

GEORGE W. CALLENDINE, JR., PH. D.  
AND ASSOCIATES

CONSULTING RADIOLOGIC PHYSICS  
803 OXFORD STREET  
WORTHINGTON, OHIO 43085

(614) 885-6187

July 31, 1985

RADIOLOGIC PHYSICS DIVISION OF  
CARTER, SCHWARTZ & SCHMIDT, INC.

DEPARTMENT PLANNING  
EQUIPMENT SPECIFICATION  
SYSTEMS ANALYSIS  
HAZARD AND QUALITY CONTROL

TELETHERAPY SURVEY REPORT

1. LICENSEE: Doctors North Hospital  
1087 Dennison Avenue, Columbus, OH 43201  
  
License No: 34-05488-02
2. SURVEYOR: George W. Callendine, Jr., Ph.D.  
803 Oxford Street, Worthington, OH 43085
3. REASON FOR SURVEY: Installation of new Cobalt-60 teletherapy source
4. COMPLETION OF INSTALLATION: June 21, 1985
5. SURVEY DATE: June 22-23, 1985
6. RADIATION DETECTION INSTRUMENTATION:
  - .1 Calibration Meter - Victoreen Model 550; calibrated February 15, 1985 by AAPM certified calibration laboratory.
  - .2 Survey Meter - Victoreen Model 470A; calibrated August 1, 1984 with a source of radium which had been calibrated traceable to the National Bureau of Standards.
7. TELETHERAPY UNIT: Atomic Energy of Canada, Ltd.  
Model No. THERATRON-780
8. TELETHERAPY SOURCE: Neutron Products, Inc.  
Model No. NPI-20-4500W
9. SOURCE ACTIVITY: 4,260 curies, as of June 21, 1985
10. PRIMARY BEAM: The unit was calibrated to have an exposure of 119.4R per minute at a source chamber distance of 80 cm for a 10 cm x 10 cm field. A full calibration was performed on the unit at the time of installation of the source.
11. SOURCE HEAD SURVEY: The maximum and average radiation levels measured at 1 meter from the source in the "Off" position are 0.80 mR per hour and 0.23 mR per hour respectively (see enclosed worksheet).

8512020608 851031  
REG3 LIC30  
34-05488-02 PDR

Page -2

12. BEAM ORIENTATION LIMITS: The beam will operate in any orientation when positioned towards the beamstopper. When the head is rotated away from the beamstopper it can be rotated 95 degrees in the clockwise position (facing towards the West) and 2 degrees in the counter-clockwise position (beam facing towards the East. These are electrical stops. The unit has no movement in the swivel (In or Out) position.
13. RADIATION SURVEY METHOD: Radiation levels in adjacent areas were measured during radiation of a phantom.
  - .1 Phantom: 30 cm x 30 cm x 30 cm polystyrene block
  - .2 Source-to-Phantom Distance: Source axis distance = 80 cm
  - .3 Field Size: 35 cm x 35 cm
14. ADJACENT AREA EXPOSURE LEVELS: Attached are plan views of the teletherapy room and adjacent areas. Each has the beam direction indicated, along with the exposure levels measured at the maximum position along each wall, overhead or below.

The beam directions are chosen to indicate the exposure levels with the beam in the most common orientation (0 degrees or down) and also in those orientations which produce the maximum exposure levels at the various locations.
15. PERSONNEL EXPOSURE ESTIMATES: A computation sheet is attached which shows the calculations for exposure estimates to individuals who might be located in critical areas. The calculations assume beam "On" times at least double those actually experienced in our statistical evaluation of the clinical practice. Calculations indicate that no individual will be exposed to more than 10 mR per week.

Five years experience monitoring the personnel exposure levels supports these computations.
16. SAFETY SYSTEMS: A report is attached indicating the proper operation of all safety systems. The method of test is described under Procedures in License No. 34-16779-01.

It is my professional opinion that the unit is operating safely and correctly.

Respectfully submitted,

---

George W. Callendine, Jr., Ph.D  
Consulting Radiologic Physicist

GWC:mt

Enclosures

CONTROL NO. 7 9 7 3 7

GEORGE W. CALLENDINE, JR., Ph. D.  
CONSULTING RADIOLOGIC PHYSICIST  
803 OXFORD STREET  
WORTHINGTON, OHIO 43085  
[614] 885-6173

CERTIFICATION OF TELETHERAPY PERFORMANCE

Location: DOCTORS NORTH HOSPITAL Room 6060 Date 06-23-85  
COLUMBUS OHIO Unit:  
Mfg. AECL Model TH 720

Signs Posted: AEC Form 3 YES Emergency Procedures YES  
Door: Caution, High Radiation Area YES Radioactive Materials YES  
Head: Radioactive Materials YES  
Other: NA

Patient Monitoring: View Window OK Mirror NA Aural OK  
CCTV NA Other NA

Door Interlock(s): Door to Room OK Other NA

Machine Interlocks: Power On/Off OK Timer On/Off OK Key OK  
Emergency Bar OK Other NA

Warning Lights:

	Control	Door	Room	Head	Other
Green	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<u>Room Monitor</u>
Red	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<u>SATISFACTORY</u>
White					<u>WAC &amp; W.O. AC.</u>

Beam Limiting Stops: Adequate YES  
Electrical 95% 200V 200W Mechanical -

Treatment Timing Device: Terminate Exp. @ Zero YES Accuracy  $-2.5 \times 10^{-3}$  min.

Source Head Survey: @ Surface  $\leq 3.4$  -mR/Hr ; @ One Meter  $\leq 0.8$  -mRhm

Wipe Test: Source Area  $\leq 0.005$  -uCi; Collimator  $\leq 0.005$  -uCi; Housing  $\leq 0.005$  -uCi

Area Survey: NO INDIVIDUAL WILL BE EXPOSED TO MORE THAN 10mR/WK.

Output Calibration: 119.4 -R/Min @ SCD = 20 -cm & WxH = 10 -cm x 10 -cm

Comments:

This unit conforms with presently accepted performance standards of radiation hazard control: Yes ☒ No ☐

① LIGHT/RADIATION CONFORMANCE IS WITHIN 1.5mm

② CALIBRATION METER - VICTOREEN MODEL 550 - CALIB, 02-15-85

Respectfully submitted,

George W. Callendine, Jr.  
CONTROL NO. 79737

## Co-60 TELETHERAPY ROOM SURVEY

HEAD  
COLLIMATOR  
SOURCE

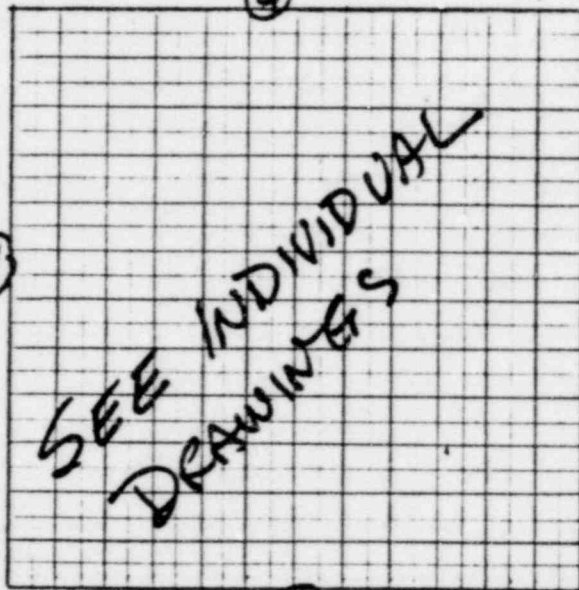
Mfg	Model	Serial
AECL	TH 780	326
NPI	NPI-20-4500W	T-775

Diameter 2 -cm: \_\_\_\_\_ -Rh on Date \_\_\_\_\_  
Specified 4260 -Ci on Date 06-21-85

I. Room:

PLAN

CONSTRUCTION DETAILS



BARRIER	
Walls - a	
b	
c	
d	
Door	
Control	
Window	
Ceiling	
Floor	

II. MEASUREMENTS: See Next Sheet

III COMMENTS: (1) SURVEY METER: VICTOREEN 470A SN 829

CALIBRATED 08-01-84

(2) PHANTOM: 30cm x 30cm x 30cm POLYSTYRENE PLACED ON TREATMENT STRETCHER.

(3) NEW SOURCE

(4) ANGLE = 0°; BEAM DOWN; OTHER ANGLES MEASURED CLOCKWISE

(5) ANGLES 60° & 300° RESULT IN MAXIMUM ADJACENT EXPOSURE LEVELS

SIGNATURE: George W. Callendine, Jr.

# TELETHERAPY ROOM SURVEY

Page 2

## II. MEASUREMENTS:

BARRIER	ADJACENT ROOM FUNCTION	BEAM Technique	Beam Dist. to Source	Beam IN/OUT	Field Size Dimensions at F.F.D.	30cm <sup>2</sup> 30x30 Random Point Irene	METER Location Reading mR/hr	BARRIER Abs. Facing in Growth Equiv.	EST. HOUR per Week this Beam	EST. mR/wk This Beam This Barrier	COMMENTS
WALL	ORTHOVOLTAGE THERAPY Room	0° 90° 90° 60° 300°	9'	IN IN OUT IN IN	35x35	IN IN IN IN IN	a 1.2 0.2 0.2 0.3 5		14 1 0.25 1 1	16.8 0.2 0.5 0.3 22.8	5.7 mR/wk
		0 90 90 60 300		IN IN OUT IN IN	1/8	IN IN IN IN IN	b 1.8 0.2 0.2 0.8 15		14 1 0.25 1 1	25.2 0.2 0.1 0.8 41.3	5.2 mR/wk
WALL	CONTROL	0 90 90 60 300		IN IN OUT IN IN	1	IN IN IN IN IN	c 0.6 0.6 0.4 0.6 0.2		14 1 0.25 1 1	8.4 0.6 0.1 0.6 9.9	9.9 mR/wk
WALL Door	CONTROL CORRIDOR	0 90 90 60 300		IN IN OUT IN IN	1/4	IN IN OUT IN IN	d 0.2 0.6 1.0 0.6 0.2		14 1 0.25 1 1	2.8 0.6 0.2 0.6 4.4	1.1 mR/wk

CONTROL NO. 79737



# TELE THERAPY ROOM SURVEY

Page 2

## II. MEASUREMENTS:

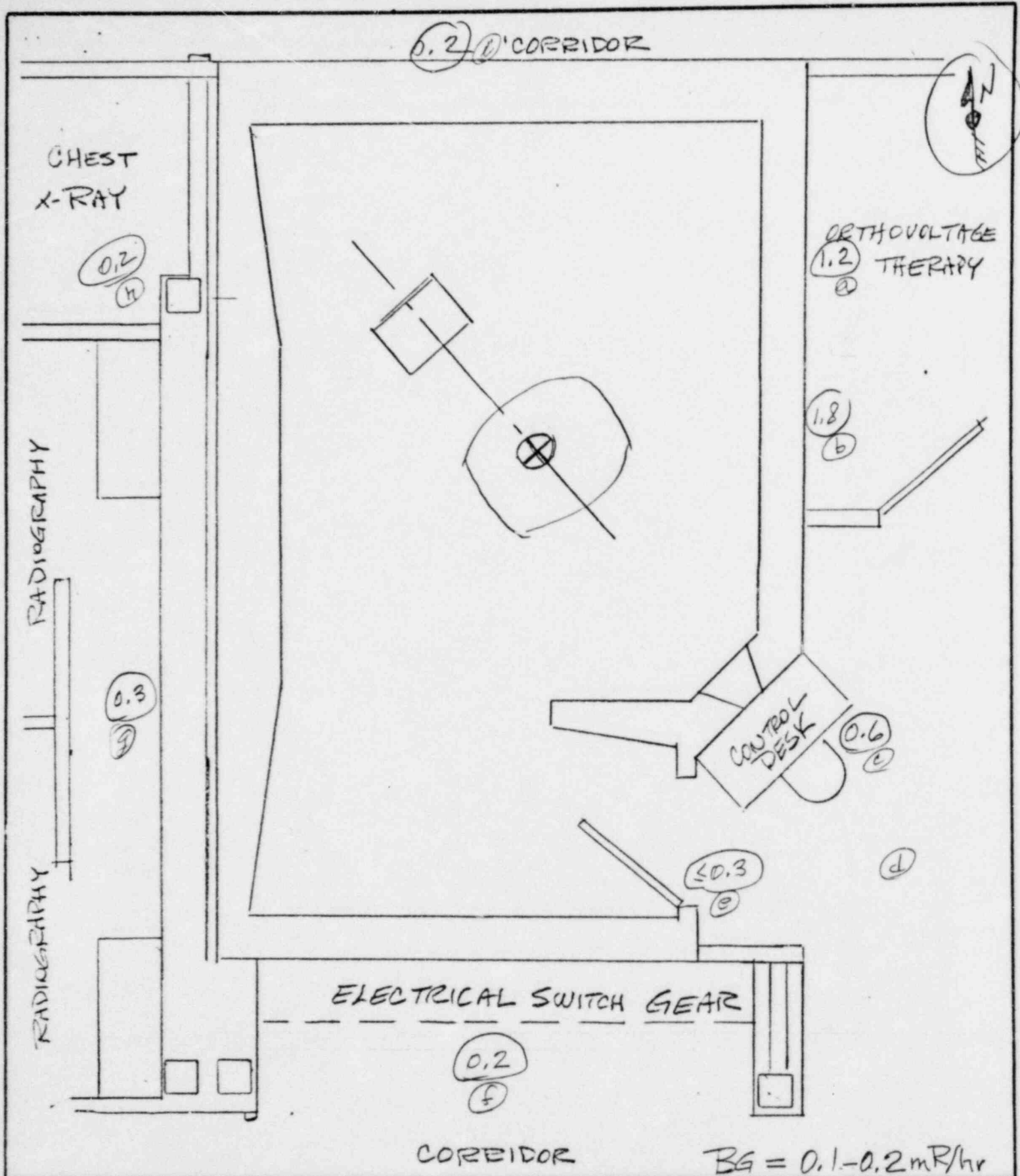
BARRIER	ADJACENT ROOM FUNCTION	BEAM		BARRIER IN/OUT	FIELD SIZE Dimensions at F.F.D.	OCCUPANCY	PHANTOM	METER		BARRIER		EST. HOUR per Week this Beam	EST. mR/wk		COMMENTS
		Direction	Distance from Barrier					Location	Reading mR/hr	Abs. Factor	In Grook Equiv.		THIS BEAM	THIS BARRIER	
DOOR	CONTROL CORRIDOR	0		IN		1/4	IN	e	0.3			14	4.2		EXPOSURE
		90		IN			IN	i	1.0			1	1.0		
		90		OUT			IN		2.5			0.25	0.7		
		60		IN			IN		1.1			1	1.1		
		300		IN			IN		0.3			1	0.3	7.3	
WALL	CORRIDOR	0				1/4		f	0.2			14	2.8		1.9 mR/wk
		90							1.9			1	1.9		
		90							4.0			0.25	1.0		
		60							1.7			1	1.7		
		300							0.3			1	0.3	7.7	
WALL	X-RAY CONTROL	0				1		g	0.3			14	4.2		7.3 mR/wk
		90							0.3			1	0.3		
		90							9.0			0.25	2.3		
		60							0.3			1	0.3		
		300							0.2			1	0.2	7.3	
WALL	X-RAY	0				1		h	0.2			14	2.8		4.4 mR/wk
		90							0.2			1	0.2		
		90							0.3			0.25	1.0		
		60							0.2			1	0.2		
		300							0.2			1	0.2	4.4	

# TELETHERAPY ROOM SURVEY

Page 2

## II. MEASUREMENTS:

BARRIER	ADJACENT ROOM FUNCTION	BEAM Direction Distance	Beam IN/OUT	FIELD SIZE Dimensions at F.F.D.	Phantom	METER Location Reading mR/hr	BARRIER Abs. Factor	EST. HOUR per week this Beam	EST. mR/wk This Beam This Barrier	COMMENTS
Floor	Locker Room	0	IN	1/4	IN	0.3		14	4.2	EXPOSURE
		90	IN		IN	0.2		1	0.2	
		90	OUT		IN	0.2		0.25	0.1	
		60	IN		IN	0.2		1	0.2	
		300	IN		IN	0.3		1	0.3	1.25 mR/hr



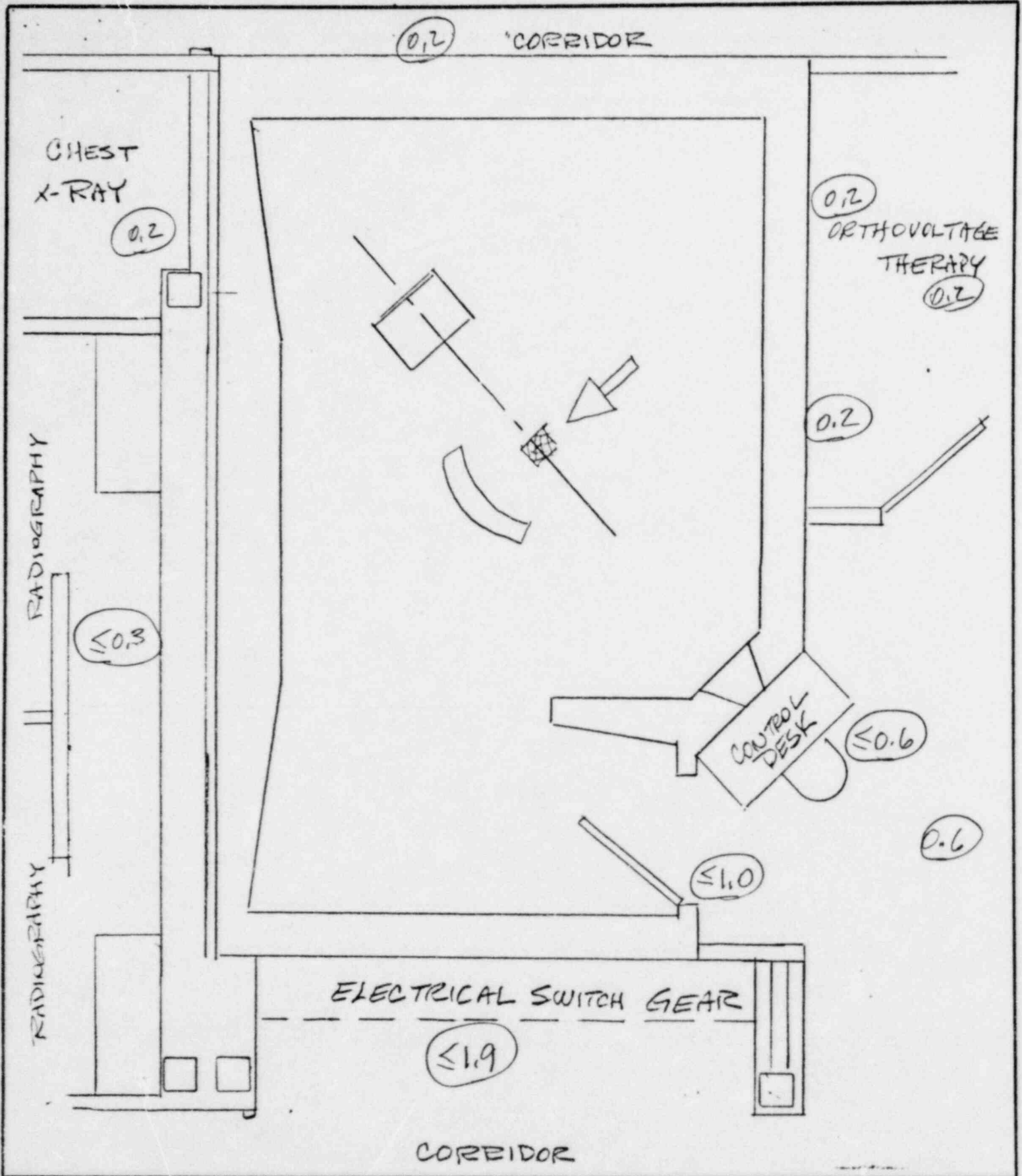
GEORGE W. CALLENDINE, JR., PH. D.  
CONSULTING RADIOLOGIC PHYSICIST  
803 OXFORD STREET  
WORTHINGTON, OHIO 43085

(614) 885-6187

60 CO TELETHERAPY-RAN VIEW  
RADIOLOGY-THERAPY  
DOCTORS NORTH HOSPITAL  
COLUMBUS OHIO

BEAM DOWN  
STEPPER-IN  
PHANTOM  
-IN



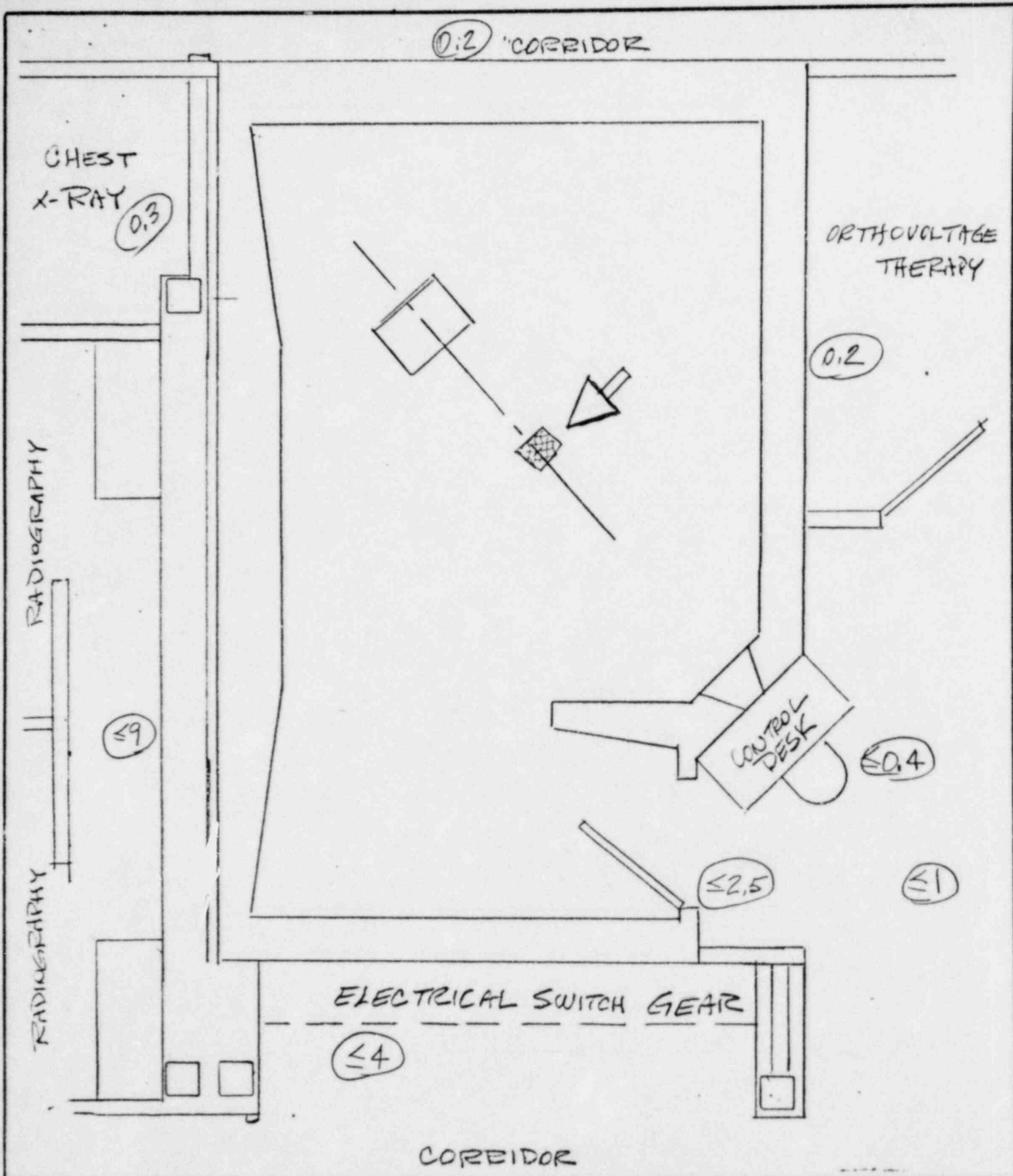


GEORGE W. CALLENDINE, JR., PH. D.  
 CONSULTING RADIOLOGIC PHYSICIST  
 803 OXFORD STREET  
 WORTHINGTON, OHIO 43085  
 (614) 885-6187

60 CO TELETHERAPY-PLAN VIEW  
 RADIOLOGY-THERAPY  
 DOCTORS NORTH HOSPITAL  
 COLUMBUS OHIO

BEAM 90°  
 STOPPER IN  
 PHANTOM IN

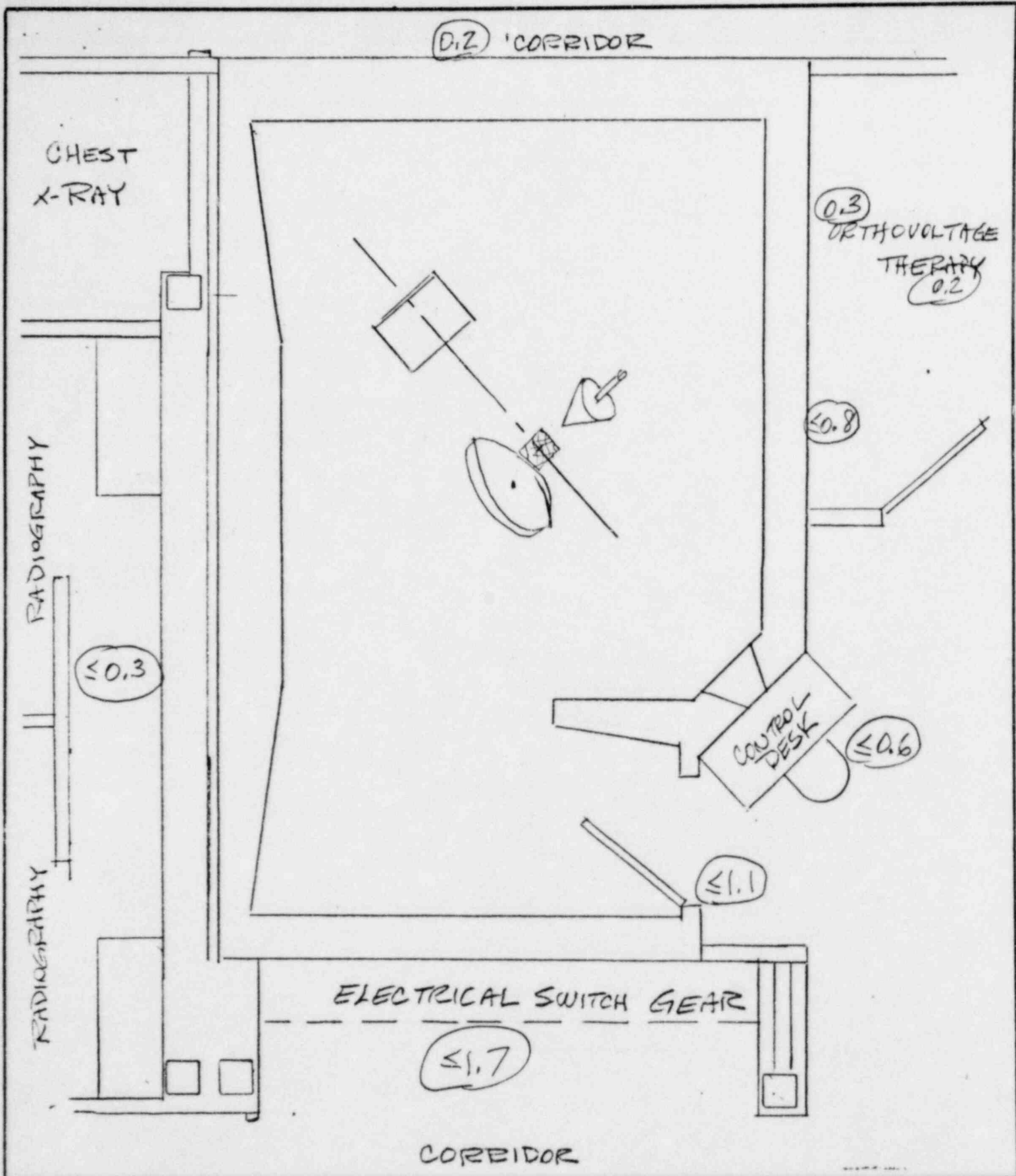
CONTROL NO. 79737



GEORGE W. CALLENDINE, JR., PH. D.  
 CONSULTING RADIOLOGIC PHYSICIST  
 803 GAYLORD STREET  
 WORTHINGTON, OHIO 43085  
 (614) 885-6187

60 CO TELETHERAPY-PLAN VIEW  
 RADIOLOGY-THERAPY  
 DOCTORS NORTH HOSPITAL  
 COLUMBUS OHIO

BEAM 90°  
 STOPPER OUT  
 PHANTOM IN

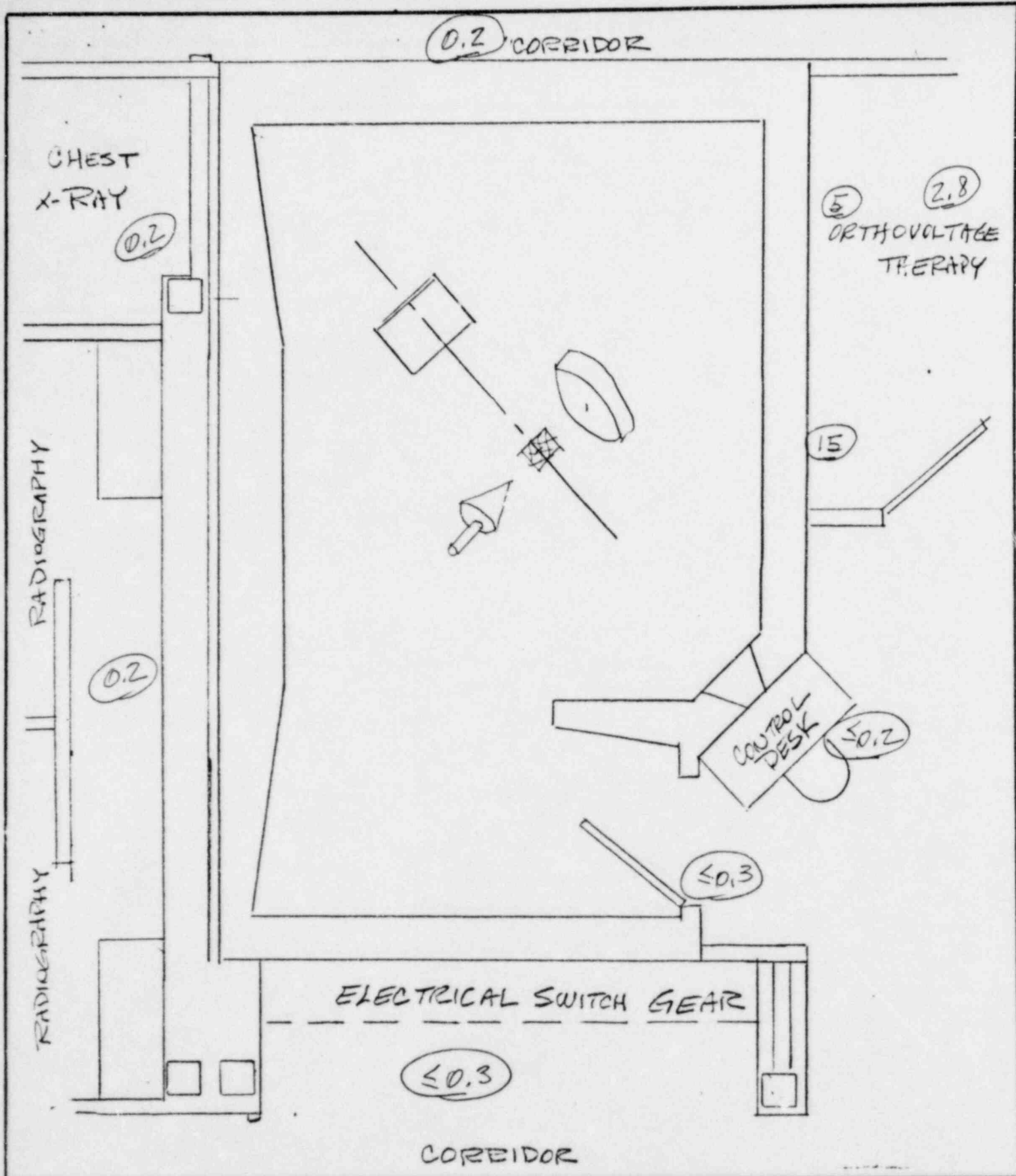


GEORGE W. CALLENDINE, JR., PH. D.  
 CONSULTING RADIOLOGIC PHYSICIST  
 803 OXFORD STREET  
 WORTHINGTON, OHIO 43085  
 (614) 885-6187

600 TELETHERAPY-PLAN VIEW  
 RADIOLOGY-THERAPY  
 DOCTORS NORTH HOSPITAL  
 COLUMBUS OHIO

BEAM 60°  
 STOPPER IN  
 PHANTOM IN

CONTROL NO. 79737



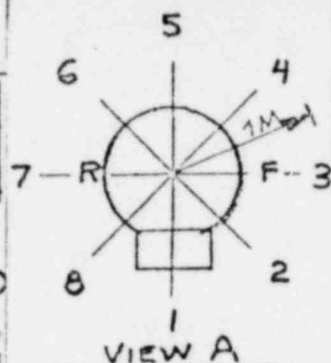
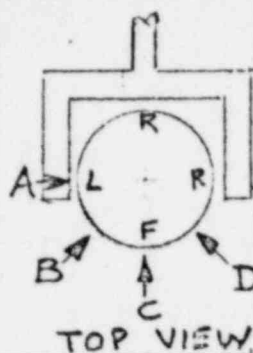
GEORGE W. CALLENDINE, JR., PH. D.  
 CONSULTING RADIOLOGIC PHYSICIST  
 803 OXFORD STREET  
 WORTHINGTON, OHIO 43085  
 (614) 885-6187

60 CO TELETHERAPY-PLAN VIEW  
 RADIOLOGY-THERAPY  
 DOCTORS NORTH HOSPITAL  
 COLUMBUS OHIO

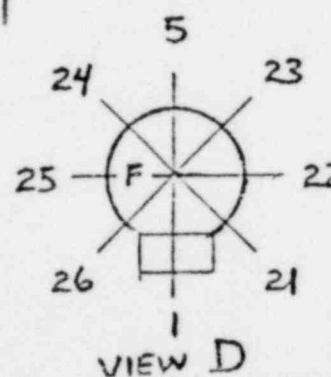
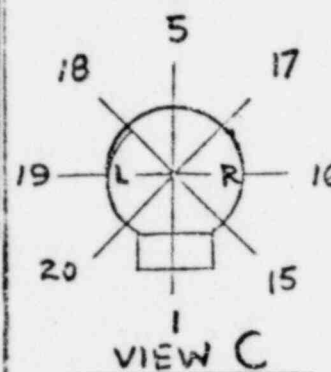
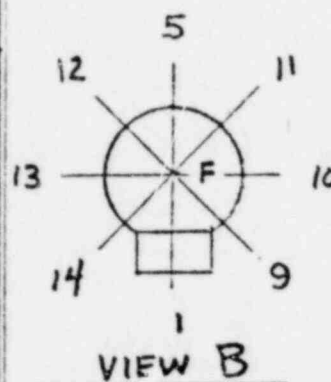
BEAM 300°  
 STOPPER IN  
 PHANTOM IN

	Mfg.	Model	Serial
UNIT	AECL	TH 780	326
HEAD			
COLLIMATOR			
SOURCE	NPI	NPI-20-4500	T-775

Diameter = 2.0 cm; Wipe Test  $\leq 0.005$   $\mu\text{Ci}$   
 Spec's: Date 06-21-85 - Rhm: 4260 - Ci



Pos. NO.	Surface	1-Meter	Pos. NO.	Surface	1-Meter
1	3.4	0.8	15	2.2	0.5
2	2.2	0.3	16	2.1	0.6
3	0.6	0.2	17	1.5	0.3
4	0.2	0.2	18	1.5	0.4
5	3.4	0.5	19	2.1	0.5
6	1.2	0.4	20	3.0	0.5
7	—	—	21	2.6	0.5
8	0.8	0.6	22	1.5	0.6
9	0.4	0.2	23	1.2	0.4
10	0.2	0.2	24	0.6	0.2
11	0.3	0.2	25	0.3	0.3
12	0.9	0.4	26	0.2	0.2
13	0.6	0.3			
14	2.2	0.4			
			35.2		9.7
			1.41		0.23
			3.4		0.80



COMMENTS: BG < 0.1 mR/hr  
 CHECK SOURCE 0.9

METER: VICTOREEN MODEL 470A S/N 829

COLLIMATOR AXIS: 2.8 AT FACE; 0.6 @ 1 METER

George W. Callendine, Jr., Ph.D.  
 803 Oxford Street  
 Worthington, Ohio  
 43085

(614) 885-6187

60 Co TELETHERAPY  
 RADIOLOGY

DOCTORS NORTH HOSPITAL  
 COLUMBUS OHIO

AECL

THECATEN 780  
 NPI-20-4500  
 S/N T-775

06-23-85

CONTROL NO. 79737



TELETHERAPY SOURCE TRANSFER

This is to certify that a cobalt-60 source:

Model Number: NPI-20-4500W  
Serial Number: T-775  
Containing 4260 curies as of 6/21/85

and which has been determined by helium pressure test and by wipe test to be leak free, has been installed in a teletherapy unit described as follows:

Manufacturer: AECL  
Model Number: Theratron 780  
Serial Number: ~~07~~ 326

This source is hereby transferred from Neutron Products' Radioactive Materials License MD-31-025-03 to Doctor's Hospital's Radioactive Materials License 34-05488-02, Amendment #10.

This will also certify that a cobalt-60 source described as follows:

Model Number: NPI-20-4500W  
Serial Number: T-378  
Containing 2270 curies as of 7/1/85

has been determined by a wipe test to be leak free and has been removed from the above teletherapy unit and transferred from Doctor's Hospital's Radioactive Materials License 34-05488-02, Amendment #10 to Neutron Products' License MD-31-025-03.

We have witnessed the inspection and operation of the above teletherapy unit after completion of the installation by Neutron Products, Inc. and have found the unit to be operating properly and safely.

\_\_\_\_\_  
Date \_\_\_\_\_

E. J. Lins  
\_\_\_\_\_  
Neutron Products, Inc.

Date 6-21-85

NEUTRON PRODUCTS inc

TELETHERAPY SOURCE CERTIFICATION

This certifies that the cobalt-60 source:

Model Number: NPI-20-4500W

Serial Number: T-775

Containing 4260 curies as of: 6/21/85

was fabricated by Neutron Products, Inc. in accordance with NPI specification P-4 per Drawing Number A20005 and was leak tested by the helium pressure test and found to be leak free on 6-12-85. The source was wipe tested and the removable activity was .021, and .0005 microcuries from the inner and outer encapsulations, respectively.

Performed by and certified to by:

Jeffrey W. Corum  
Jeffrey W. Corum, Manager  
Hot Cell Operations

Reviewed and approved by:

Marvin M. Turkanis  
Marvin M. Turkanis  
Vice President

6-20-85  
Date

NEUTRON PRODUCTS inc

CONTROL NO. 79737

REPORT OF INSPECTION AND SERVICING  
("FIVE YEAR INSPECTION" REPORT)

This is to certify that the Atomic Energy of Canada, (AECL)  
teletherapy unit, Model Theratron 780, Serial Number 326  
located at Doctor's Hospital, Dennison & Third Avenue,  
Columbus, Ohio, 43201 was inspected and serviced on  
6-21-85 by E.F. Finn to assure  
the proper function of the source exposure mechanism as authorized  
by Maryland License MD-31-025-03.

Signed E.F. Finn Date 6-21-85

Parts: NEW RIDER RING (IFRONT)  
NEW DETENT PIN  
REBUILT AIR REGULATOR WITH  
CUSTOMERS KIT

Nonstandard Service: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Doctor's Hospital  
Dennison at Third Ave.  
Columbus, Ohio

## INSPECTION CHECK LIST

Unit: T-780

Serial Number: 077 326

Operation	Prior to Transfer*	Subsequent to Transfer**
1. Determine Operating History	X ✓	
2. Head Movement	X ✓	X ✓
3. Electrical and Mechanical Source Condition-Indicator Check	X ✓	X ✓
4. Manual Source/Shutter Return	X ✓	X ✓
5. Timer	X ✓	X ✓
6. Source Holder/Shutter Movement Check	X ✓	X ✓
7. Pneumatic Activating System	X ✓	X ✓
8. Mercury Shutter System	X NA	X NA
9. Stand and Stretcher		X ✓
10. Protective Source Housing, Beam-Off Leakage (Confirm Measured by Medical Physicist)		X
11. Source-Surface Distance (SSD)		X ✓
12. Beam Orientation	X ✓	X ✓
13. Congruence of Light and Radiation Fields		X ✓
14. Full Calibration (Confirm Performed by Medical Physicist)		X
15. Facility Door Interlock	X ✓	X ✓
16. Teletherapy Units with Moving Source Drawer	X ✓	X ✓
17. Teletherapy Units with Moving Shutter Blocks	X NA	X NA
18. Teletherapy Units with Rotating Shutter	X NA	X NA
19. Indicator Light	X ✓	X ✓
20. Emergency Shutoffs	X ✓	X ✓
21. Collimator	X ✓	X ✓

Note: \*Circle all items not meeting attached criteria.

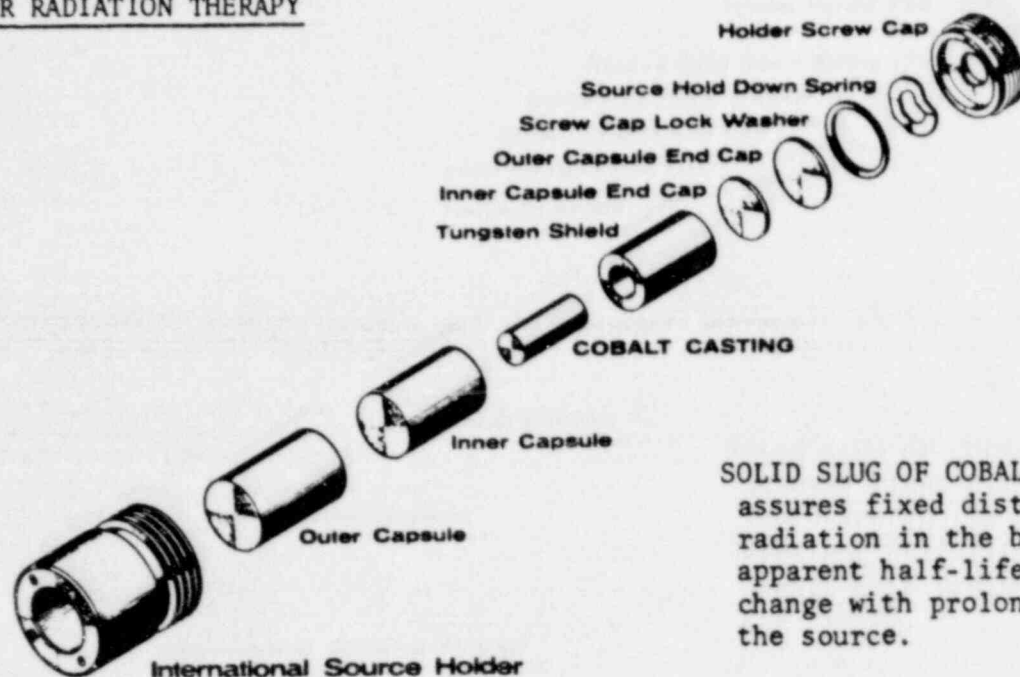
\*\*Circle all items not meeting attached criteria after servicing.

Signed: E. L. MinDate: 6-21-85

NEUTRON PRODUCTS Inc

CONTROL NO. 79737

COBALT-60 SOURCES  
FOR RADIATION THERAPY



DOUBLE ENCAPSULATION, with or without internal heavy metal shield, is fabricated, seal-welded, leak-tested, and checked for external contamination to highest standards.

Source capsule holder is provided for any teletherapy machine, including INTERNATIONAL CAPSULE (as shown), SHIELDED DRAWER, or other holder as appropriate.

NEUTRON PRODUCTS sources and fabrication procedures have been approved for standard applications in beam therapy units. Licensed personnel provide installation and radiation surveys.

Prices quoted on request will cover FULL SERVICE --- shipping, rigging, installation, routine maintenance, removal and disposal of turn-in source. Special maintenance, calibration, leakage field surveys, reports to regulatory agency, and other services may be ordered.

For further information  
please write or call:

**NEUTRON PRODUCTS Inc**

22301 Mt. Ephraim Rd  
P. O. Box 68  
Dickerson, MD 20842  
(301) 349-5001

CONTROL NO. 79737