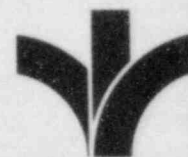


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ST. MARY'S HOSPITAL
A Bon Secours Health Care Facility

April 5, 1985

Material Licensing Branch
Office of Nuclear Material Safety and Safeguards
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

COBALT-60 TELETHERAPY UNIT SURVEY REPORT

On March 14, 1985 a new Cobalt-60 source was installed in the AECL Theratron 80 teletherapy unit located in Radiation Oncology. As required by our NRC Materials License, Number 45-11367-01 (reference number 030-00522), condition 18, we are providing a report of survey conducted subsequent to the installation of the new Cobalt-60 source.

Institution: St. Mary's Hospital
5801 Bremon Road
Richmond, Virginia 23226

Persons conducting the survey and calibration:

Marcus A. Gilbert, M.Sc.
Radiation Safety Officer
St. Mary's Hospital

Alfred M. Strash, Phd.
11746 Heathmere Crescent
Richmond, Virginia 23235

Date of Source Installation: March 14, 1985

Date of Survey: March 14 & 15, 1985

Instruments used for survey and calibration:

Victoreen Model 471RF Ionization Survey Meter, Serial Number 202, last calibrated on September 20, 1984 using two Nuclear Associates Inc. Cesium-137 sources, models 67-802 and 67-804 measuring 16.33 and 8.23 milligrams radium equivalence, respectively, with NBS traceable calibration accurate to within $\pm 5\%$. Each scale on the survey meter was calibrated at approximately 1/3 and 2/3 of full scale.

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45-11367-01 PDR

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Date... 4/17/85
Log... April 2nd
By... Brown
Orig. To...
Action Compl. 4/2/85

RIT case

FEE EXEMPT

18881

tl survey report

Baldwin Farmer Electrometer, Type 2502/3, Serial Number 320, and Baldwin Farmer 0.6 cc chamber, Type 2505/3, Serial Number 1931, last calibrated on January 16, 1984 by the National Bureau of Standards.

Teletherapy Unit: AECL Theratron 80
Serial Number 146

Teletherapy Source: Neutron Products, Inc.
Model Number NPI-20-8000W
Serial Number T-754
7850 curies of cobalt-60 as of March 14, 1985

Source Output: Measured 137 RMM on March 14, 1985

Teletherapy Head Survey: (See Figure F-1)

Maximum radiation level 4.4 mR/hr
Average Radiation level 1.9 mR/hr

Beam Orientation Limits: The cobalt unit has a primary beam stopper and electrical interlocks that prevent operation unless the head swivel is less than 4 degrees. This prevents the unit from operating unless the beam is intercepted by the beam stopper.

Angle Orientation: 0 degrees is vertical toward the floor, 90 degrees is horizontal toward the south wall, 180 degrees is vertical toward the ceiling and 270 degrees is horizontal toward the north wall (See Figure 2 & 3).

Measurements of Radiation Levels: A 30 cm x 30 cm water phantom was placed at an 80 cm source tophantom distance. The field size was the maximum permitted by the collimators and the radiation levels in areas surrounding the cobalt room were obtained by direct measurement. As a result the measurements indicate the total leakage and scattered radiation levels. As stated above the primary beam was always intercepted by the beam stopper. Each radiation measurement was obtained with a beam orientation that resulted in the maximum reading at that location.

LOCATION	MEASURED	MAXIMUM RADIATION	MAXIMUM RADIATION
	MAXIMUM RADIATION LEVEL (mR/hr)	LEVEL IN ANY ONE HOUR (mR)	LEVEL IN ANY SEVEN CONSECUTIVE DAYS (mR)
J	0.05	0.01	0.4
K	0.05	0.01	0.4
L	0.05	0.01	0.4
M	0.05	0.01	0.4
N	0.05	0.01	0.4
O	0.05	0.01	0.4
P	0.05	0.01	0.4
Q(Atrium)	14 (330°Angulation)	1.78	71
R	0.05	0.01	0.4

The measured dose rate at a distance of 80 centimeters was 200 - 225 rads per minute, depending on the field size. Assuming a maximum of 4 patients in any one hour and a maximum dose per patient of 400 rads, the maximum machine "On" time in any one hour was estimated to be 7.6 minutes (0.13 hr.) The Radiation Oncology Division operates 8 hours per day and 5 days each week. The maximum radiation levels expected in any one hour and the maximum radiation level expected in any 7 consecutive days are based on these beam "On" times.

Figures 2 and 3 show the layout of the cobalt room and surrounding areas. This room is underground and has nothing located below it or beyond the north wall. The west wall is a barrier between the cobalt room and an adjacent linear accelerator treatment room. Behind the south wall is a control area and oncology staff work area. Beyond the east wall is a Cardiac Catheterization Laboratory. The ceiling of the cobalt room is covered with 3 feet of soil and a garden of shrubs and bushes designed to keep people away from the roof of the cobalt room and the atrium. A walkway is located above the ceiling level of the cobalt room and runs along the north wall.

Teletherapy Treatment Room Door Interlock: With the primary beam on the door to the room was opened slightly. The primary beam was turned off automatically by the door interlock when the door was ajar by approximately 4 centimeters. Primary beam condition was determined with an in-beam monitor as well as the area monitor in the room. The beam could not be restarted until the door was closed and the on/off control was reset at the control panel.

Teletherapy "On-Off" Indicators: The teletherapy unit was put into the "Beam On" condition with the room door closed. The presence of radiation was indicated by a red warning light on the unit control and by a red area monitor light on the wall above the control console. In addition, when the room door was quickly opened, it was observed that the meter and warning light of the area monitor within the therapy room reflected the presence of radiation. The test was repeated using the emergency battery pack by disconnecting the 120 volt power to the area monitor. The monitor functioned, as before, indicating the presence of radiation when the teletherapy unit was in the "Beam On" condition.

Electrical Stops: The unit has a primary beam stopper and an electrical interlock that prevents operation unless the head swivel is less than 4 degrees. During testing, the head swivel was set at 4.5 degrees in the clockwise direction and an attempt was made to turn the unit on. The source would not move to the "ON" position as indicated by the warning light on the control panel and the area monitor light outside the room. The head swivel was then set at 4.5 degrees in the counter clockwise direction and the test repeated. Again, the unit would not turn on. When the angle of swivel was reduced to less than 4 degrees in both the clockwise and counter clockwise directions, the unit would function properly when turned on.

Teletherapy Treatment Timing Device: The cobalt unit timer was compared against an electronic timer for a set time of 1.0 minute and showed a difference of less than 0.2 seconds. At the end of the one minute period the cobalt source promptly returned to "Off" position as indicated by the warning light on the control panel and the area monitor light outside the room. The reset button was then pressed and an attempt was made to turn the unit "On" without resetting the timer. It was not possible to keep the timer switch in the "On" position as it was spring loaded and returned to the "Off" position as soon as it was released. When the timer was reset again, it was possible to operate the unit normally and the source promptly moved into the "On" position.

Source Removed: Source removed on March 14, 1985
Neutron Products, Inc.
22301 Mt. Ephraim Rd.
P O Box 68
Dickerson, MD 20842
License # MD-31-025-03

Emergency Off Control: The emergency off control at the control panel terminated the teletherapy exposure immediately. The beam could not be restarted until the On-Off control was reset at the control panel.

Patient Communication System: The patient viewing system (TV Camera and Monitor) and the audio communication system functioned properly.

Radiation Sign: A "Caution - High Radiation Area" sign is posted on the entrance door.

Emergency Source Push Bar: An emergency source push bar is located at the control panel at all times.

Emergency Instructions: Emergency instructions are clearly posted on the wall directly above the control panel.

I hope this teletherapy survey report provides all needed information. Please feel free to contact Mr. Gilbert, Radiation Safety Officer, at (804) 281-8251 if you have any questions or require additional information.

Sincerely yours,

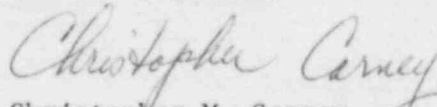

Christopher M. Carney,
Vice President of Operations

Figure F-1 TELETHERAPY HEAD SURVEY

(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	1.5
2	1.7
3	3.8
4	0.3

View B	
5	4.4
6	4.2
7	0.2
8	0.1

View C	
9	1.1
10	1.3

View D	
11	0.1
12	0.2
13	4.4
14	4.4

Average value 1.9

Maximum value 4.4

Date of survey 3/14/85

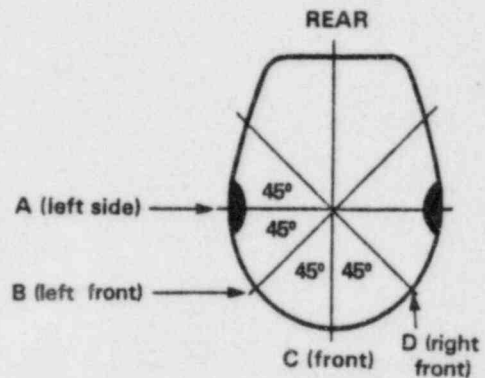
Instrument used Victoreen
471 RF

Manufacturer's name & model number
of teletherapy source Neutron Products, Inc.
NPI-20-8000W

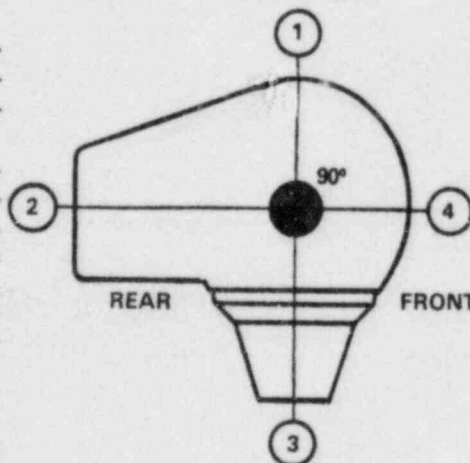
Date of installation 3/14/85

OUTPUT 137 ☐ RHM
☒ RMM

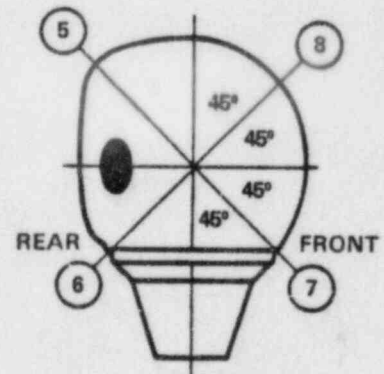
Date of output
measurement 3/14/85



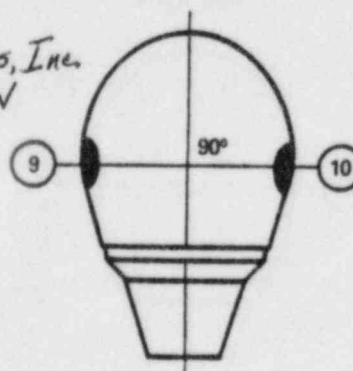
View A-Vertical
from left side



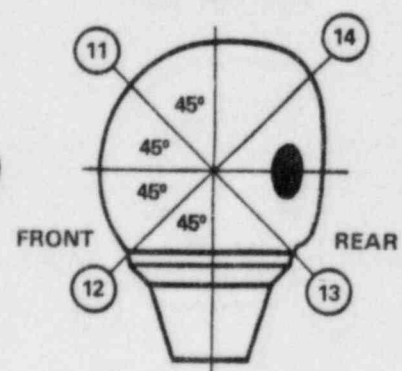
View B-Vertical
from left front



View C-Vertical
from front



View D-Vertical
from right front



[illegible]
$$14'' = 1' - 0''$$

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ST. MARYS HOSP
RICHMOND VA.

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☒ OTHER Region II

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TELETHERAPY SOURCE TRANSFER

This is to certify that a cobalt-60 source:

Model Number: NPI-20-8000W
Serial Number: T-754
Containing 7850 curies as of 3/14/85

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 80
Serial Number: 146

This source is hereby transferred from Neutron Products' Radioactive Materials License MD-31-025-03 to St. Mary's Hospital's Radioactive Materials License #45-11367-01.

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

Model Number: NPI-20-8000W
Serial Number: T-419
Containing 4140 curies as of 3/14/85

has been determined by a wipe test to be leak free and has been removed from the above teletherapy unit and transferred from St. Mary's Hospital's Radioactive Materials License #45-11367-01 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.

Marcus A. Gilbert

Date 3/14/85

John
Neutron Products, Inc.

Date 3.14.85

NEUTRON PRODUCTS inc

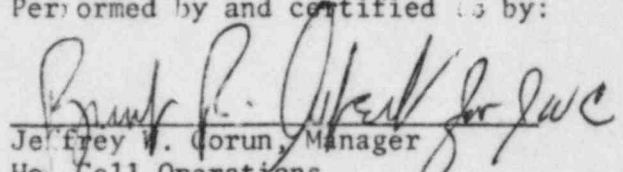
TELETHERAPY SOURCE CERTIFICATION

This certifies that the cobalt-60 source:


Model Number **NPI-20-8000W**
Serial Number: **T-754**
Containing **7850** curies as of **3/14/85**

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 3/12/85. The source was wipe tested and the removable activity was .48 and .0009 microcuries from the inner and outer encapsulations, respectively.

Performed by and certified as by:


Jeffrey W. Gorun, Manager
Hot Cell Operations

Reviewed and approved by:


Marvin M. Turkanis
Vice President

Date 3/13/85

NEUTRON PRODUCTS inc

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

This is to certify that the Atomic Energy of Canada, Ltd. (AECL)
teletherapy unit, Model Theratron 80, Serial Number 146
located at St. Mary's Hospital, 5801 Bremon Avenue, Richmond,
Virginia, 23226 was inspected and serviced on
3.14.85 by Russ Brown to assure
the proper function of the source exposure mechanism as authorized
by Maryland License MD-31-025-03.

Signed RHou Date 3.14.85

Parts: Ident pin in source coupling
Teflon guides on micro-switch starter bar
Light conductor tapes.

Nonstandard Service: _____

Facility Address:

Revision Date
July 25, 1983

St. Mary's Hospital
5801 Bremon Avenue
Richmond, VA 23226

INSPECTION CHECK LIST

Unit: AECL Th-80 Serial Number: 146

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	X
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	X
18. Teletherapy Units with Rotating Shutter	X	X
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: [Signature]

Date: 3/14/85

NEUTRON PRODUCTS inc

13881

MATERIALS DATA INPUT - INDUSTRIAL, MEDICAL, SOURCE/SPECIAL NUCLEAR

A. TYPE OF ACTION AND IDENTIFICATION CODES

A. TYPE OF ACTION						DOCKET NUMBER	MAIL CONTROL NUMBER	CHANGE NAME ADDRESS ("X" box)
NEW LICENSE	<input type="checkbox"/>	AMENDMENT TO RENEW LICENSE	<input type="checkbox"/>	AMENDMENT TO TERMINATE	<input type="checkbox"/>	VOID		
NEW LICENSE AND NEW LICENSEE	<input checked="" type="checkbox"/>	OTHER AMENDMENT	<input type="checkbox"/>	CLERICAL CHANGE NO AMENDMENT	<input type="checkbox"/>	4	030-00522	01881 50555

B. INDICATIVE INFORMATION

INDIVIDUAL LICENSEES	NAME (Last, First, Middle)		NAME (Last, First, Middle)		NAME (Last, First, Middle)		NAME (Last, First, Middle)	
	NAME (Last, First, Middle)		NAME (Last, First, Middle)		NAME (Last, First, Middle)		NAME (Last, First, Middle)	
	NAME (Last, First, Middle)		NAME (Last, First, Middle)		NAME (Last, First, Middle)		NAME (Last, First, Middle)	
ORGANIZATION	ORGANIZATION		ORGANIZATION		ORGANIZATION		ORGANIZATION	
LICENSEES	LICENSEES		LICENSEES		LICENSEES		LICENSEES	
ADDRESS	ADDRESS		ADDRESS		ADDRESS		ADDRESS	
TYPE OF APPLICANT	TYPE OF APPLICANT		TYPE OF APPLICANT		TYPE OF APPLICANT		TYPE OF APPLICANT	
	TYPE OF APPLICANT		TYPE OF APPLICANT		TYPE OF APPLICANT		TYPE OF APPLICANT	
DATE REQUEST RECEIVED		DATE REQUEST RECEIVED		DATE REQUEST RECEIVED		DATE REQUEST RECEIVED		
INSTITUTION CODE		INSTITUTION CODE		INSTITUTION CODE		INSTITUTION CODE		
PENDING PROG CODE		PENDING PROG CODE		PENDING PROG CODE		PENDING PROG CODE		
ACTUAL PROG CODE		ACTUAL PROG CODE		ACTUAL PROG CODE		ACTUAL PROG CODE		
SECONDARY PROGRAM CODES (As required)		SECONDARY PROGRAM CODES (As required)		SECONDARY PROGRAM CODES (As required)		SECONDARY PROGRAM CODES (As required)		
#1		#2		#3		#4		
#5		#6		#7		#8		
LICENSE NUMBER		LICENSE NUMBER		LICENSE NUMBER		LICENSE NUMBER		
EXPIRATION DATE		EXPIRATION DATE		EXPIRATION DATE		EXPIRATION DATE		

C. STATISTICAL INFORMATION

MEDICAL CATEGORY	FOR HUMAN USE ONLY	FOR HUMAN AND NONHUMAN USE	FOR NONHUMAN USE ONLY
------------------	--------------------	----------------------------	-----------------------

POSSESSION OF THE MATERIAL IS AUTHORIZED IN ONE OF THE FOLLOWING AREAS

AND/OR IN THE STATE(S), TERRI- TORIES/IS- LANDS/ COUNTRY CHECKED (At right)	SAME AS STATE IN ADDRESS		ALL STATES		ALL NON AGREEMENT STATES	
		AL ALABAMA	GA GEORGIA	MD MARYLAND	NJ NEW JERSEY	SC SOUTH CAROLINA
	AK ALASKA	HI HAWAII	MA MASSACHUSETTS	NM NEW MEXICO	SD SOUTH DAKOTA	
	AZ ARIZONA	ID IDAHO	MI MICHIGAN	NY NEW YORK	TN TENNESSEE	AS AMERICAN SAMOA
	AR ARKANSAS	IL ILLINOIS	MN MINNESOTA	NC NORTH CAROLINA	TX TEXAS	CZ CANAL ZONE
	CA CALIFORNIA	IN INDIANA	MS MISSISSIPPI	ND NORTH DAKOTA	UT UTAH	GU GUAM
	CO COLORADO	IA IOWA	MO MISSOURI	OH OHIO	VT VERMONT	PR PUERTO RICO
	CT CONNECTICUT	KS KANSAS	MT MONTANA	OK OKLAHOMA	VA VIRGINIA	VI VIRGIN ISLANDS
	DE DELAWARE	KY KENTUCKY	NE NEBRASKA	OR OREGON	WA WASHINGTON	
	DC WASHINGTON, DC	LA LOUISIANA	NV NEVADA	PA PENNSYLVANIA	WV WEST VIRGINIA	CA CANADA
	FL FLORIDA	ME MAINE	NH NEW HAMPSHIRE	RI RHODE ISLAND	WI WISCONSIN	

D. POSSESSION LIMITS OF SOURCE AND SPECIAL NUCLEAR MATERIALS AND TRITIUM

SOURCE MATERIAL CEILING				G - GRAMS Kg - KILOGRAMS				SNM CEILING				G - GRAMS Kg - KILOGRAMS				IF FOR POWER REACTOR ("X" here)			
MATERIAL	AMOUNT	UNIT	CONFIG	ENRICH.	MATERIAL	AMOUNT	UNIT	CONFIG	ENRICH.										
U5 U235		G	S	.			G	S	.										
		Kg	UNS	.			Kg	UNS	.										
		G	S	.			G	S	.										
U3 U233		Kg	UNS	.			Kg	UNS	.										
		G	S	.			G	S	.										
PU-Plutonium		Kg	UNS	.			Kg	UNS	.										
		G	S	.			G	S	.										
UR-Uranium		Kg	UNS	.			Kg	UNS	.										
		G	S	.			G	S	.										
TH-Thorium		Kg	UNS	.			Kg	UNS	.										
		G	S	.			G	S	.										
H3 Tritium		Kg	UNS	.			Kg	UNS	.										
		G	S	.			G	S	.										
				RIS CODES															