THE MEDICAL CENTER OF DELAWARE

ADDRESS REPLY TO:

DEPARTMENT OF RADIATION THERAPY

CARLO A. CUCCIA, M.D., F.A.C.R.
EKKEHARD S. SCHUBERT, M.D.
DONALD C. TILTON, D.O.
VIROON DONAVANIK, M.D.

DIPLOMATES
AMERICAN BOARD OF RADIOLOGY

EDWARD TORVIK, Sc.D.
JOSEPH A. ROSE, B.S.E.E.

February 28, 1985

Ms. Jenny Johansen
Nuclear Materials Section B
U. S. Nuclear Regulatory Commission
Region 1
631 Park Avenue
King of Prussia, PA 19406

Re: License # 07-12153-03

Dear Ms. Johansen:

Enclosed please find copies of radiation survey and calibration reports on the equipment recently installed in the Department of Radiation Therapy - Christiana Hospital.

The following equipment changes have been made since we submitted our amendment application:

I. The beam-on monitor has been replaced with a Eberline Source Position Indicator, Model SPI-2 for all teletherapy rooms.

In our amendment application we stated that the functional status of the monitor would be determined using 10 microCurie source. The Eberline equipment was not sensitive enough to respond to the 10 microCurie source. The functional status of the Eberline monitors is determined by the technologist at the start of each treatment day by turning the teletherapy on (source in "ON" position) and observing on the TV monitor the response of indicating lights on Eberline monitor.

II. Our teletherapy system has been replaced by the following units:

1. Keithley Electrometer Model 602 Serial #191720
2. Data Precision Digital Multimeter Model 22, Serial #2600

CHRISTIANA HOSPITAL
4755 OGLETOWN-STANTON ROAD
P.O. BOX 6001
NEWARK, DELAWARE 19718

Ms. Jenny Johansen (cont'd)

3. PTW Chamber Model N23333 (Nuclear Associates Model 30-352 (0.6 ml, acrylic) Serial # A325

4. Acrylic Buildup Cap # A325

This system was calibrated by:

The CNMC Company
Radiological Services Division
7029 W. 42nd Avenue
P.O.Box 50118
Amarillo, TX 79159-0118

Calibration date is March 23, 1984.

Yours truly,

Edward Torvik

Edward Torvik, Sc.D.,Physicist

ET/el

RADIATION SURVEY AND CALIBRATION

MEDICAL CENTER OF DELAWARE, INC.

CHRISTIANA HOSPITAL

4755 Ogletown-Stanton Road

P.O. Box 6001

Newark, Delaware 19718

ELDORADO - 78

Serial No. 10

Edward Torvik, Sc.D., Physicist

February 26, 1985

RADIATION SURVEY AND CALIBRATION

THE MEDICAL CENTER OF DELAWARE, INC.

CHRISTIANA HOSPITAL

4755 Ogletown-Stanton Road

Newark, Delaware 19718

ELDORADO - 78

A. This is a report of the head protection survey with the beam "OFF", room protection with the beam "ON", and the direct primary beam calibration of the Atomic Energy of Canada Limited, Eldorado-78, Cobalt-60 unit. This unit has 2880 Curie Cobalt-60 source. This source was installed February 7, 1985 at the Christiana Hospital, Newark, Delaware. Authorization for this Cobalt-60 source was granted by the USNRC in source license #07-12153-03, Amendment No. 2.

1. SURVEY OF SOURCE HEAD, BEAM "OFF"

   A survey of the source housing was made with the beam "OFF" on a sphere one meter from the source. The 17 data points were used to compute maximum and average exposure rates. The results are tabulated in Table 1. The measured maximum and average exposure rates are less than 10 mR/hr and 2 mR/hr respectively.

2. ROOM PROTECION SURVEY, BEAM "ON"

   A radiation protection survey of the areas adjacent to the Eldorado-78 room was performed, using an Eberline-530 survey meter calibrated January 3, 1985. All readings were taken with the collimator fully opened and a plastic phantom placed in the primary beam. Average beam "ON" time for any span of 1 hour is estimated to be 20 minutes. Maximum beam "ON" time is estimated to be 10 hours per week with the beam directed vertically downward 90% of the time, and towards the outside wall the other 10% of the time. The average weekly exposure for each wall enclosing the unit are tabulated in Table 2. These figures were calculated by adding together the maximum dose rate at each wall with the beam in the vertical position, multiplied by 9.0 hours, and the maximum dose rate with the beam in the horizontal position multiplied by 1.0 hours.

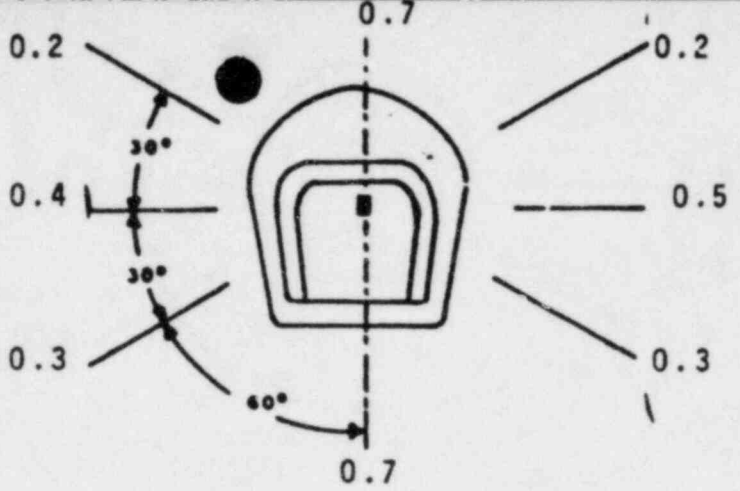
TABLE 1

Teletherapy Unit

Manufacturer: AECL

Model No: ELDORADO-78

Serial No: 10



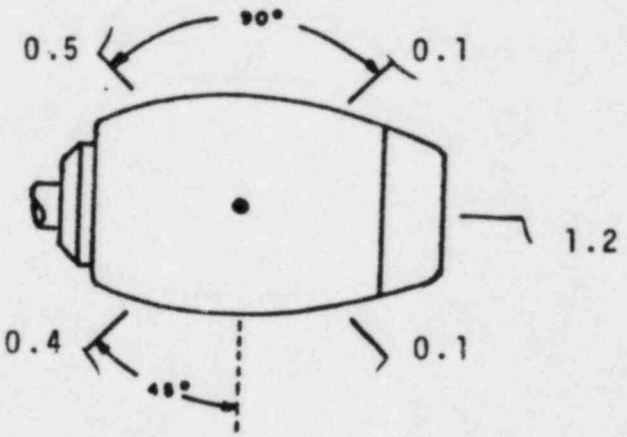
Source Data

Manufacturer: Neutron Products

Model No: NPI-20-9000W

Serial No: T-200

Activity: 2880 Ci on 1/1/85



Survey Meter

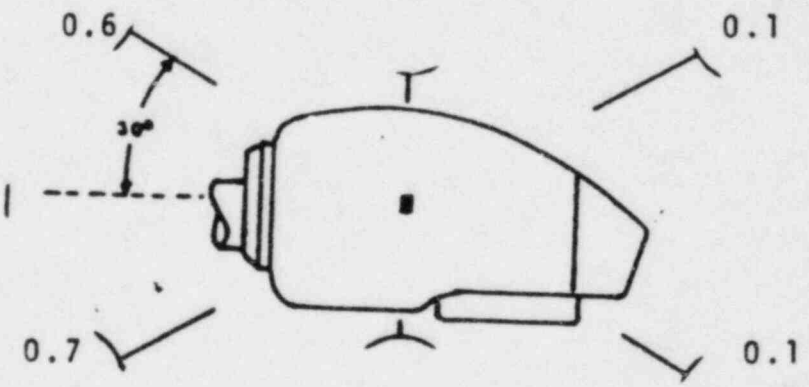
Manufacturer: Eberline

Model No: PIC-3

Serial No: 235

Calibration Date: January 3, 1985

Listed values are in mR/hr at one meter



Average Exposure 0.4

Maximum Exposure 1.2

CHRISTIANA HOSPITAL

Teletherapy Head

Radiation Survey Report - Beam OFF

TABLE 2

ELDORADO - 78

RADIATION PROTECION SURVEY

Maximum Field Size at 80 cm.

Plastic Phantom

Location	Primary Beam Directed Down (mR/hr)	Primary Beam Directed Toward Outside Wall (mR/hr)	Average Weekly Exposure
Entrance Door	0.5	0.2	0.7
Control Wall	0.3	0.1	0.4
Exam. Wall	0.3	0.1	0.4
High Energy Wall	0.0	0	0
Outside (Scatter only)	0.3	0.1	0.4
Outside	0.3	0.1	0.4
Roof	0.3	0.1	0.4

The listed readings are the maximum exposure rate for that location in mR/hr.

Exposure Condition

Plastic Phantom in Primary Beam= W = 25 Cm
L = 25 cm
H = 20 cm

Maximum Field Size

Source Phantom Distance 80 cm

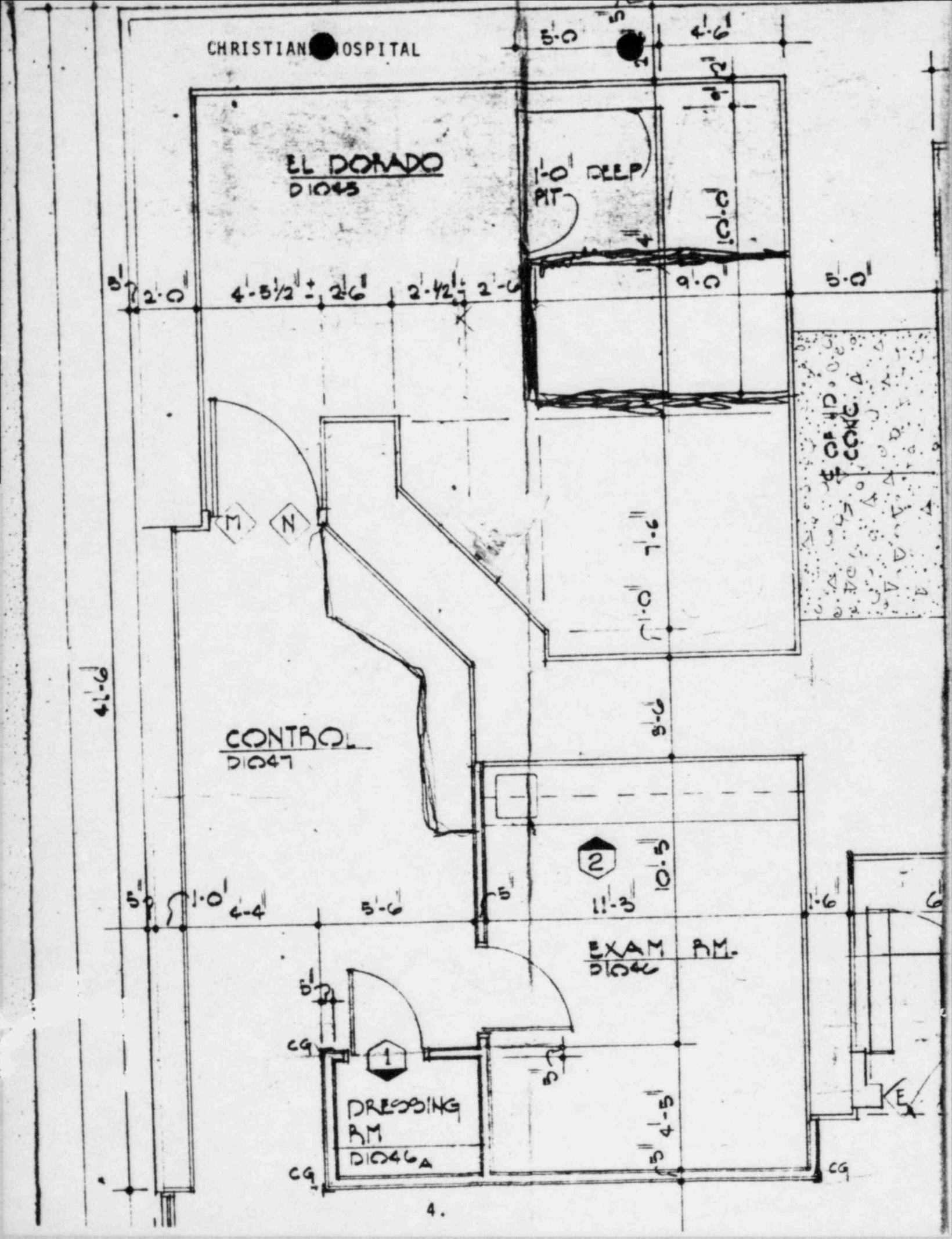
Survey Instrument

Mfg: Eberline

Model No. E-530

Serial No. 457

Calibration Date: Jan.3, 1985


CHRISTIAN HOSPITAL
EL DORADO
D1045
1'-0" DEEP PIT
CONC.
CONC.
CONTROL
D1047
EXAM RM.
D1046
DRESSING RM
D1046A
M
N
1
2
E
CG
CG
CG

3. SAFETY DEVICES

A. Signal lights on the control panel and on the source head support arm indicate the source "OFF" (green) and the source "ON" (red) position. A light over the entrance door indicates source "ON" condition. All these lights operate normally.

B. A door interlock switch turns the source "OFF" if the treatment room door is opened. The source remains in the "OFF" position until the door to the treatment room is closed and control panel reset button pushed.

C. The emergency procedure to be followed when the source fails to move into the "OFF" position is displayed at the console. See APPENDIX 1.

D. A sign with the radiation symbol and the wording "CAUTION HIGH RADIATION AREA" is posted on the treatment room door.

E. A sign bearing the conventional radiation symbol and the words

CAUTION
RADIOACTIVE MATERIALS
COBALT-60 8730 CURIES
8/1/76
Cat.No. NPI 20 9000W
Serial No. T-200

is placed on the unit.

F. Mercury cutout switches allow the primary beam to be directed no more than 37°(degrees) from the vertical position towards the exam wall and no more than 102° (degrees) from the vertical towards the outside wall.

G. Emergency off switches, which de-energize the entire unit, are located on the unit's mainframe, hand control, and console. All these switches operate normally.

H. A wall mounted radiation monitor (with back up power supply) which flashes red whenever the source is "ON" is secured to the treatment room wall.

I. Exposure Timer

The accuracy of the exposure timer was measured and found to be in error by 0.027 minutes. That is, exposure time must be reduced by 0.027 minutes.

J. Back-up LED Elapsed Timer has been installed on the control panel of this teletherapy unit.

K. The five year Inspection Certificate and Teletherapy Transfer Form have been completed and can be found in APPENDIX B. The Teletherapy Transfer Form indicates that source has been wipe tested and found to be leak free.

L. The depleted Uranium wipes have been performed and the swabs sent to ICN Pharmaceuticals for analysis. The results have not yet been received.

4. Beam Intensity

The intensity of the primary beam was measured on February 8, 1985 using system calibrated by CNMC Company on March 23, 1984. The measurements were made at a depth of 5 centimeters in a water phantom. The field defining collimators were set for a 10cm x 10cm field at 70 centimeters. The measured dose rate was then adjusted to a depth of 70.5 centimeters.

Dose Rate = 91.68 rads/min at 70.5 cm. for a 10cm x 10cm field at a source distance of 70 cm.

APPENDIX 1

APPENDIX 2

IMPORTANT

AECL MODELS 76, 78, 765, 780, AND 780 ETS TELETHERAPY UNITS

IF THE DRAWER FAILS TO CLOSE, PROCEED AS FOLLOWS:

1. Remove the patient from the treatment room.

   A. If the patient is ambulatory, instruct him to get off the table and leave the room.

   B. If the patient is not ambulatory:

      I. Enter the treatment room (avoid exposure to the useful beam)

      2. Disconnect wheel locks on treatment table, and

      3. Push treatment table from the room.

2. Close the door and secure the room against unauthorized entry.

3. Notify the following individuals:

Chief Technician:	Elizabeth T. Klein
Physicians:	Carlo A. Cuccia, M.D. Ekkehard S.Schubert, M.D. Donald C. Tilton, D.O. Viroon Donavanik, M.D.
Radiation Safety Office:	733-1453

4. All remedial action to be taken will be under the supervision of Radiation Safety Office Personnel.

APPENDIX 2

Therapy Services Incorporated

Five Year Inspection Certificate

This is to certify that the AECL Cobalt-60 teletherapy unit, Model No. ELDORADO 78 Serial No. 10 located at MEDICAL CENTER OF DELAWARE NEWARK, DELAWARE was inspected and serviced on FEBRUARY 7, 1985 by JERRY L. FOGLE to assure the proper function of the source drive mechanism as authorized by Maryland Radioactive Materials License Number MD-21-009-01.

Signed Jerry L. Fogle Date 2-7-85

Parts Used _____

Recommendations for future service _____

I further certify, that Therapy Services Incorporated, Source Drive Mechanism Servicing Procedure 1001 or 1002 was followed.

Signed Jerry L Fogle Date 2-7-85

TSI Form 103

Teletherapy Transfer Form

This is to certify that the following Cobalt-60 teletherapy source:

Manufacturer NEUTRON PRODUCTS INC.
Model Number NPI-20-9000W
Serial Number T-200

containing 2880 curies as of 1-1-85 has been wipe tested and found to be leak free; has been ~~removed from~~ INSTALLED IN the following teletherapy unit:

Manufacturer AECL
Model Number ELDORADO 78
Serial Number 10

located at CHRISTIANA HOSPITAL
4755 OGLETOWN-STANTON RD.
NEWARK, DELAWARE 19805

and is hereby transferred from ALPHA-OMEGA SERVICES, INC., PARAMOUNT, CALIFORNIA Radioactive Materials License Number 2641-70 to MEDICAL CENTER OF DELAWARE NRC-Radioactive Materials License Number 07-12153-03.

Signed Jerry C. Fogle Elizabeth T. Klein
Date 2-7-85 2-7-85
Company/Institution ALPHA-OMEGA SERVICES, INC. Medical Center of Delaware

Teletherapy Transfer Form

This is to certify that the following Cobalt-60 teletherapy source:

Manufacturer NEUTRON PRODUCTS INC.

Model Number NPI-20-9000W

Serial Number T-200

containing 2880 curies as of 1-1-85 has been wipe tested and found to be leak free; has been removed from the following teletherapy unit:

Manufacturer AECL.

Model Number ELDORADO 78

Serial Number 10

located at WILMINGTON MEDICAL CENTER
CHESTNUT + BROOM STREETS
WILMINGTON, DELAWARE 19805

and is hereby transferred from WILMINGTON MEDICAL CENTER, WILMINGTON, DEL. NRC - Radioactive Materials License Number 07-12153-03 to

ALPHA-OMEGA SERVICES, INC., PARAMOUNT, CA.

Radioactive Materials License Number 2641-70 .

Signed Jerry L. Fogle Elizabeth S Klein

Date 2-5-85 2-7-85

Company/
Institution ALPHA-OMEGA SERVICES, INC. Medical Center of Delaware

RADIATION SURVEY AND CALIBRATION

MEDICAL CENTER OF DELAWARE, INC.

CHRISTIANA HOSPITAL

4755 Ogletown-Stanton Road

P.O. Box 6001

Newark, Delaware 19718

THERATRON-80

Serial No. T 438

Edward Torvik

Edward Torvik, Sc.D., Physicist

February 26, 1985

THERATRON-80 TELETHERAPY UNIT

This report covers the source housing protection survey with the beam "OFF", room protection survey with the beam "ON" and direct primary beam calibration of the AECL, Theratron-80, Cobalt-60 teletherapy unit. This Cobalt-60 source was installed January 29, 1985 by Therapy Services Inc. at the Christiana Hospital, a Division of the Medical Center of Delaware. Authorization for this Cobalt-60 source was granted by the USNRC in license #07-12153-03, Amendment No. 02.

Survey of Source Head, Beam "OFF":

A survey of the source housing was made with the source in the "OFF" position on a sphere one meter from the source. All 17 data points were used to compute maximum and average exposure rates. The results are tabulated on Table 1. The measured maximum and average exposure rates are less than 10 mR/hr and 2 mR/hr.

Room Protection Survey, Beam "ON"

The radiation protection survey was made of the areas adjacent to the Theratron-80 room. A survey meter was used to measure dose rate values for radiation transmitted through protective walls and ceiling of the treatment room. All survey meter readings were made with the collimator wide open, plastic phantom in primary beam at a distance of 80 centimeters from the source. The maximum instrument readings for 0, 90, 180, and 270 degrees with beam stopper in primary beam and weekly exposure doses are tabulated in Table 2.

From the data in Table 2, it can be concluded that the shielding around the Theratron-80 unit more than meets the requirements of Title 10, Part 20, Code of Federal Regulations, Chapter I, Standards for Protection Against Radiation.

The weekly exposure was calculated using the following assumptions:

1. Beam "ON TIME" would be 10 hours per week
2. The primary beam would be directed at the various locations for the following times during the week:

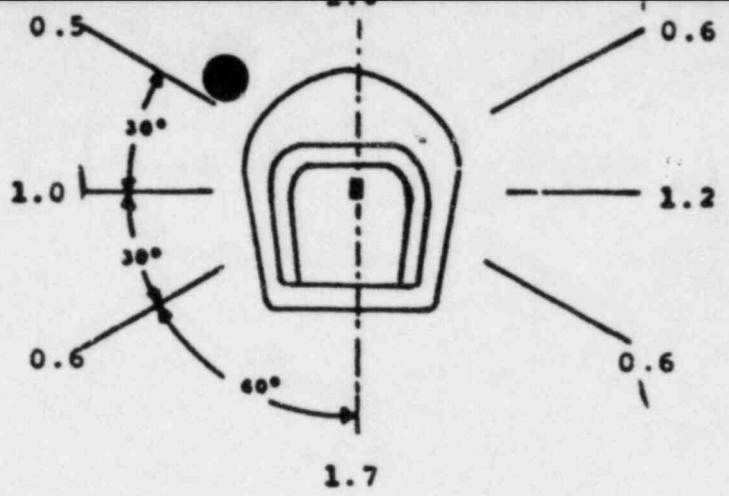
Beam Angle	Hours per week	Location
0°	10 hrs	Floor
90°	2.5 hrs	Outside wall
180°	1.3 hrs	Ceiling
270°	2.5 hrs	Corridor wall

Teletherapy Unit

Manufacturer: AECL

Model No: Theratron-80

Serial No: 267



Source Data

Manufacturer: Neutron Products

Model No: NPI-20-9000W

Serial No: T-438

Activity: 4786 Ci on 1/1/85

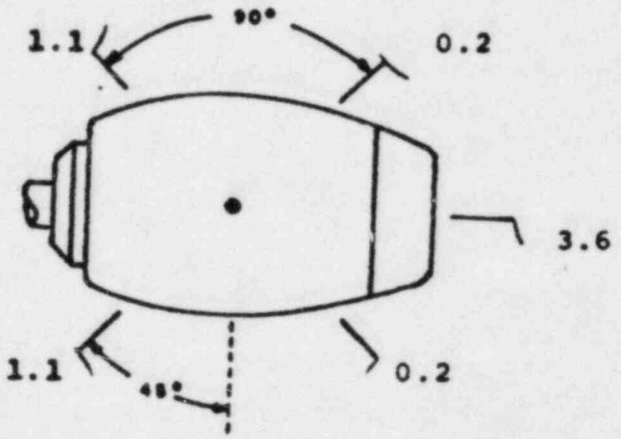
Survey Meter

Manufacturer: Eberline

Model No: PIC-3

Serial No: 135

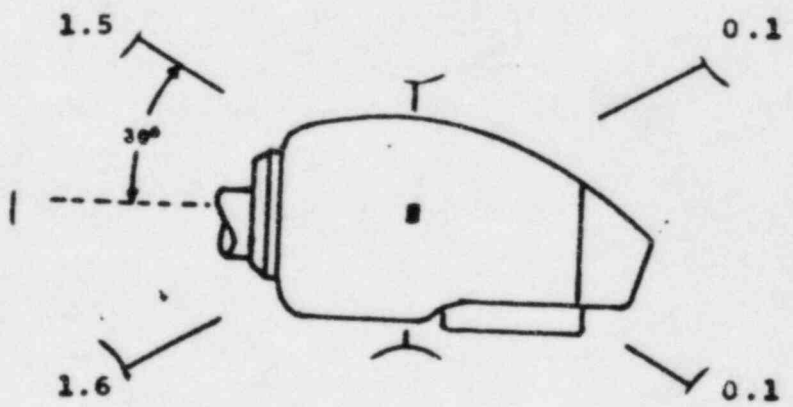
Calibration Date: Jan. 3, 1985



Listed values are in mR/hr at one meter

Average Exposure 0.8

Maximum Exposure 3.6



CHRISTIANA HOSPITAL

Teletherapy Head

Radiation Survey Report - Beam OFF

TABLE 2

THERATRON - 80
RADIATION PROTECTION SURVEY

Location \ Beam Angle	Exposure Rate 0° mR/hr	90° mR/hr	180° mR/hr	270° mR/hr	Calculated Weekly Exposure 0° mR/wk	90° mR/wk	180° mR/wk	270° mR/wk		Total Weekly Dose mR/wk
Entrance Door	<.03	<.03	<.03	<.03	0.3	0.1	0.1	0.1		1.0
Control Wall	"	"	"	"	"	"	"	"		"
Corridor Wall	"	"	"	"	"	"	"	"		"
Maxitron Wall	"	"	"	"	"	"	"	"		"
Clinac-4 Wall	"	"	"	"	"	"	"	"		"
Rear Wall	"	"	"	"	"	"	"	"		"
Roof	"	"	"	"	"	"	"	"		"

Exposure Condition

Plastic Phantom in Primary Beam = W = 25 cm
L = 25 cm
H = 20 cm

Maximum Field Size

Source Phantom Distance 80 cm.

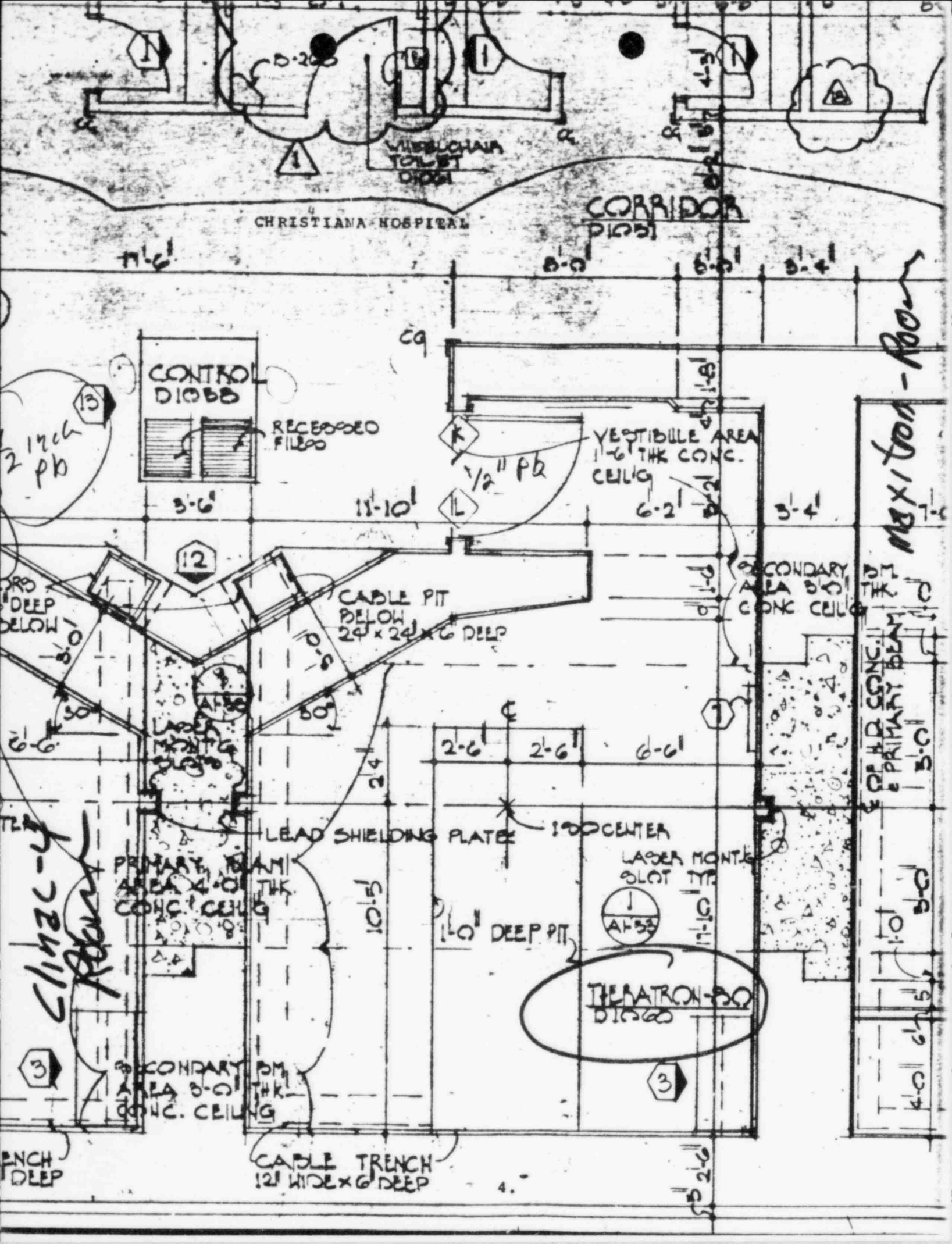
Survey Instrument

Mfg: Eberline

Model No. E-530

Serial No. 457

Calibration Date: Jan. 3, 1985


CHRISTIANA HOSPITAL
CORRIDOR
D1051
WHEELCHAIR TOILET D1054
CONTROL D1055
RECESSED FILES
VESTIBULE AREA 1'-6" THK CONC. CEILG
1/2" Pb
2 inch Pb
CABLE PIT BELOW 2'-4" x 2'-4" x 6" DEEP
SECONDARY BM AREA 3'-0" THK CONC CEILG
PRIMARY BEAM
LASER MNTG SLOT
LEAD SHIELDING PLATE
100 CENTER
PRIMARY BEAM AREA 4'-0" THK CONC CEILG
1'-0" DEEP PIT
THERATRON-80 D1056
SECONDARY BM AREA 3'-0" THK CONC. CEILG
CABLE TRENCH 12" WIDE x 6" DEEP
4.

Beam Intensity

The intensity of the primary beam was measured on January 31,1985 using system calibrated by CNMC Company on March 23, 1984. The measurements were made at a depth of 5 centimeters in a water phantom. The field defining collimators were set for a 10cm x 10cm field at 80 centimeters. The measured dose rate was then adjusted to a depth of 80.5 centimeters.

Dose Rate = 135.4 rads/min at 80.5 cm. for a 10cm x 10 cm field at a source distance of 80 cm.

The previous dose rate value corrected for physical decay yielded a value of 135.0 rads per minute at 0.5 cm depth in water for a field size of 10cm x 10cm at source distance of 80 cm.

Safety Devices Include the Following:

1. Signal lights on the control panel and on the source head support arm indicate the source "OFF" (green) and the source "ON" (red) position. A red light over the entrance door indicates source "ON" condition. All these lights operate normally.

2. A wall mounted radiation monitor (with back up power supply) which flashes red when the source is "ON" is secured to the treatment room wall.

3. A door interlock switch turns the source "OFF" if the treatment room door is opened. The source remains in the "OFF" position until the door to the treatment room is closed and control panel reset button pushed.

4. The emergency procedure to be followed when the source fails to move into the "OFF" position is displayed in APPENDIX A.

5. A sign with the radiation symbol and the wording "Caution, High Radiation Area" is posted on the treatment room door.

6. Mercury cutout switches allow the primary beam to be directed towards the walls and ceiling only when the beam stopper is interposed in the primary beam.

7. A sign bearing the conventional radiation symbol and the words:

7. (cont'd)

CAUTION
RADIOACTIVE MATERIALS
COBALT-60 8470 Curies
9/1/80
Cat. No. 20-9000W
Serial No. - T438

has been attached to the head of the Theratron-80 unit.

8. Exposure Timer

The accuracy of the exposure timer was measured and found to be in error by 0.027 minutes. That is, exposure time must be reduced by 0.027 minutes.

9. The five year Inspection Certificate and Teletherapy Transfer Form have been completed and can be found in APPENDIX B. The Teletherapy Transfer Form indicates that source has been wipe tested and found to be leak free.

10. The depleted Uranium wipes have been performed and the swabs sent to ICN Pharmaceuticals for analysis. The results have not yet been received.

APPENDIX A

APPENDIX B

APPENDIX "A"

IMPORTANT

A.E.C.L. MODELS 6, 8, 60 AND 80
TELETHERAPY UNITS

IF THE DRAWER FAILS TO CLOSE,

PROCEED AS FOLLOWS:

1. Remove the patient from the treatment room.

   A. If the patient is ambulatory, instruct him to get off the table and leave the room.

   B. If the patient is not ambulatory:

      1. Enter the treatment room (avoid exposure to the useful beam) and close field collimators to minimum field size.

      2. Rotate the treatment table so that patient is out of the useful treatment beam, and

      3. Transfer the patient to stretcher and remove from the room.

2. Close the door and secure the room against unauthorized entry.

3. Notify the following individuals:

   Chief Technician: E. Klein

   Physicians: Dr. C. Cuccia
   Dr. E. Schubert
   Dr. D. Tilton
   Dr. V. Donavanik

   Radiation Safety Office: 733-1453 or 1458

4. All remedial action to be taken will be under the supervision of Radiation Safety Office Personnel.

APPENDIX B

Therapy Services Incorporated

Five Year Inspection Certificate

This is to certify that the A.E.C.L. Cobalt-60 teletherapy unit, Model No. THERATRON 80 Serial No. 267 located at CHRISTIANA HOSPITAL, NEWARK, DELAWARE was inspected and serviced on JANUARY 29, 1985 by JERRY L. FOGLE to assure the proper function of the source drive mechanism as authorized by Maryland Radioactive Materials License Number MD-21-009-01.

Signed Jerry L. Fogle Date 1-29-85

Parts Used 2 - TEFLON GUIDES

Recommendations for future service

I further certify, that Therapy Services Incorporated, Source Drive Mechanism Servicing Procedure 1001 or 1002 was followed.

Signed Jerry L. Fogle Date 1-29-85

TSI Form 103

Teletherapy Transfer Form

This is to certify that the following Cobalt-60 teletherapy source:

Manufacturer NEUTRON PRODUCTS INC.

Model Number NPI-20-9000W

Serial Number T-438

containing 4786 curies as of 1-1-85 has been wipe tested and found to be leak free; has been ~~removed from~~ INSTALLED IN the following teletherapy unit:

Manufacturer AECL

Model Number THERATRON 80

Serial Number 267

located at CHRISTIANA HOSPITAL
4755 OGLETOWN-STANTON ROAD
NEWARK, DELAWARE 19718

and is hereby transferred from ALPHA-OMEGA SERVICES, INC.
PARAMOUNT, CALIFORNIA Radioactive Materials License Number 2641-70 to
CHRISTIANA HOSPITAL, NEWARK, DELAWARE - NRC Radioactive Materials License Number 07-12153-03.

Signed	Jerry C Foglo	Elizabeth J Klein
Date	1-29-85	1-30-85
Company/ Institution	ALPHA-OMEGA SERVICES, INC.	Med Center of Delaware

Teletherapy Transfer Form

This is to certify that the following Cobalt-60 teletherapy source:

Manufacturer NEUTRON PRODUCTS INC.

Model Number NPI-20-9000W

Serial Number T-438

containing 4786. curies as of 1-1-85 has been wipe tested and found to be leak free; has been removed from the following teletherapy unit:

Manufacturer AECL

Model Number THERATRON 80

Serial Number 267

located at WILMINGTON MEDICAL CENTER
CHESTNUT & BROOM STREETS
WILMINGTON, DELAWARE 19805

and is hereby transferred from WILMINGTON MEDICAL CENTER, WILMINGTON, DELAWARE, NRC Radioactive Materials License Number 07-12153-03 to

ALPHA-OMEGA SERVICES INC., PARAMOUNT, CA., CALIF.
Radioactive Materials License Number 2641-70.

Signed	Jerry L Fogle	Elizabeth T Klein
Date	1-25-85	1-30-85
Company/ Institution	ALPHA-OMEGA SERVICES, INC.	Med. Center of Delaware

RADIATION SURVEY AND CALIBRATION

MEDICAL CENTER OF DELAWARE, INC.

CHRISTIANA HOSPITAL
4755 Ogletown-Stanton Road
P.O. Box 6001
Newark, Delaware 19718

THERATRON-80
Serial No. 231

Edward Torvik

Edward Torvik, Sc.D., Physicist

February 26, 1985

THERATRON-80 TELETHERAPY UNIT

This report covers the source housing protection survey with the beam "OFF", room protection survey with the beam "ON", and direct primary beam calibration of the AECL, Theratron-80, Cobalt-60 teletherapy unit. This Cobalt-60 source was installed October 10, 1984 by AECL LTD at the Christiana Hospital, a Division of the Medical Center of Delaware. Authorization for this Cobalt-60 source was granted by the USNRC in license #07-12153-03, Amendment No. 03.

Survey of Source Head, Beam "OFF":

A survey of the source housing was made with the source in the "OFF" position on a sphere one meter from the source. All 17 data points were used to compute maximum and average exposure rates. The results are tabulated on Table 1. The measured maximum and average exposure rates are less than 10 mR/hr and 2 mR/hr.

Room Protection Survey, Beam "ON"

A radiation protection survey was made of the areas adjacent to the Theratron-80 room. A survey meter was used to measure dose rate values for radiation transmitted through protective walls and ceiling of the treatment room. All survey meter readings were made with the collimator wide open, water phantom in primary beam at a distance of 80 centimeters from the source. The maximum instrument readings for 0, 90, 180, and 270 degrees with beam stopper in primary beam and weekly exposure doses are tabulated in Table 2.

From the data in Table 2, it can be concluded that the shielding around the Theratron-80 unit more than meets the requirements of Title 10, Part 20, Code of Federal Regulations, Chapter I, Standards for Protection Against Radiation.

The weekly exposure was calculated using the following assumptions:

1. Beam "ON TIME" would be 10 hours per week
2. The primary beam would be directed at the various locations for the following times during the week:

Beam Angle	Hours per week	Location
0^{o}	10 hrs	Floor
90^{o}	2.5 hrs	Outside wall
180^{o}	1.3 hrs	Ceiling
270^{o}	2.5 hrs	Corridor wall

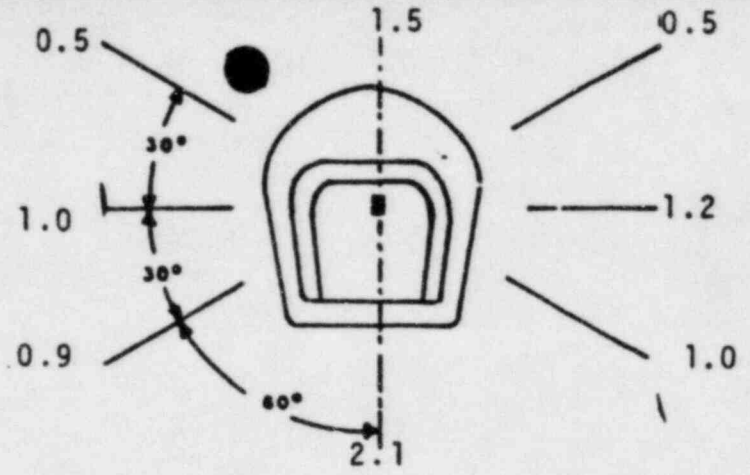
TABLE 1

Teletherapy Unit

Manufacturer: AECL

Model No: Theratron-80

Serial No. 234



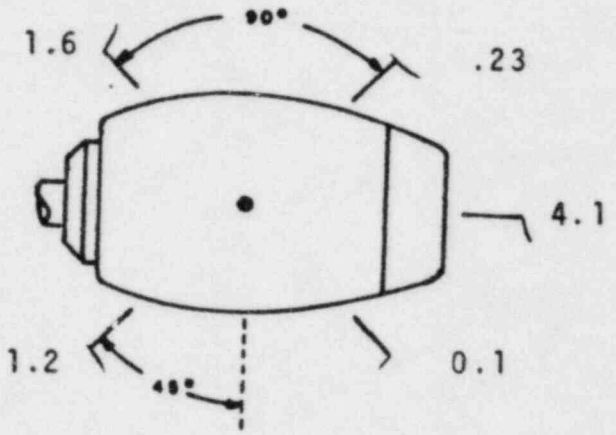
Source Data

Manufacturer: AECL

Model No: C-146

Serial No: S-3623

Activity: 5985 Ci on 1/1/85



Survey Meter

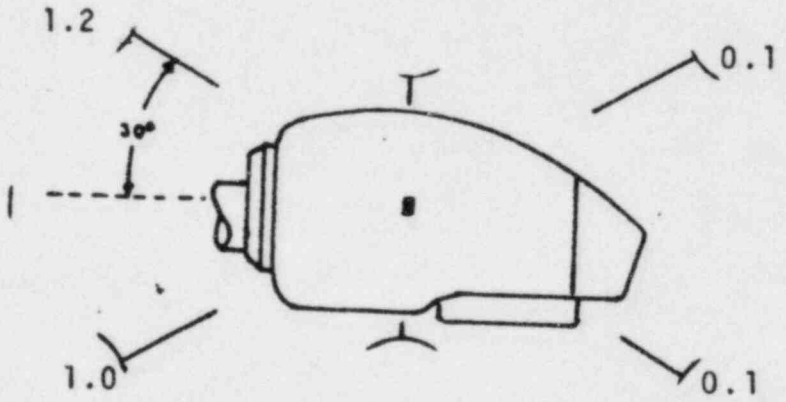
Manufacturer: Eberline

Model No: PIC-3

Serial No: 135

Calibration Date: Jan. 3, 1985

Listed values are in MR/hr at one meter



Average Exposure 1.08

Maximum Exposure: 4.1

Christiana Hospital

Teletherapy Head

Radiation Survey Report- Beam OFF

TABLE 2

THERATRON - 80
RADIATION PROTECTION SURVEY
CHRISTIANA HOSPITAL

Beam Angle / Location	Exposure Rate 0° mR/hr	90° mR/hr	180° mR/hr	270° mR/hr	Calculated Weekly Exposure 0° mR/wk	90° mR/wk	180° mR/wk	270° mR/wk		Total Weekly Dose mR/wk
Entrance Door	.03	.03	.03	.03	0.3	0.1	0.1	0.1		1.0
Control Wall	"	"	"	"	"	"	"	"		"
Exam Room 4	"	"	"	"	"	"	"	"		"
Storage Wall	"	"	"	"	"	"	"	"		"
High Energy Room	"	"	"	"	"	"	"	"		"
Rear Wall	"	"	"	"	"	"	"	"		"
Roof	"	"	"	"	"	"	"	"		"

Exposure Conditions:

Water Phantom in Primary Beam = L = 30 cm
W = 40 cm
H = 30 cm

Maximum Field Size

Source Phantom Distance 80 cm

Survey Instrument

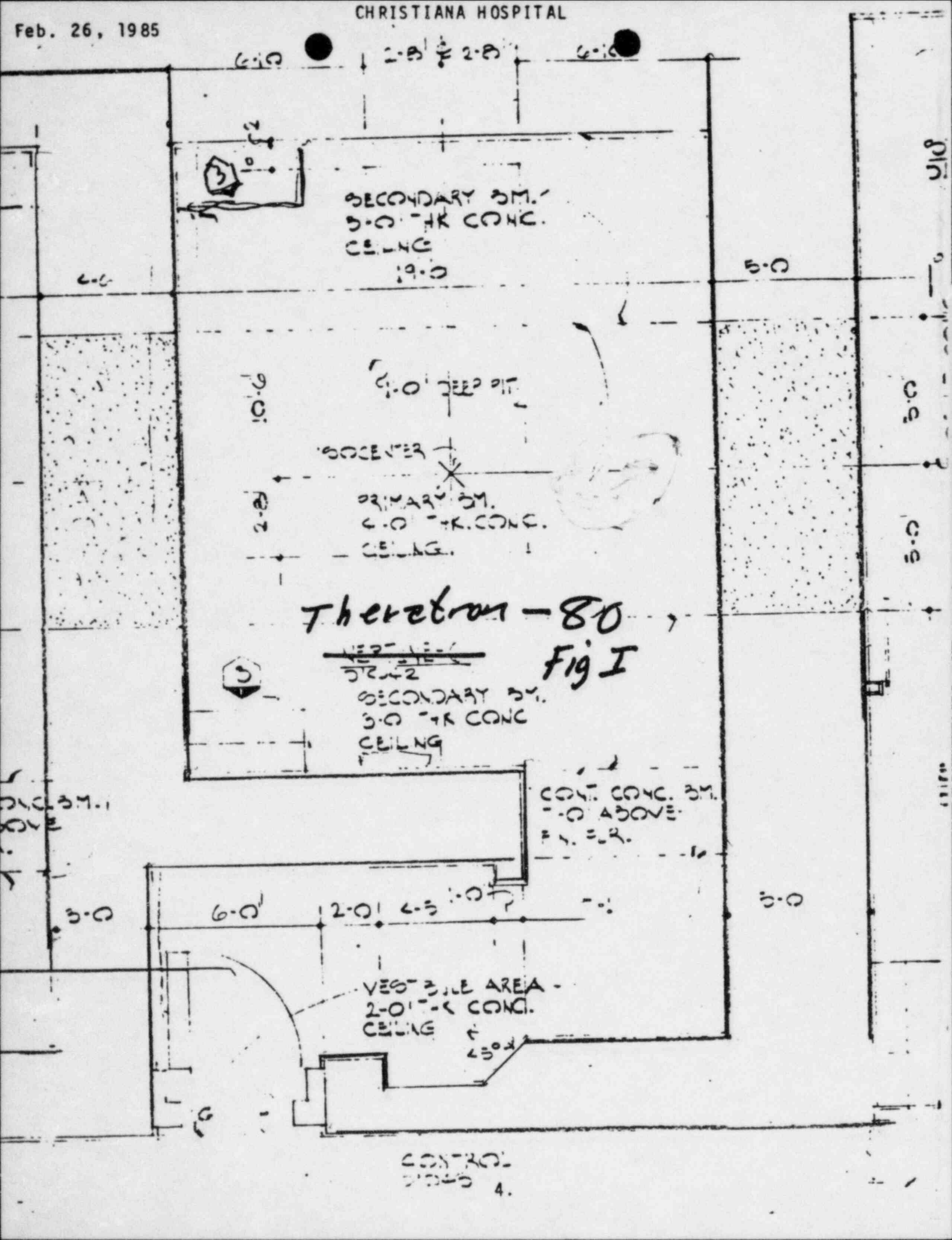
Mfg: Eberline

Model No. E-530

Serial No. 457

Calibration Date: Jan. 3, 1985

CHRISTIANA HOSPITAL



Therotron-80

Fig I

Beam Intensity

The intensity of the primary beam was measured on January 31,1985 using system calibrated by CNMC Company on March 23, 1984. The measurements were made at a depth of 5 centimeters in a water phantom. The field defining collimators were set for a 10cm x 10cm field at 80 centimeters. The measured dose rate was then adjusted to a depth of 80.5 centimeters.

Dose Rate = 146.9 rads/min at 80.5 cm for a 10cm x 10cm field at a source distance of 80 cm.

Safety Devices Include the Following:

1. Signal lights on the control panel and on the source head support arm indicate the source "OFF" (green) and the source "ON" (red) position. A light over the entrance door indicates source "ON" condition. All these lights operate normally.

2. A wall mounted radiation monitor (with back up power supply) which flashes red when the source is "ON" is secured to the treatment room wall.

3. A door interlock switch turns the source "OFF" if the treatment room door is opened. The source remains in the "OFF" position until the door to the treatment room is closed and control panel reset button pushed.

4. The emergency procedure to be followed when the source fails to move into the "OFF" position is displayed in APPENDIX A.

5. A sign with the radiation symbol and the wording "CAUTION, HIGH RADIATION AREA" is posted on the treatment room door.

6. Mercury cutout switches allow the primary beam to be directed towards the walls and ceiling only when the beam stopper is interposed in the primary beam.

7. A sign bearing the conventional radiation symbol and the words:

CAUTION
RADIOACTIVE MATERIALS
COBALT-60 6464 Curies
June 4, 1984

has been attached to the head of the Theratron-80 unit.

8. Exposure Timer

The accuracy of the exposure timer was measured and found to be in error by 0.008 minutes. That is, exposure time must be reduced by 0.008 minutes.

9. A dry wipe test was performed by AECL on 10/10/84 - results negative.

A dry wipe test was performed by Medical Center of Delaware on 2/7/85 - results negative.

10. The depleted Uranium wipes have been performed and the swabs sent to ICN Pharmaceuticals for analysis. The results have not yet been received.

IMPORTANT

A.E.C.L. MODELS 6, 8, 60 AND 80
TELETHERAPY UNITS

IF THE DRAWER FAILS TO CLOSE,

PROCEED AS FOLLOWS:

1. Remove the patient from the treatment room.

   A. If the patient is ambulatory, instruct him to get off the table and leave the room.

   B. If the patient is not ambulatory:

      1. Enter the treatment room (avoid exposure to the useful beam) and close field collimators to minimum field size.

      2. Rotate the treatment table so that patient is out of the useful treatment beam, and

      3. Transfer the patient to stretcher and remove from the room.

2. Close the door and secure the room against unauthorized entry.

3. Notify the following individuals:

   Chief Technician: E. Klein

   Physicians: Dr. C. Cuccia
   Dr. E. Schubert
   Dr. D. Tilton
   Dr. V. Donavanik

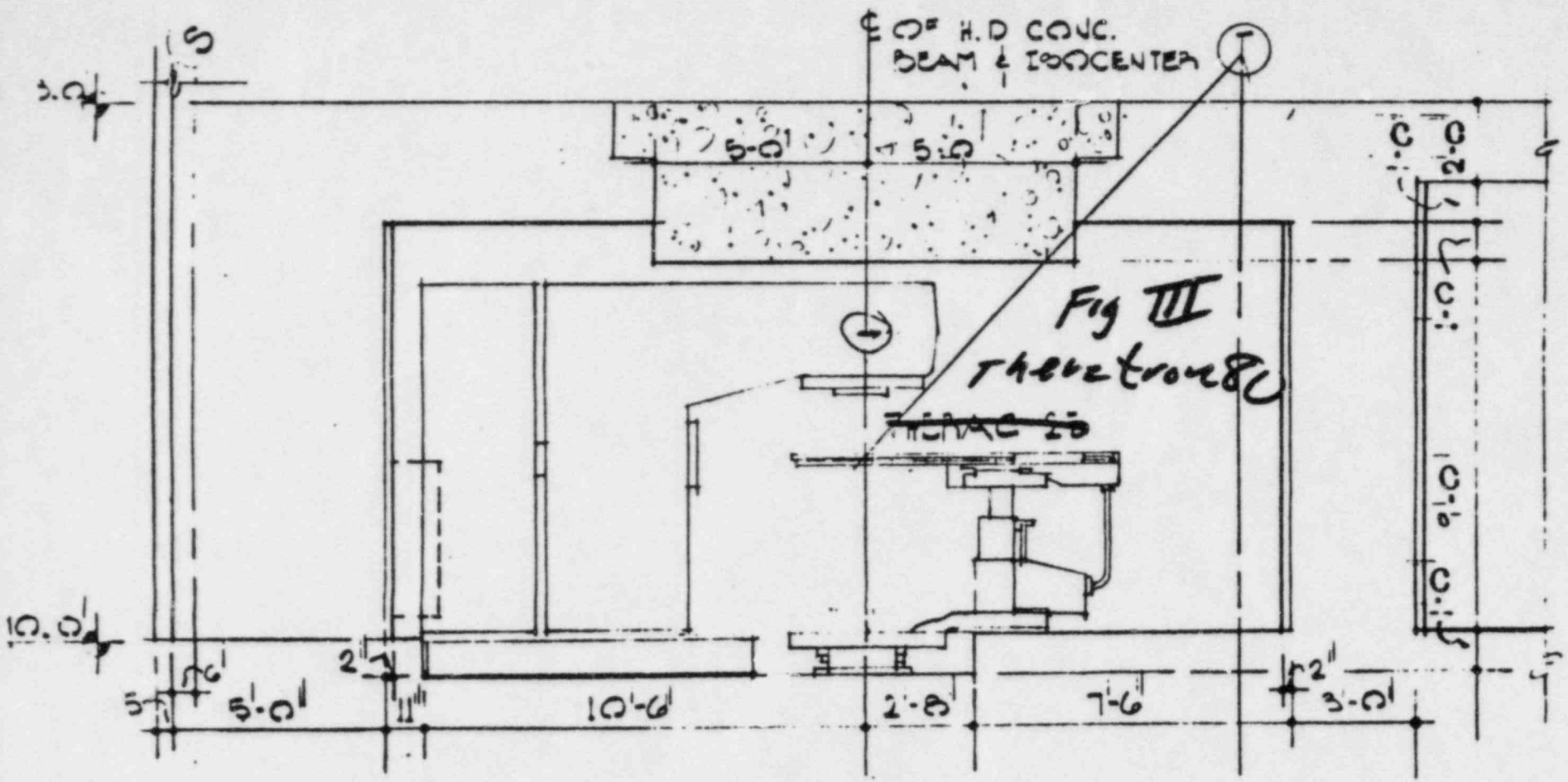
   Radiation Safety Office: 733-1453 or 1458

4. All remedial action to be taken will be under the supervision of Radiation Safety Office Personnel.

APPENDIX A

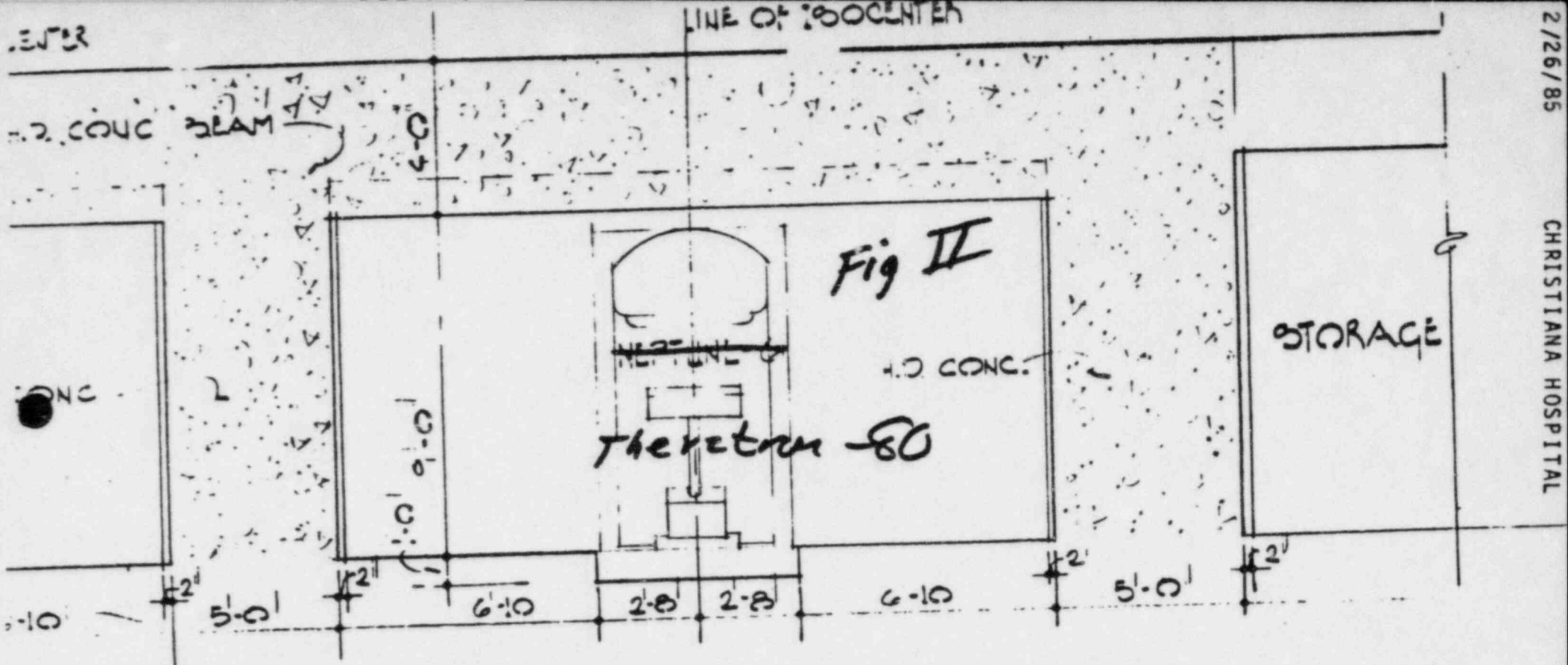
SCALE: 1/4"=1'-0"

SCALE: 1/4"=1'-0"



2/26/85

CHRISTIANA HOSPITAL



2/26/85 CHRISTIANA HOSPITAL

COPY

STRUCTIONS

TITLE:

RADIATION THERAPY

REV	DATE
1	4/4/82

SHEET NO: A3.

DATE: 9-1-80

DRAWN BY: PF.

SCALE: AS NOTED

DIVISION