24 November 1985

### 2. Unit Description:

- A. AECL Theratron-80, Serial Number 20
- B. New Source: 1.5 cm diameter, AECL Type C-146, Serial Number S-3802, source activity of 5882 Ci measured on 22-October-85 by AECL
- C. Location: Floor 3B, Naval Hospital, San Diego, California

### 3. Dosimetry Equipment:

#### A. Primary Beam Calibration:

- 1. Keithley Electrometer: Model 616, Serial Number 48998A
- 2. Keithley Interface: Model 6169, Serial Number 49755A
- 3. Chamber: NEL Farmer 0.6cc (graphite), Model 2505/3, Serial Number 2145, 0.5 cm Acrylic Buildup Cap Number 2145
- 4. Calibration: System Calibration on 25-April-85 at M.D. Anderson Dosimetry Calibration Laboratory

#### B. Radiation Exposure Survey Measurements:

- 1. Radlac Meter AN/PRD-27R, Serial Number B1265
- 2. Calibration: Naval Electronic System Command Standard Radlac Calibration Procedure No. 3, 30 October 1985, using NBS traceable Cs-137 source. Meter reads directly in terms of exposure rates from an unshielded type Co-60 source (refer to attached calibration report).

4. Intensity of Primary Beam In RMM: Primary beam radiation intensity measured after the source was installed in the unit is 102.2 R/min for a 12.5 x 12.5 cm field size at 100 cm SAD (refer to attached Calibration Report).
5. Maximum and Average Radiation Levels Around the Treatment Head: The maximum radiation level was 3.6 mR/hr and the average was 1.5 mR/hr measured at 14 points on the surface of a sphere one meter in radius centered on the source (refer to attached Teletherapy Head Survey Diagram).
6. Limits of Beam Orientation: Refer to the attached diagram.
7. Measurements of Radiation Levels In Adjacent Areas:
  - A. Phantom: 30 x 30 x 30 cm of polystyrene
  - B. Source-to-Phantom Distance: 65 cm SSD, 80 cm to phantom center
  - C. Field Size: Maximum permitted by collimators (24 x 25 cm at 80 cm)
  - D. Measured Radiation Levels: Refer to the attached plan and elevation drawings which are keyed to the measurement locations.
  - E. Measured Radiation Levels above 2 mR/hr:
    1. Restricted passageway next to East wall of Cobalt-60 room
    2. Patient Exam Room adjacent to North wall of Cobalt-60 room
    3. Cobalt-60 control console area
    4. O.R. Recovery Room adjacent to East wall of restricted passageway
    5. Machine space above Cobalt-60 room
  - F. Additional Information Pertaining to Area Survey: The exposure levels measured during the radiation survey represent the maximum that would be expected for the following reasons:
    1. Actual Workload: Average workload is 10-12 patients per day with a maximum expected of 20 per day. An average of 2 fields are treated per patient with an average prescribed dose of 150 rad per field. Assuming an average TAR of 0.6, this would result in an average unit "on" time of approximately 35 minutes/day.
    2. Use Factors: Approximately 50% of the treatments involve parallel opposed fields at 0 and 180 degrees, 30% parallel opposed fields at 90 and 270 degrees (laterals) and 20% at parallel opposed oblique fields (tangential breast and chest wall treatments).

3. Field Size: The average field size is approximately 12-15 cm squared vice the maximum, 24.5 cm squared, used for the area survey.

8. Procedures to maintain personnel exposure within requirements of paragraphs 20.105(b)(1) and (2) of 10 CFR Part 20:

A. Restricted Areas: The only restricted area is the passageway adjacent to the East wall of the Cobalt-60 room. This area is designated a restricted area and is unoccupied whenever the unit is on. The doors at the South end of the passageway are locked and a rope barrier attached to a "Radiation Area" warning sign is placed across the North end of the passageway. An environmental monitor (film badge) has been placed on the East wall of the passageway and evaluated monthly. From the time period of September 1984 through September 1985 (13 months) the monitors registred a cumulative exposure of 43 mR. This is lower than the exit surface of the wall adjacent to the Cobalt-60 room due to inverse square fall off, but still indicates that the radiation exposure in this passageway is low and presents no hazard to personnel.

B. Unrestricted Areas:

1. Patient Exam Room adjacent to North wall of Cobalt-60 room: This area has a very low occupancy (1/16) and has an exposure of greater than 2 mR/hr only when the unit is orientated at angles of 60-120 degrees. An environmental monitor (film badge) has been placed at approximately the location of measurement point 6, and has been evaluated monthly. From the time period of September 1984 through September 1985 (13 months) the monitor registred a cumulative exposure of 77 mR. This indicates that the radiation exposure in this area is well within the guidelines of paragraphs 20.105(b)(1) and (2) of 10 CFR Part 20.

2. Control Console: This area has an exposure of greater than 2 mR/hr only when the unit is orientated at angles between approximately 270-330 degrees. The area adjacent to the control is normally unoccupied during treatment because the TV monitor for viewing the patient is located against the West wall of this area. The technologist who administers most of the Cobalt-60 treatments, Mr. Roger Johnson, has not received any measurable exposure to his film badge for the last two calander years (1984

and 1985). This indicates that the radiation exposure in this area is well within the guidelines of paragraphs 20.105(b)(1) and (2) of 10 CFR Part 20.

3. O.R. Recovery Room adjacent to East wall of restricted passageway: This area has an exposure greater than 2 mR/hr only when the unit is orientated at angles between approximately 240-300 degrees. Due to inverse square drop off, this area would be expected to have an annual cumulative exposure less than that of the restricted passageway (43 mR/13 months). This indicates that the radiation exposure in this area is well within the guidelines of paragraphs 20.105(b)(1) and (2) of 10 CFR Part 20.

4. Machine space above Cobalt-60 room: This area has a very low occupancy (1/16) and an exposure of greater than 2 mR/hr only when the unit is orientated at angles between approximately 120-240 degrees. An environmental monitor (film badge) has been placed at approximately the location of measurement point 10, and has been evaluated monthly. From the time period of September 1984 through September 1985 (13 months) the monitors registred a cumulative exposure of 17 mR. This indicates that the radiation exposure in this area is well within the guidelines of paragraphs 20.105(b)(1) and (2) of 10 CFR Part 20. Additionally, Condition 24 of our NRC license allows for a maximum radiation level of 30 mR/hr in this area.

#### 9. Tests of Safety Systems:

A. Treatment Room Door Interlock: Source was placed in the "on" position and the door was opened just enough to activate the interlock. The source immediately returned to the "off" position as verified by the unit's "on-off" indicators, the independent area monitors and the AN/PRD-27R radiation survey meter. The treatment room door interlock shall be tested monthly.

B. Teletherapy "on-off" Indicators: Electrical indicators (one set at console and one set on gantry face) and the independent area monitors (Nuclear Associates Primalert Monitors) were tested by placing the source in the "on" position and observing that the indicators flashed "red" and, when the source returned to the "off" position, that the indicators indicated "green" status. Position of source was verified by the primary beam calibration system positioned at isocenter. The teletherapy "on-off" indicators shall be tested monthly.

3. Electrical Stops To Limit Use of the Primary Beam of Radiation: These were tested in both the clockwise and counterclockwise directions by swiveling the treatment head to the angle where the stops should activate (not allow the source to be moved to the "on" position) and attempting to turn the unit on. These stops operated satisfactorily in that the source could not be moved to the "on" position at angles at or greater than the specified limiting angles. The electrical stops to limit primary beam direction shall be tested monthly.

4. Teletherapy Treatment Timing Device: The timer was tested and the its correction factor determined during the unit calibration (refer to the attached report). The accuracy of the timer was checked against a stopwatch. The source position, "on" or "off", was verified using the primary beam calibration system. Once the timer expired or the irradiation period was interrupted, i.e., with the door interlock, the source would not return to the "on" position without the timer being reset. The teletherapy treatment timing device shall be tested monthly.

10. Removal of Existing Source:

A. Date: Existing source was removed from the unit on 22 November 1985

B. Firm: Atomic Energy of Canada, Limited, P.O. Box 6300, Ottawa, Canada, K2A 3W3; USNRC License No. 54-00300-04



SDJ

ACTIVITY PERFORMING CALIBRATION  
RADIAC CALIBRATION FACILITY

CERTIFICATE OF CALIBRATION  
FOR  
RADIAC SET AN/PDR-27J, P, Q, R & S

This is to certify that the equipment identified herein has been calibrated in accordance with Naval Electronic System Command Standard Radiac Calibration Procedure No. 3. The radiacmeter in all respects complies with the standards specified in this procedure.

Ship/Activity DRMC 50 Equip. Ser. No. B 1265

-DATA-

1. Calibration Standard: Cs-137 source, traceable to National Bureau of Standards.
2. Component Check: Complete (✓) Missing items \_\_\_\_\_
3. Field Changes Status: ECL
4. Mechanical Check: Complete (✓)
5. Electrical Check: DC Voltages
  - a. For AN/PDR-27J, P, and Q
    - Terminal 2 \_\_\_\_\_ (99-121 volts);
    - Terminal 3 N (50-60 volts);
    - Terminal 4 N (50-60 volts);
    - Terminal 5 A (650-750 volts);
    - Terminal 6 A (650-750 volts)
  - b. For AN/PDR-27R
    - HV TP(1A2) 680 (680 volts);
    - Terminal 9 5.1 (4.3-5.2 volts)
  - c. For AN/PDR-27S
    - TP-2 \_\_\_\_\_ (710 volts);
    - TP-1 N (4-5 volts)
6. Operational Check:
  - a. Battery Condition (✓)
  - b. Headset (✓)
7. Calibration:
  - a. Calibration data:

TABLE 1

SOURCE INTENSITY FROM AN/UDM-1A <del>OR</del> <del>AN/UDM-1A</del> (mR/h) (1)	DISTANCE FOR AN/UDM-1A (cm) <del>OR</del> <del>AN/UDM-1A</del> FOR (2)	RADIACMETER READING (mR/h)			R A N G E (6)
		(3) DESIRED	(4) ACTUAL	(5) LIMITS	
500	74.46	400	<u>400</u>	320-480	500
125	148.19	100	<u>100</u>	80-120	500
37.5	56.72	30+	<u>30</u>	24-36	50
5.53	144.54	4	<u>4</u>	3.2-4.8	5
1.38	292.	1	<u>1</u>	0.8-1.2	5
0.55	463.55	0.4+	<u>0.4</u>	0.32-0.48	0.5

+ Desired and actual readings shall be identical. Tolerance limits show the end-user the 20% level. The limits do not apply during performance of this procedure.

Equip. Ser. No. B1265

b. Notes

- (1) The accuracy of this radiacmeter is  $\pm 20\%$  or better.
- (2) No beta calibration has been performed.
- (3) When using the AN/UDM-1A, this radiacmeter is calibrated with the detector, DT-196/PDR-27J or DT-613/PDR-27S, located in the mounting well of the radiacmeter housing.
- (4) The radiacmeter reads directly in terms of exposure rates from unshielded type Co-60 sources.

8. Remarks:

9. Calibrated by: Elkissel

Date: 10-30-85

The person designated to sign for an action verifies, based on personal observation, and certifies by his signature that the action has actually been performed in accordance with the specified requirements.

10. Supervisor reviewing calibration results: [Signature]

Date: 10-30-85

## COBALT-60 ANNUAL CALIBRATION

24-November-1985

Following Source Replacement on 22-November-1985

### 1. Unit Description:

- A. AECL Theratron-80, Serial Number 20
- B. Source: 1.5 cm diameter, Type C-146, Serial Number S-3802, Installed on 22-November-85; source activity of 5882 Ci measured on 22-October-85
- C. Location: Floor 3B, Naval Hospital, San Diego, California
- D. Physician-In-Charge: F. G. Sanford, CAPT, MC, USN

### 2. Dosimetry Equipment:

- A. Keithley Electrometer: Model 616, Serial Number 48998A
- B. Keithley Interface: Model 6169, Serial Number 49755A
- C. Chamber: NEL Farmer 0.6cc (graphite), Model 2505/3, Serial Number 2145, 0.5 cm Acrylic Buildup Cap Number 2145
- D. Calibration: System Calibration on 25-April-85 at M.D. Anderson Dosimetry Calibration Laboratory

### 3. Accuracy of Distance Measuring Devices:

- A. Mechanical and Optical distance measuring devices align at 80.0 cm from source face to within  $\pm 0.5$  mm.
- B. Beam Splitter aligns at 80.0 cm SSD to within  $\pm 0.5$  mm
- C. Exposure measurements at Isocenter, 10x10 cm field size:

<u>Angle</u>	<u>Reading x (10)**-9 C</u>
0	34.0
90	33.7
180	33.8
270	33.5

The above measurements demonstrate a maximum radiation exposure deviation between opposing angles of approximately 0.6%, corresponding to a distance separation of approximately 3 mm at 80.0 cm SAD. The maximum deviation between any angle is approximately 1.5% indicating that the Isocenter is contained within a 3 mm radius sphere.



#### 4. Timer Accuracy and Correction:

A. Accuracy: Unit Timer and Verification Timer checked against Stop Watch: Agreement within +/- 1%

B. Timer On-Off Correction Factor: 10 x 10 cm field @ 80.0 cm SAD

Timer (min)	VeriTimer	Stopwatch	Reading x (10)**-9 C
1.0	1.00	60.2	33.8
1.0	1.01	60.0	33.9
1.0	1.00	60.2	33.8
1.0	1.01	60.2	33.9
1.0	1.01	60.2	33.85
5.0	5.01	300.2	171.2

$$\text{Correction} = \frac{5[(169.2) - (171.2)]}{[5(171.2)] - (169.2)} = -0.014 \text{ min } (-0.85 \text{ sec})$$

#### 5. Reference Field Calibration:

A. Temp: 24.5 C; Pressure: 759.0 mm Hg; Temp/P Correction = 1.010

B. In-Air Calibration: 10.0 x 10.0 cm field size @ 80.0 cm SAD, 1.0 min timer settings: 33.85 x (10)\*\*-9 C (See 4. above)

$$\text{Exposure} = [(33.85 \times (10)**-9 \text{ C/min})] \times (4.657 \times (10)**+9 \text{ R/C}) \times (0.993) \times (1.0/.99) \times (1.010) = \underline{159.7 \text{ R/min}}$$

Where: 33.85 = Dosimeter Reading per minute

4.657 = Calibration Factor for Chamber

0.993 = Electrometer Calibration Factor

(1.0/.99) = On-Off Correction

1.010 = Temperature-Pressure Correction

$$\text{Dose (delta m of water)} = (159.7 \text{ R/min}) \times (0.988) \times (0.967) \times (0.989) \\ = 150.9 \text{ rad/min [Values from AAPM Protocol (Med Phys 10(6): 741-771)]}$$

Where: 0.988 = Inverse Square Correction (80.0/80.5)\*\*2

0.967 = f-Factor for Water

0.989 = A(eq)

C. Measured output using secondary dosimetry system, Victoreen R-meter model 571, Serial Number 2043, and model 621 chamber; 0.5 minute setting:

$$\text{Exposure} = (83 \text{ R}) \times (0.947) \times (1.0/.49) \times (1.010) = \underline{162 \text{ R/min}}$$

Where: 83 = Dosimeter Reading per 0.5 minute

0.947 = Calibration Factor for Chamber

(1.0/.49) = On-Off Correction

1.010 = Temperature-Pressure Correction

D. Projected exposure output from calibration certificate for maximum field size is 109.4 R/min (+/- 5%), or for 10x10 cm @ 80.0 cm SAD:

$$\text{Exposure} = (109.4 \text{ R/min}) \times (0.945) \times (1.56) \times (0.989) = \underline{160.4 \text{ R/min}}$$

Where: 0.945 = Field size correction from maximum to 10x10 cm

1.56 = Inverse square correction from 100 to 80 cm

0.989 = Decay factor from 25 Oct to 24 Nov 1985

This value is only 0.1% lower than the measured exposure rate.

E. Additional important dose rates:

- D(max) Dose with full scatter =  $150.9 \times 1.036 = \underline{156.3 \text{ rad/min}}$

Where: 1.036 = PSF (Peak Scatter Factor) for 10 x 10 cm field.

- Dose (delta m of water) on 15-Dec-85 =  $0.992 \times 150.9 = \underline{149.7 \text{ rad/min}}$

6. Relative Dose Rate as a Function of Field Size: Reference field = 10 x 10 cm, measured in Air, 80 cm SAD, 1 min timer setting. Measured to 0.5 cm diameter delta M of water required for electronic build-up.

NOTE: Refer to attached Relative Field Size Output Table

Collimator Setting	Trimmer Distance	Field Size	Equiv Sq	Dosimeter Reading	Relative to 10cm2*
5 x 5 cm	45 cm	5 x 5 cm	5.0 cm2	32.70	0.966
7 x 7	45	7 x 7	7.0	33.25	0.982
10 x 10	45	10 x 10	10.0	33.85	1.000
12 x 12	45	12 x 12	12.0	34.30	1.013
15 x 15	45	15 x 15	15.0	34.85	1.030
20 x 20	45	20 x 20	20.0	35.50	1.049
24 x 24	45	24 x 24	24.0	35.80	1.058

<u>Collimator Setting</u>	<u>Trimmer Distance</u>	<u>Field Size</u>	<u>Equiv Sq</u>	<u>Dosimeter Reading</u>	<u>Relative to 10cm2*</u>
4 x 4	65	4 x 4	4.0	33.00	0.975
6 x 6	65	6 x 6	6.0	33.65	0.994
8 x 8	65	8 x 8	8.0	34.10	1.007
10 x 10	65	10 x 10	10.0	34.50	1.019
12 x 12	65	12 x 12	12.0	34.85	1.030
15 x 15	65	15 x 15	15.0	35.30	1.043
20 x 20	65	20 x 20	20.0	35.75	1.056

\*  $[(\text{Dosimeter Reading})/(\text{Dosimeter Reading}')] ]$

Where: Dosimeter Reading = Reading of Collimator Field Size

Dosimeter Reading' = Reading of 10 x 10 cm Field Size @ 80.0 cm

7. Congruence of Radiation Field and Light Field: Lightfield was first set to the desired dimension before the collimator dial setting was recorded.

<u>Dial Setting</u>	<u>Trimmer Distance</u>	<u>Light Field</u>	<u>Radiation Field</u>
5.0 x 5.1 cm	45	5.0 x 5.0 cm	5.0 x 5.0
10.0 x 10.0	45	10.0 x 10.0	10.0 x 10.0
15.0 x 15.0	45	15.0 x 15.0	15.0 x 15.0
20.0 x 20.1	45	20.0 x 20.0	20.0 x 20.0
5.0 x 5.3 cm	65	5.0 x 5.0 cm	5.0 x 5.0 cm
10.0 x 10.3	65	10.0 x 10.0	10.0 x 10.0
15.0 x 15.3	65	15.0 x 15.0	15.0 x 15.0
20.0 x 20.3	65	20.0 x 20.0	20.0 x 20.0

Results: Center of Light and Radiation Fields Correspond to with +/- 1.0 mm for all measurements. All congruency measurements are satisfactory; however, the scale that reads 0.3 cm large with the trimmers at 65 cm should be adjusted. The problem may be with the a bent or misaligned trimmer. The trimmers are scheduled to be replaced within two weeks.

8. Radiation field Uniformity and Its Dependence on Beam Orientation: Uniformity checked by exposing Kodak verification film located at 80.0 cm SFD (0.5 cm build up over film) to approximately 60 rad. Uniformity was measured using a MacBeth Densitometer: 0.5-0.8 rad/0.01 density unit

A. Uniformity: Field sizes from 5 x 5 cm to 20 x 20 cm on Dial checked: Exposure across fields within 1 cm of the the boarder was within +/- 2.5%.

B. Collimator Rotation: Field Size of 10 x 10 cm on Dial checked for collimator rotations of 0, -90 and +90 Degrees: Exposure across fields within 1 cm of the the boarder was within +/- 2.0%.

C. Gantry Rotation: Field Size of 10 x 10 cm on Dial checked for gantry rotations of 90, 180 and 270 Degrees: Density across fields within +/- 2.0%

9. Beam Modifier Measurements: Trimmers at 45 cm

Beam Modifier	Field Size	Reading $\times 10^{** -9} \text{ C}$	Transmission Factor
Slotted Tray	10 x 10 cm	32.9	0.972
Solid Tray	10 x 10	32.3	0.954
Wedge (5 x 15 cm)	10 x 10	25.75	0.761
Wedge (6 x 15 cm)	10 x 10	24.5	0.724
Wedge (8 x 15 cm)	10 x 10	22.7	0.671
Wedge (10 x 15 cm)	10 x 10	21.0	0.620

\* [(Dosimeter Reading)/(Dosimeter Reading')]

Where: Dosimeter Reading = Reading for Collimator Field Size  
with Beam Modifier

Dosimeter Reading' = Reading for Collimator Field Size  
without Beam Modifier

10. Dosimetry Calculations for clinical Treatment:

$$\text{Treatment Time} = \text{Dose} / [\text{D.R.}(10 \times 10) \times (\text{REF}) \times (\text{BSF}) \times (\text{BMTF}) \times (\text{D.D.})] \\ + 0.01 \text{ min}$$

A. Unblocked Field:

Where: Dose = Prescribed Tumor Dose  
D.R.(10x10) = Dose Rate for 10x10 cm Field in-air  
          measured to delta M of tissue  
REF = Relative Exposure Factor measured in-air  
BSF = Backscatter Factor  
BMTF = Beam Modifier Transmission Factor  
D.D. = Fractional Depth Dose  
0.01 = On-Off Correction

B. Blocked Field:

Where: Dose = Prescribed Tumor Dose  
D.R.(10x10) = Dose Rate for 10x10 cm Field in-air  
          measured to delta M of tissue  
REF = Relative Exposure Factor measured in-air for  
          Unblocked Collimator field size setting  
BSF = Backscatter Factor for blocked field size equivalent  
          square  
BMTF = Beam Modifier Transmission Factor  
D.D. = Fractional Depth Dose for blocked field size  
          equivalent square  
0.01 = On-Off Correction

NCTE: D.R.(10x10) in-air dose rate to delta M of tissue =  
(0.99) x [D.R.(10x10) in-air dose rate to delta M of water]

R.L. La FONTAINE  
LCDR MSC USN  
ABR Certified Physicist



COBALT-60 ANNUAL CALIBRATED OUTPUT AT D(MAX)  
AS A FUNCTION OF FIELD SIZE FOR THE YEAR 1986

The Original Calibration Was Performed on: 24-NOV-85

The Output To a 10 x 10 cm Field on that Date Was: 150.9 rads/min  
for a 10 x 10 cm field at 80.5 cm SAD, to a small mass of water.

The Calibrated Output on 15-JAN of 1986 IS 148.2 rads/min  
for a 10 x 10 cm field at 80.5 cm SAD, to a small mass of water.

Output Relative to the 10 x 10 field is computed to a delta M of Water

Relative Output in Rads/Min As a Function of Field Size  
Trimmers at 45 cm

	5x5 cm	7x7 cm	10x10 cm	12x12 cm	15x15 cm	20x20 cm	24x24 cm
EQ. SQ.: 5.0	7.0	10.0	12.0	15.0	20.0	24.0	CM2
Month	0.966	0.982	1.000	1.013	1.030	1.049	1.058
JAN	143.2	145.5	148.2	150.1	152.6	155.5	156.8
FEB	141.6	143.9	146.6	148.5	151.0	153.8	155.1
MAR	140.1	142.4	145.0	146.9	149.3	152.1	153.4
APR	138.5	140.8	143.4	145.3	147.7	150.4	151.7
MAY	137.0	139.3	141.8	143.7	146.1	148.8	150.1
JUN	135.5	137.8	140.3	142.1	144.5	147.2	148.4
JUL	134.0	136.3	138.7	140.6	142.9	145.5	146.8
AUG	132.6	134.8	137.2	139.0	141.4	144.0	145.2
SEP	131.1	133.3	135.7	137.5	139.8	142.4	143.6
OCT	129.7	131.8	134.3	136.0	138.3	140.8	142.0
NOV	128.3	130.4	132.8	134.5	136.8	139.3	140.5
DEC	126.9	129.0	131.3	133.0	135.3	137.8	139.0

Relative Output in Rads/Min As a Function of Field Size  
Trimmers at 65 cm

	4x4 cm	6x6 cm	8x8 cm	10x10 cm	12x12 cm	15x15 cm	20x20 cm
EQ. SQ.: 4.0	6.0	8.0	10.0	12.0	15.0	20.0	CM2
Month	0.975	0.994	1.007	1.019	1.030	1.043	1.056
JAN	144.5	147.3	149.2	151.0	152.6	154.6	156.5
FEB	142.9	145.7	147.6	149.4	151.0	152.9	154.8
MAR	141.4	144.1	146.0	147.7	149.3	151.2	153.1
APR	139.8	142.5	144.4	146.1	147.7	149.6	151.4
MAY	138.3	141.0	142.8	144.5	146.1	147.9	149.8
JUN	136.8	139.4	141.3	142.9	144.5	146.3	148.1
JUL	135.3	137.9	139.7	141.4	142.9	144.7	146.5
AUG	133.8	136.4	138.2	139.8	141.4	143.1	144.9
SEP	132.3	134.9	136.7	138.3	139.8	141.6	143.3
OCT	130.9	133.4	135.2	136.8	138.3	140.0	141.8
NOV	129.5	132.0	133.7	135.3	136.8	138.5	140.2
DEC	128.1	130.5	132.3	133.8	135.3	137.0	138.7

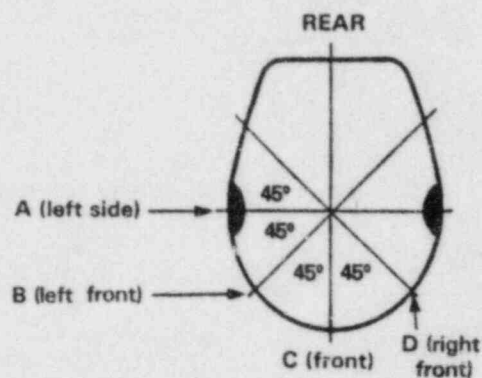
# Figure F-1 TELETHERAPY HEAD SURVEY

U.S. NAVAL HOSPITAL  
San Diego, CA 92134  
USNRC License No. 04-01369-01

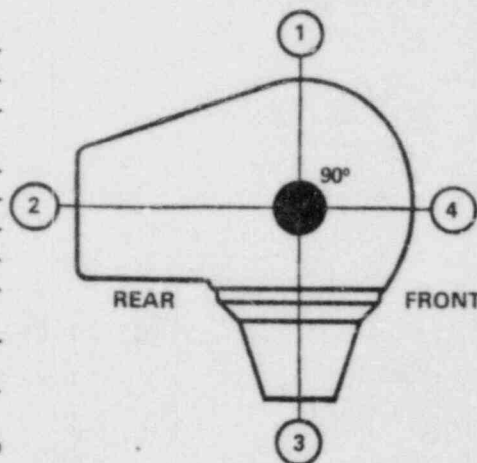
(Source in "OFF" position.  
Measurements taken one meter  
from source)

Top View-Showing  
orientation  
of Views A through D

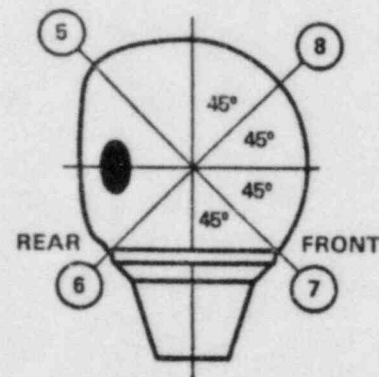
Position No.	Radiation Level (mr/hr)
View A	1 2.8
	2 0.6
	3 2.8
	4 3.6
View B	5 1.1
	6 1.8
	7 1.0
	8 0.1
View C	9 1.3
	10 1.6
View D	11 0.1
	12 0.7
	13 2.1
	14 1.2
Average value	1.5
Maximum value	3.6



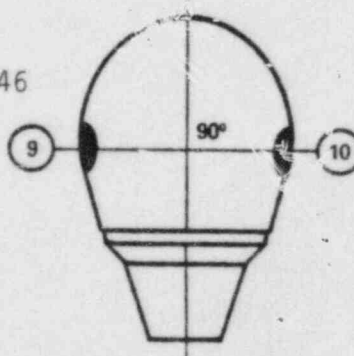
View A-Vertical  
from left side



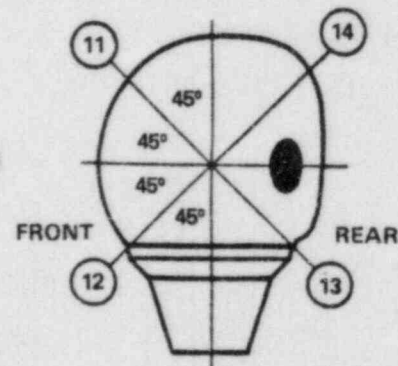
View B-Vertical  
from left front



View C-Vertical  
from front



View D-Vertical  
from right front



Date of survey 24-NOV-85  
Instrument used AN/PDR-27R, #B1265

Manufacturer's  
name & model number  
of teletherapy source AECL Type C-146

Date of installation 22-NOV-85

OUTPUT 102.2 ☐ RHM  
☒ RMM

Date of output  
measurement 24-NOV-85

MECHANICAL/ELECTRICAL BEAM STOPS THAT LIMIT BEAM ORIENTATION

Theratron-80 Cobalt-60 Unit

Building 26, Third Basement

Naval Hospital San Diego, CA

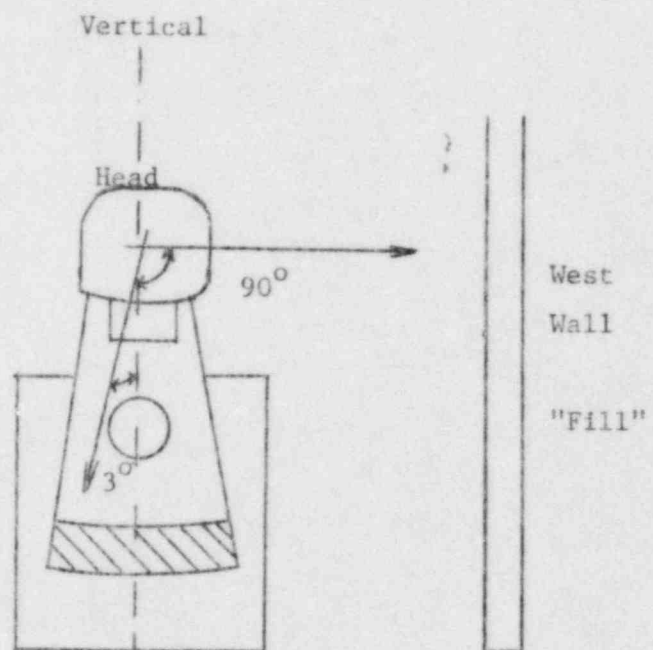
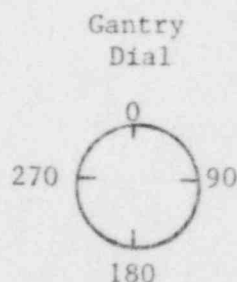
USNRC By-Product Material License No. 04-01369-01: Control Number 18480

1. Mechanical and/or electrical beam stops that are operational and restrict beam orientation when the primary beam is directed toward the integral beam absorber: None

2. Mechanical and/or electrical beam stops that are operational and restrict beam orientation when the primary beam is directed away from the integral beam absorber:

1. Beam orientation is limited to 3 degrees from vertical for head rotation toward the East wall.

2. Beam orientation is limited to 90 degrees from vertical for head rotation toward the West wall.



U.S. Naval Hospital  
San Diego, CA 92134  
USNRC License No. 04-01369-01

Area Radiation Survey Around Cobalt-60 Room

Following Source Replacement on 22 November 1985

<u>Location</u>	<u>Gantry Angle†</u>						
	0	60	90	150	180	270	300
	<u>Exposure (mR/hr)</u>						
1	0.8	0.07	0.05	*	0.7	0.3	14
2	4.2	0.15	0.25	*	3.3	2.7	58
3	1.5	0.20	0.20	*	1.2	42	17
4	0.4	0.13	0.13	0.15	0.3	3.6	2.1
5	0.3	0.75	0.80	*	0.3	0.6	0.3
6	1.4	2.0	2.1	*	1.2	1.0	1.0
7	0.7	0.10	0.05	*	0.4	0.1	0.3
8	0.4	*	*	*	0.7	1.1	4.9
9	*	*	*	*	*	4.2	2.0
10	*	*	*	15	6.0	*	*

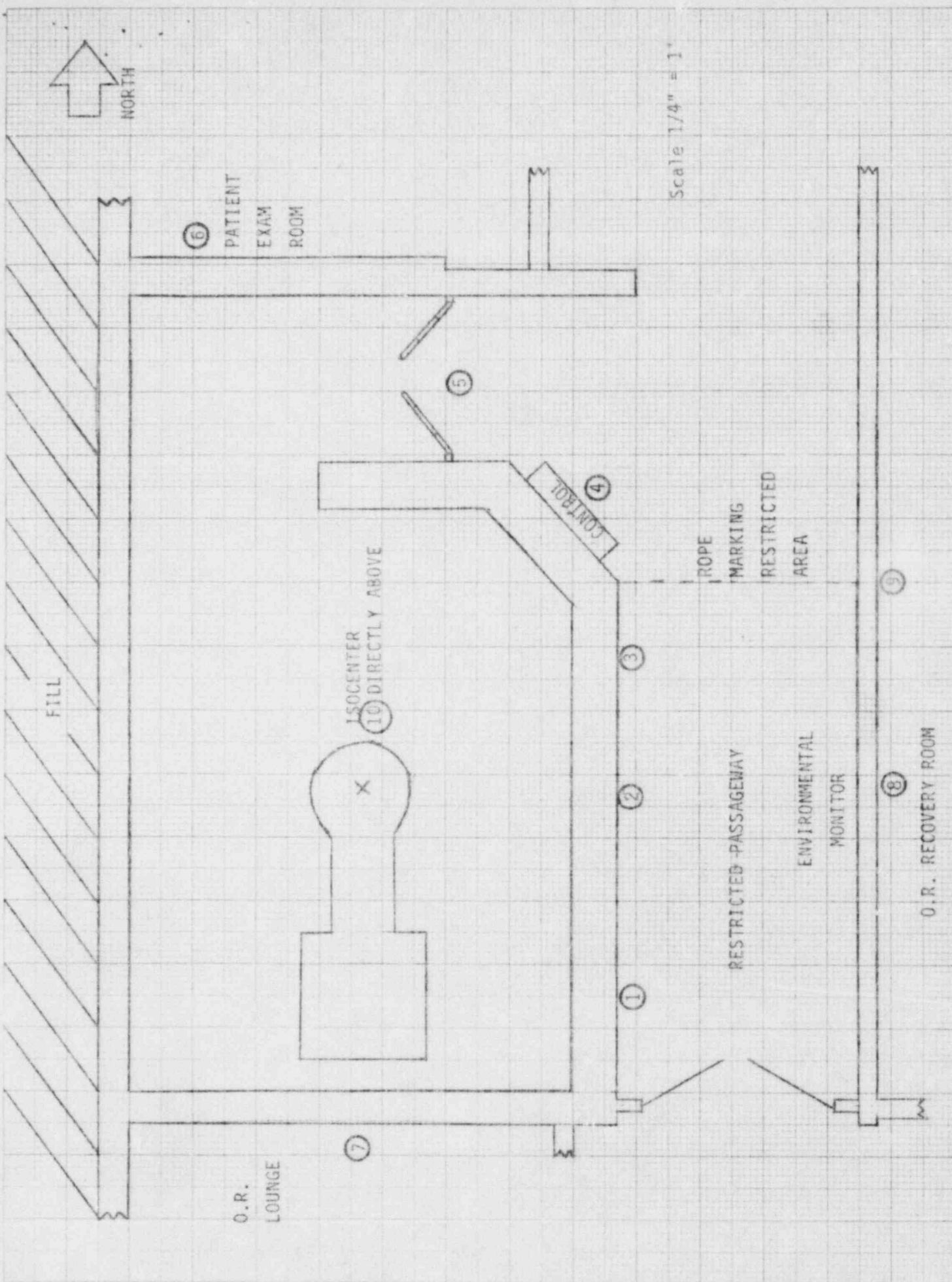
† Gantry scale rotates with unit such that at 90 the primary beam is directed at the East wall and at 270 it is directed at the West wall.

\* Exposure not measured at this gantry angle



46 1472

COBALT-60 TELE THERAPY ROOM, U.S. NAVAL HOSPITAL, SAN DIEGO, CA 92134; USNRC BY-PRODUCT LICENSE NO. 04-01369-01





FILL



DEPARTMENT OF THE NAVY  
NAVAL HOSPITAL  
SAN DIEGO, CALIFORNIA 92134-5000

030-00104  
Amendment

IN REPLY REFER TO:

6470

Ser 87:RLL:mp/2844

17 DEC 1985

From: Commanding Officer, Naval Hospital, San Diego  
To: Material Licensing Branch, Division of Fuel Cycle and Material Safety,  
Office of Nuclear Material Safety and Safeguards, U.S. Nuclear  
Regulatory Commission, Washington, D.C. 20555  
Via: (1) Commander, Naval Medical Command, Southwest Region, San Diego,  
CA 92134-7000  
(2) Commander, Naval Medical Command (MEDCOM-3C22), Washington,  
DC 20372-5120

Subj: TELETHERAPY SURVEY REPORT REQUIRED BY USNRC BY-PRODUCT MATERIAL  
LICENSE NO. 04-01369-01

Encl: (1) Teletherapy Survey Report of Cobalt-60 Unit, Naval Hospital,  
San Diego

1. In accordance with Conditions 18 and 19 of USNRC By-product Material  
License No. 04-01369-01, enclosure (1) is submitted following replacement  
of the teletherapy unit Cobalt-60 source on 22 November 1985.

  
H. M. KOENIG

Copy to:  
USNRC Region V

FEE EXEMPT

*Telcom w/LCDR Gary Williams 1/13/86  
This report did not go thru the Navy  
Coordinator's office but LCDR Williams  
did receive a copy & has no objection to  
NRC proceeding w/ review of this  
document*  
*PL Vacca*

85 DEC 23 13:47