

APPLICATION FOR MATERIALS LICENSE — TELETHERAPY

INSTRUCTIONS — Complete Items 1 through 22 if this is an initial application or an application for renewal of a license. Use supplemental sheets where necessary. Item 22 must be completed on all applications and signed. Retain one copy. Submit original and one copy of entire application to: Director, Office of Nuclear Materials Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Upon approval of this application, the applicant will receive a Materials License. An NRC Materials License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Parts 19, 20, 21, and 35 and the license fee provision of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 22 and the appropriate fee enclosed.

<p>a. NAME AND MAILING ADDRESS OF APPLICANT (institution, firm, clinic, physician, etc.) INCLUDE ZIP CODE</p> <p>LUTHERAN MEDICAL CENTER 2609 FRANKLIN BLVD. CLEVELAND, OHIO 44113</p>	<p>1.b. STREET ADDRESS(ES), ACTUAL LOCATION OF TELETHERAPY SOURCE, INCLUDING BUILDING NAME, ROOM NUMBER, ETC.</p> <p>Same as 1.a. Bldg A, Ground Floor Radiation Therapy Department</p>
<p>TELEPHONE AREA CODE (216) NUMBER 696-4300</p>	
<p>2. PERSON TO CONTACT REGARDING THIS APPLICATION</p> <p>Theodore J. Castele, M.D.</p>	<p>3. THIS IS AN APPLICATION FOR: (Check appropriate item)</p> <p><input type="checkbox"/> a. NEW LICENSE</p> <p><input type="checkbox"/> b. AMENDMENT TO LICENSE NO. _____</p> <p><input checked="" type="checkbox"/> c. RENEWAL OF LICENSE NO. 34-01869-02</p>
<p>TELEPHONE AREA CODE (216) NUMBER 696-4300</p>	
<p>4. INDIVIDUAL USERS (Name individuals who will use or directly supervise use of radioactive material. Complete Supplements A and B for each individual.)</p> <p>Theodore J. Castele, M.D. Reynaldo F. Guillermo, M.D. Celia Yap, M.D.</p>	<p>5. RADIATION SAFETY OFFICER (RSO) (Name of person designated as radiation safety officer. If other than individual user, complete resume of training and experience as in Supplement A.)</p> <p>Avtar S. Ahuja, Ph.D.</p>

6. SEALED SOURCES TO BE USED IN TELETHERAPY UNITS (Attach supplemental pages if necessary)

	BYPRODUCT MATERIAL (Element and Mass No.)	NAME OF SOURCE MANUFACTURER	SOURCE MODEL NUMBER	MAXIMUM ACTIVITY PER SOURCE	NUMBER OF SOURCES
A.	Cobalt - 60	AECL	Type C - 146 Co 60 C	6000 Curies	2
B.					
C.					

7. TELETHERAPY UNITS (Attach supplemental pages, if necessary)

	NAME OF MANUFACTURER (Include description, if unit is custom made)	MODEL NUMBER
A.	Atomic Energy of Canada Limited	Theratron 780
B.		
C.		

8. USE (Attach supplementary pages, if necessary)

A	B	C	HUMAN USE ONLY
X			HUMAN AND OTHER USE (Specify on separate sheet)

License Fee Information
on Next Page 6/19/84 etc.

8507150286 850619
REG3 LIC30
34-01869-02 PDR

9. PERSONNEL MONITORING DEVICES

	TYPE (Check and/or complete as appropriate)	SUPPLIER (Service Company)	EXCHANGE FREQUENCY
X	(1) FILM BADGE — WHOLE BODY	R.S. Landauer, Jr. & Co.	Monthly
	(2) THERMOLUMINESCENT DOSIMETER (TLD) — WHOLE BODY		
X	(3) OTHER (Specify): TLD — extremities	R.S. Landauer, Jr. & Co.	Monthly

Control No. 77046

Postmarked 6/21/84

INFORMATION REQUIRED FOR ITEMS 10 THROUGH 21

For items 10 through 21, check the appropriate box(es) and submit a detailed description of all the requested information. Begin each item on a separate sheet. Identify the item number and the date of the application in the lower right corner of each page. If you indicate that an appendix to the teletherapy licensing guide will be followed, do not submit the pages, but specify the revision number and date of the referenced guide: Regulatory Guide 10 Rev. _____ Date: March 1982

<p>10. MEDICAL ISOTOPE COMMITTEE</p> <p><input checked="" type="checkbox"/> Names and specialties attached; and (check one)</p> <p><input checked="" type="checkbox"/> a. Duties as in Appendix A, or</p> <p><input type="checkbox"/> b. Equivalent duties attached.</p>	<p>15. BEAM STOPS</p> <p><input checked="" type="checkbox"/> Description of stops used to restrict beam orientation attached.</p>
<p>11. TRAINING AND EXPERIENCE</p> <p><input checked="" type="checkbox"/> a. Supplements A & B attached for each individual user; and</p> <p><input checked="" type="checkbox"/> b. Supplement A attached for RSO.</p>	<p>16. SHIELDING EVALUATION</p> <p><input type="checkbox"/> Evaluation of proposed shielding attached.</p>
<p>12. INSTRUMENTATION (check one)</p> <p><input checked="" type="checkbox"/> a. Appendix C form attached, or</p> <p><input type="checkbox"/> b. List manufacturer's name and model number.</p>	<p>17. OPERATING AND EMERGENCY PROCEDURES</p> <p><input checked="" type="checkbox"/> a. Description of operating procedures attached; and</p> <p><input checked="" type="checkbox"/> b. Copy of emergency procedures attached.</p>
<p>13. CALIBRATION OF INSTRUMENTS (check one)</p> <p><input checked="" type="checkbox"/> a. Appendix D, Part 2 procedures followed for instrumentation calibration, or</p> <p><input type="checkbox"/> b. Description of sources, calibration frequency and equivalent procedures attached.</p>	<p>18. INSTRUCTION OF PERSONNEL (check one)</p> <p><input checked="" type="checkbox"/> a. Training program and schedule in Appendix H followed, or</p> <p><input type="checkbox"/> b. Description of instruction program for employees attached.</p>
<p>14. FACILITIES AND EQUIPMENT</p> <p><input checked="" type="checkbox"/> a. Description and drawing of facilities attached; and</p> <p><input checked="" type="checkbox"/> b. Description of patient viewing and communicating systems attached; and</p> <p><input checked="" type="checkbox"/> c. Description of area safeguards attached.</p>	<p>19. LEAK TESTS OF SEALED SOURCES</p> <p><input checked="" type="checkbox"/> Description of leak-test procedures attached.</p> <p>20. QUALIFIED EXPERT (Use only if the individual fails to meet 10 CFR 35.24 requirements.)</p> <p><input type="checkbox"/> Statement of qualifications of the expert who will perform teletherapy calibrations attached.</p>
	<p>21. ALARA PROGRAM (check one)</p> <p><input checked="" type="checkbox"/> ALARA Program as in Appendix I, or</p> <p><input type="checkbox"/> Equivalent ALARA Program attached.</p>

22. CERTIFICATE

(This item must be completed by the applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 1a certifies that this application is prepared in conformity with Title 10, Code of Federal Regulations, Parts 30 and 35, and that all information contained herein, including supplements attached hereto, is true and correct to the best of our knowledge and belief.

<p>a. LICENSE FEE REQUIRED (See section 170.31, 10 CFR 170)</p>	<p>b. APPLICANT OR CERTIFYING OFFICIAL (Signature)</p> <p align="center"><i>Theodore J. Castele, M.D.</i></p>
<p>(1) LICENSE FEE CATEGORY 10CFR Part 170.31 (7A)</p>	<p>(1) NAME (Type or print) Theodore J. Castele, M.D.</p>
<p>(2) LICENSE FEE ENCLOSED \$ 350.00</p>	<p>(2) TITLE Director of Radiology</p>
	<p>c. DATE June 19, 1984</p>

WARNING: 18 U.S.C. Section 1001; Act of June 25, 1948; 62 Stat. 749, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

LUTHERAN MEDICAL CENTER

RENEWAL OF TELETHERAPY LICENSE NO. 34-01869-02

ITEM 10: MEDICAL ISOTOPE COMMITTEE

Names and Specialties:

Theodore J. Castele, M.D., Director of Radiology and Chairman of
Radiation Safety Committee.

Avtar S. Ahuja, Ph.D., Radiation Safety Officer and Radiologic
Physicist.

Janet Dostal, R.T., Coordinator of Radiological Services.

Steve Riczo, Assistant Vice President and Secretary of RSC.

Carmen Santin R.N., Vice President and Director of Nursing Services.

These individuals were approved as Amendment No. 15, in response to
our letter of March 14, 1984.

ITEM 10
JUNE 19, 1984

LUTHERAN MEDICAL CENTER

RENEWAL OF TELETHERAPY LICENSE NO. 34-01869-02

ITEM 11: TRAINING AND EXPERIENCE

(a) Individual users are:

Theodore J. Castele, M.D.

Reynaldo F. Guillermo, M.D.

Celia Yap, M.D.

These individuals have been authorized to use the radioactive material under the Teletherapy License No. 34-01869-02, Amendment No. 12.

(b) Radiation Safety Officer is:

Avtar S. Ahuja, Ph.D.

He has been authorized under the Teletherapy License No. 34-01869-02, Amendment No. 14 following our letter of November 2, 1983.

LUTHERAN MEDICAL CENTER

RENEWAL OF TELETHERAPY LICENSE NO. 34-01869-02

ITEM 12: INSTRUMENTATION

1. Survey meters

- a. Manufacturer's name: Keithley
 Manufacturer's model number: 36150 (Digital Integrating Survey Meter)
 Number of instruments available: 1
 Minimum range: 0 mr/hr to 200 mr/hr
 Maximum range: 0 mr/hr to 20,000 mr/hr
- b. Manufacturer's name: Victoreen
 Manufacturer's model number: 498 (G-M Survey Meter with Audio)
 Number of instruments available: 1
 Ranges: _____
 Minimum range: 0 mr/hr to 1 mr/hr
 Maximum range: 0 mr/hr to 1,000 mr/hr

2. Beam-on Monitor

Manufacturer's name: Philips
 Manufacturer's model number: ZP 1300 (G-M tube)
 Number of instruments available: 1
 Backup Battery Power Supply: Yes x No _____

3. Dosimetry System

a. Electrometer

Manufacturer's name: Keithley
 Manufacturer's model number: 35025

b. Probes

Manufacturer's name: Nuclear Enterprises Limited
 Manufacturer's model number: 2581
 Number of probes: 2
 Ranges: Therapy level dose rates. 100 KV-35 MV, For dosimetry of Photons and Electrons

LUTHERAN MEDICAL CENTER

RENEWAL OF TELETHERAPY LICENSE NO. 34-01869-02

ITEM 12 - cont'd

4. Well Counter with scintillation detector

a. Manufacturer's name: Nuclear Chicago
Manufacturer's model number: 8725
Number of instruments available: 1

The above instruments (1-4) have been approved by NRC under License
No's. 34-01869-01 and 34-01869-02.

LUTHERAN MEDICAL CENTER

RENEWAL OF TELETHERAPY LICENSE NO. 34-01869-02

ITEM 13: CALIBRATION OF INSTRUMENTS

(a) Survey Instruments

1. Survey instruments will be calibrated at least annually and following repair.
2. Calibration will be performed at least at two points on each scale used for radiation protection purposes.

The two points will be located at approximately $1/3$ and $2/3$ of full scale. A survey instrument may be considered properly calibrated when the instrument readings are within $\pm 10\%$ of the calculated or known values for each point checked. Readings within $\pm 20\%$ are considered acceptable if a calibration chart, graph, or response factor is prepared, attached to the instrument, and used to interpret meter readings to within $\pm 10\%$ for radiation protection purposes.

3. Survey instruments will be calibrated by the manufacturers.

(b) Beam on Monitor

This monitor will be checked daily for proper functioning before starting treatment of the patients.

(c) Dosimetry System

It is calibrated every two years by an Accredited Dosimetry Calibration Laboratory (ADCL).

LUTHERAN MEDICAL CENTER

RENEWAL OF TELETHERAPY LICENSE NO. 34-01869-02

ITEM 14: FACILITIES AND EQUIPMENT

(a) Description and drawing of facilities

Please see our renewal application dated January 22, 1979, and our letters dated March 19, 1980, September 26, 1980 and May 10, 1984.

(b) Description of patient viewing and communicating systems

Electronic means such as T.V. monitor and intercom are used to view and communicate with the patient. These systems are checked daily prior to beginning of the patient treatment. In the event the systems malfunction, the patient treatment will be suspended until the systems are repaired and functioning again.

(c) Description of area Safeguards

Door leading to the teletherapy room is equipped with an interlock to control the "on-off" mechanism of the teletherapy unit. The source is moved to the "off" position when the door is opened. The source cannot be returned to the "on" condition until the door is closed and the system is reset at the control.

LUTHERAN MEDICAL CENTER

RENEWAL OF TELETHERAPY LICENSE NO. 34-01869-02

ITEM 15: BEAM STOPS

Please see our application dated January 22, 1979 and letters dated March 19, 1980, September 26, 1980 and May 10, 1984.

Control No. 77046

LUTHERAN MEDICAL CENTER

RENEWAL OF TELETHERAPY LICENSE NO. 34-01869-02

ITEM 17: OPERATING AND EMERGENCY PROCEDURES

1. Operating Procedures

(a) Safety Device Checks

Safety devices such as timer, mechanical and electrical interlocks, Safety Switches, warning lights and alarms and beam collimators will be checked periodically to insure that they are operating properly.

(b) Personnel Dosimetry

Teletherapy personnel are required to wear film badges to monitor their exposures. Film badges, when not being worn, will be stored outside the treatment room.

(c) Monthly Spot - Check Measurements

Procedures for monthly spot-check measurements of our teletherapy unit, as described in Section 35.22 of 10 CFR Part 35, will be followed by the department physicist.

(d) Full Calibration of The Teletherapy Unit

Procedures for annual calibration of our teletherapy unit, as described in section 35.21 of 10 CFR Part 35, will be followed by the department physicist.

LUTHERAN MEDICAL CENTER

RENEWAL OF TELETHERAPY LICENSE NO. 34-01869-02

ITEM 17 - cont'd

(e) Recordkeeping

Records pertaining to safety device checks, instrument calibration, monthly spot-check, full calibration, leak testing and personnel monitoring reports will be maintained.

2. Emergency Procedures

Procedures described in Appendix G are followed. Names of a radiotherapist (Reynaldo F. Guillermo, M.D.) and Radiation Safety Officer (Avtar Ahuja, Ph.D.) and their on and off duty phone numbers have been conspicuously posted on the door of the treatment room.

LUTHERAN MEDICAL CENTER

RENEWAL OF TELETHERAPY LICENSE NO. 34-01869-02

ITEM 19: LEAK TEST OF SEALED SOURCES

In-house leak tests are performed by Avtar S. Ahuja, Ph.D., Radiation Safety Officer.

(a) Method of taking smears,

1. Collect the following materials: 4 Q-tips, 1 Plastic vial, 1 marker, a pair of scissors, and a GM Survey Meter with audio.
2. Ascertain that the source is in the OFF position. Wear personnel monitoring device (film badge).
3. Rotate the stretcher away from the unit and rotate the arm to 270° (or 90°). Fully open the collimators.
4. Moisten the Q-tip swabs. Wipe two Q-tip swabs on the collimator blades and the sourcehead-collimator junction and monitor for activity above background by bringing the Q-tips close to the GM Survey meter probe. Cut the sticks close to swabs and let the swabs drop into the vial. Mark the vial by a marker. Repeat the procedure by wiping the two swabs on the inside of the hole (in the sourcehead) through which the Beam-on indicator rod emerges in the BEAM-ON mode. Check the contamination level by the GM meter, place the swabs in the vial and mark the vial.
5. Monitor hands and scissors for activity above background.
6. Analyze vials, one at a time in the well counter as described below.

LUTHERAN MEDICAL CENTER

RENEWAL OF TELETHERAPY LICENSE NO. 34-01869-02

ITEM 19 - cont'd

(b) Instruments

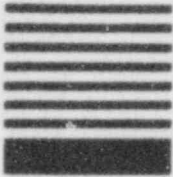
1. Co-60 standard source of known activity
2. Well counter with scintillation detector

(c) Method of Analysis

1. High voltage, window and base are set to count Co-60 gamma radiation.
2. Count the background and determine the background count/minute.
3. Count the two vials, one at a time, and determine the net sample count/minute, N_s .
4. Count the Co-60 standard and determine the net count/minute of the standard, N .
5. Activity of the sample in microcurie = $\frac{A}{N} \times N_s$, where A is the activity of the standard in microcurie.

(d) Sensitivity of the counting system

By counting the background and sample for one hour each, the minimum detectability is 5×10^{-5} microcurie. Criteria used for the minimum detectability is net count/minute of the sample equal to 3 times the standard deviation of the background count per minute.



Lutheran Medical Center

2609 Franklin Boulevard, Cleveland, Ohio 44113
Telephone: 216/696-4300

THEODORE J. CASTELE, M.D., F.A.C.R.
Director of Radiology

May 10, 1984

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

RE: License No. 34-01869-02

Dear Sir:

As required, I am enclosing a copy of the survey report following replacement of cobalt 60 source in our teletherapy unit. If further clarification or information is needed, please let us know.

Very truly yours,

Theodore J. Castele, M.D.
Theodore J. Castele, M.D.

TJC/jl

Enclosure

cc: US NRC, Region III

RECEIVED BY LFMB	
Date	5/21/84
Log	me 17
By	CP
Orig To	KTD
Ac	Q

100% teletherapy
FEE EXEMPT

8406270188 840627
NMS LIC30
34-01869-02 PDR

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pp.

17519

SURVEY REPORT OF COBALT TELETHERAPY UNIT

INSTITUTION

Lutheran Medical Center

2609 Franklin Boulevard

Cleveland, OH 44113

NRC LICENSE No.

34-01869-02

TETETHERAPY UNIT

A E C L Theratron 780 #234, Source, Serial No. S-3552, Type C-146

Co60C, certified as containing 5040 curies of cobalt 60 on

September 27, 1983.

REASON FOR THE SURVEY

Installation of a new source, specified above, on April 19, 1984.

The source activity on April 19, 1984 was 4678 curies.

SURVEYOR

Avtar Ahuja, Ph.D.

Radiologic Physicist and Radiation Safety Officer.

Lutheran Medical Center

2609 Franklin Boulevard

Cleveland, OH 44113

DATES OF THE SURVEY

April 19 and 20, 1984

SURVEY INSTRUMENTS

1. Keithley Survey Meter, Model No. 36150, Serial No. 17344. This instrument was calibrated by Keithley on August 30, 1983.
2. Keithley Electrometer Model 35025 and N E L ion chamber Model No. 2581. Ion chamber was calibrated last by A D C L, K & S Associates, INC., Nashville, TN on September 29, 1982.

OUTPUT OF THE PRIMARY BEAM

The unit was fully calibrated in air on April 20 and 21, 1984. A representative set of exposure rates measured in air on the beam axis for the source-to-chamber distance of 80 c.m. is:

<u>Field size (c.m.²)</u>	<u>Output (R/min.)</u>
5x5	130.2
10x10	135.8
20x20	141.4
35x35	142.6

HEAD SURVEY

Radiation levels were measured at 14 points that were one meter from the teletherapy source in the "off" position. The average level was 0.3 mR/hr. and the maximum was 0.65 mR/hr. Details are presented in the accompanying diagram on page 5.

LIMITS OF BEAM ORIENTATION

With the beam directed at the integral beam absorber, no restrictions existed on the orientation of the beam.

With the beam directed away from the integral beam absorber, electrical beam stops permitted the beam to be turned on only if it was within a 90 degree arc between vertically down and horizontally towards the outer (northwest) wall of the building. See accompanying room plans.

The above restrictions were tested by rotating the gantry to various angle positions (0°, 30°, 60°, 90°, 270°, 315°), swivelling the head to various angle positions and attempting to turn the beam on. Results were as described above.

~~1-1-84~~

AREA SURVEY

Radiation levels were measured in areas adjacent to the teletherapy room for a variety of beam orientations. Details are included in the accompanying table. For this survey, collimators were opened to the maximum extent (35 c.m. x 35 c.m. at 80 c.m.). The phantom, where used, was water phantom of 30 c.m. x 30 c.m. x 30 c.m.

With only one exception, all measured exposure levels fell within the limit of 2mR/hr. for the unrestricted areas. This exception was the area just outside of the outer (northwest) wall, where an exposure of 8mR/hr. was measured. This was for a beam orientation in which the beam was directed horizontally at the wall and the beam axis was 175 c.m. (5'-9") above the ground. The outside area in question is a grass verge which separates the exterior wall of the building from the sidewalk. The verge is approximately 12 feet wide and 3 feet above the floor level of the teletherapy room.

The above beam orientation is not likely to be employed for patient treatment. However, it yields worst possible exposure level outside of the wall. For a worst possible situation, assume this mode of operation to average not more than one hour per week. Then the average yearly exposure to an individual is (8mR/week) (52 weeks/year) = 416mR/year. This exposure is less than the maximum permissible level of 500 mR/year. Under the provisions of 10 C F R 20.105 (a), an exception to the radiation level in this unrestricted area was requested in our application of January 22, 1979 and letter of September 26, 1980 and was granted by N R C in a letter dated January 15, 1981.

The following tests were performed during the calibration phase of the survey, when the electrometer and the ion chamber served as an independent check on the presence of the radiation primary beam.

DOOR INTERLOCK

The electrical interlock on the door was found to operate satisfactorily in the manner described in condition 17 of our license. When the door was opened, the primary beam was shut off immediately. The beam could not be turned on when the door was open. However, to turn the radiation beam on, the door had to be closed, the timer switch had to be turned off, the treatment mode selected (FIX, ROT, SKIP, ARC) the reset button depressed, and the timer switch turned on again.

ON-OFF INDICATORS

All "on-off" indicators were found to operate satisfactorily. When the radiation beam was turned on, red lights came on on the console and on the door. An area radiation monitor inside the teletherapy room

has been set so that red light over the console flashed on and off whenever the beam was on. The monitor would sound an alarm only if the door is opened. Further, when the radiation beam is turned on, by using the T.V. monitor, one can observe a light on the sourcehead as well as the beam-on indicator rod protruding from the sourcehead. As the beam is turned off, one can clearly see on the T.V. monitor the indicator rod moving back into the sourcehead.

TIMER

The accuracy of the timer was checked by setting it for integer and fractional minutes and comparing the elapsed exposure time with the time measured by an independent stopwatch. At the end of the exposure, the timer switch turned off. The radiation beam could not be turned on again by turning on the timer switch alone. The treatment mode (FIX, ROT, SKIP, ARC) had to be selected, the reset button depressed, the timer reset and timer switch turned on and only then could radiation beam be turned on.

Timer error or time correction term was also measured during the calibration phase of the survey. Following the procedure outlined in N C R P Report No. 69, timer error was measured to be - 1.0 sec. (true exposure time equals timer setting minus 1.0 seconds).

INSTALLATION OF THE NEW SOURCE AND REMOVAL OF THE OLD SOURCE

Atomic Energy of Canada Limited (A E C L) installed the new source and removed the old source:

A E C L

P.O. BOX 6300

Station J

Ottawa, Canada K2A-3W3

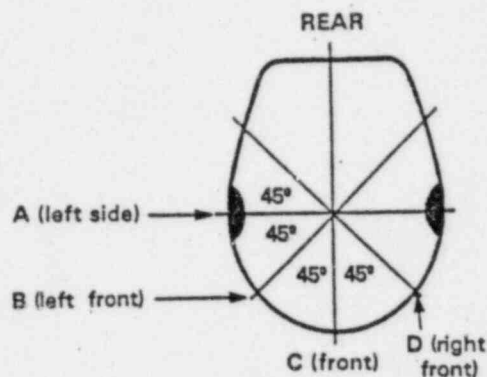
The old source was removed by A E C L from the hospital premises on May 1, 1984.

Figure F-1
TELETHERAPY HEAD SURVEY

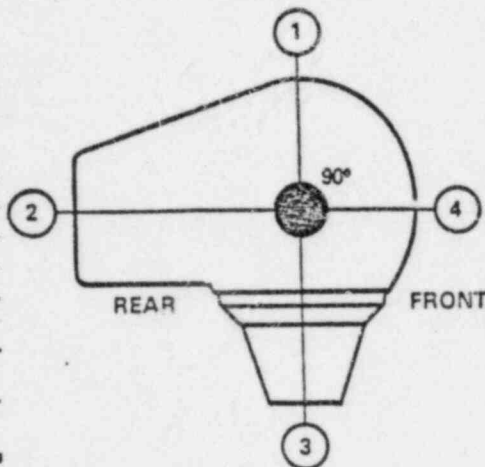
(Source in "OFF" position.
Measurements taken one meter
from source)

Position No.	Radiation Level (mr/hr)
View A	1 0.25
	2 0.55
	3 0.45
	4 0.65
View B	5 0.2
	6 0.2
	7 0.1
	8 0.2
View C	9 0.2
	10 0.2
View D	11 0.1
	12 0.2
	13 0.55
	14 0.1
Average value	0.3
Maximum value	0.65

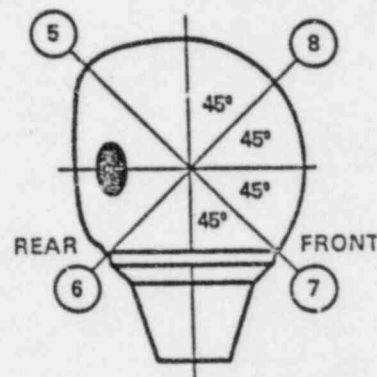
Top View-Showing
orientation
of Views A through D



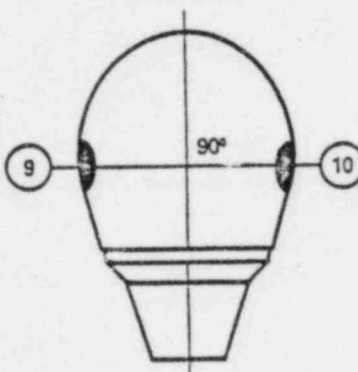
View A-Vertical
from left side



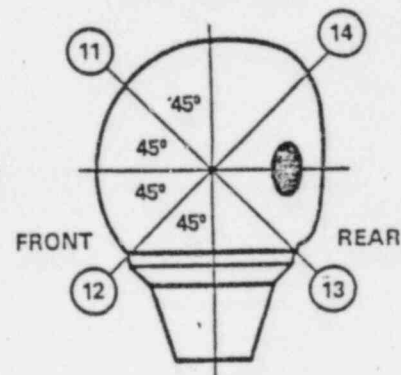
View B-Vertical
from left front



View C-Vertical
from front



View D-Vertical
from right front



Date of survey April 20, 1984

Instrument used Keithley 36150

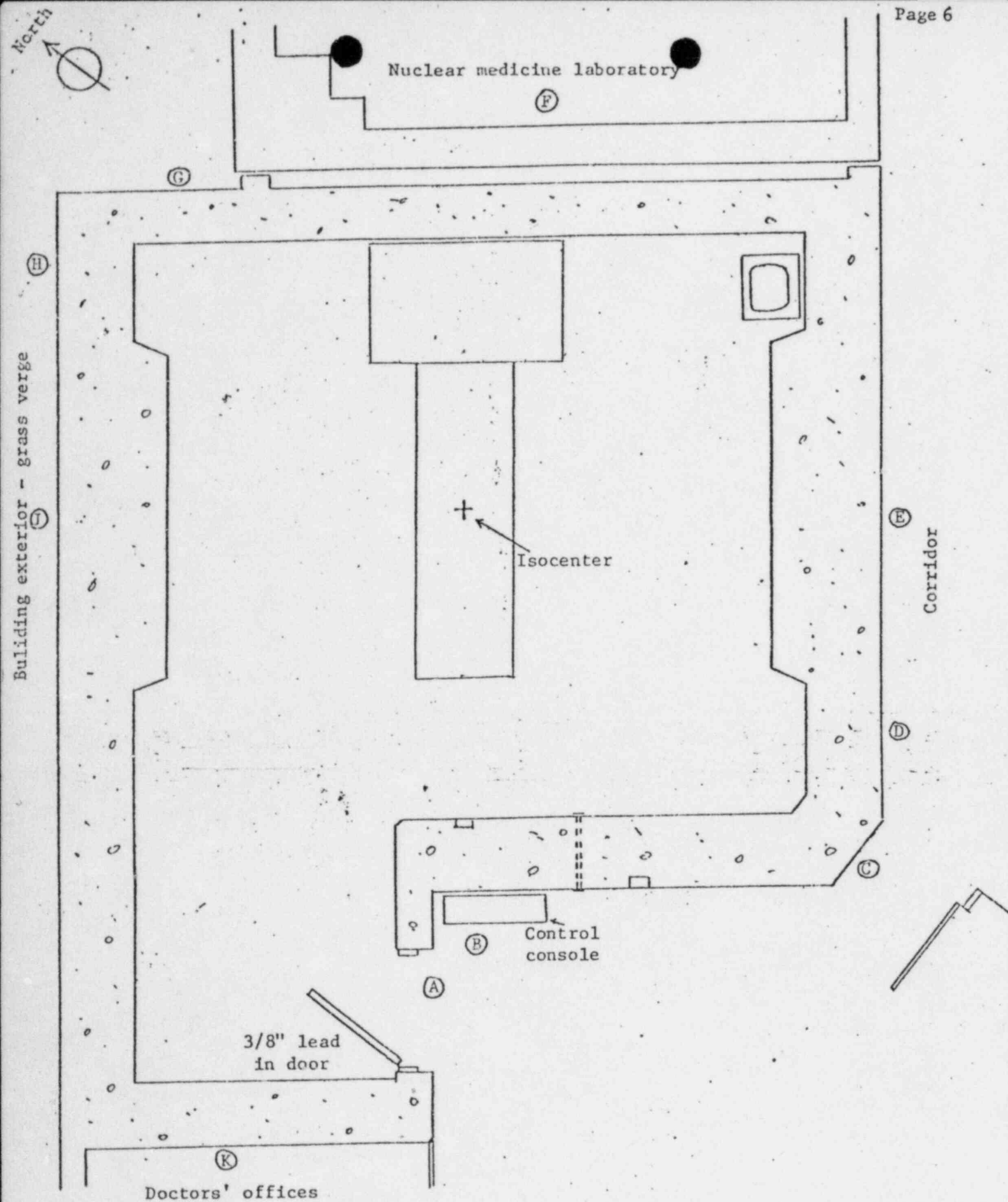
Manufacturer's
name & model number
of teletherapy source AECL Theratron
780

Date of installation April 19, 1984
of a new source

OUTPUT 100.8 ☐ RHM
☒ RMM

Date of output
measurement Sept. 27, 1983

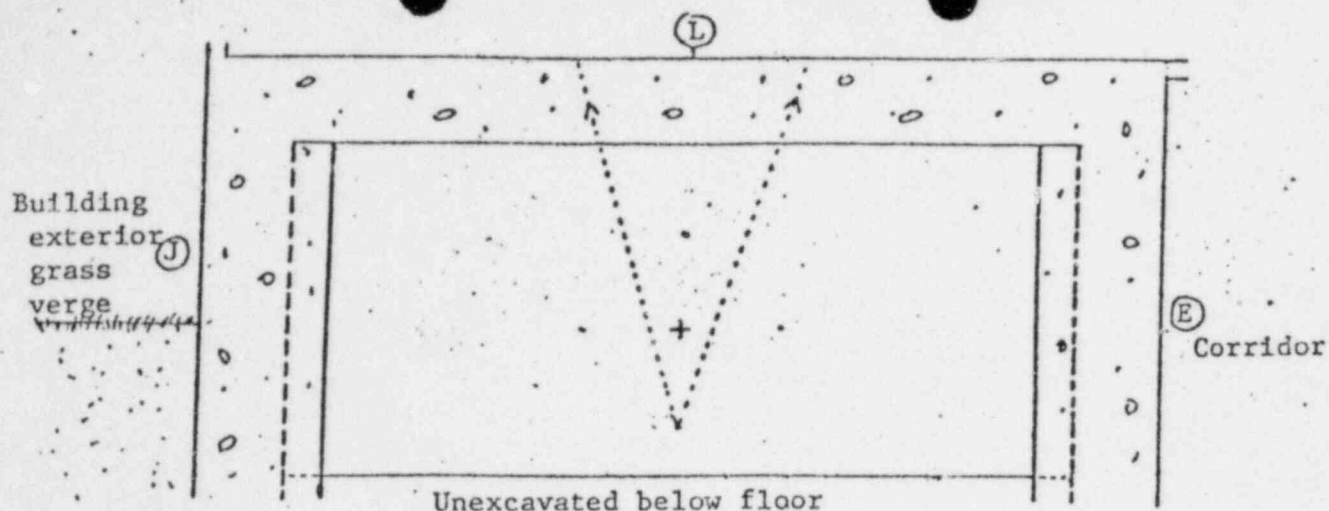
17519



Plan of cobalt teletherapy room equipped with AECL Theratron 780 in basement of Lutheran Medical Center, Cleveland, Ohio.

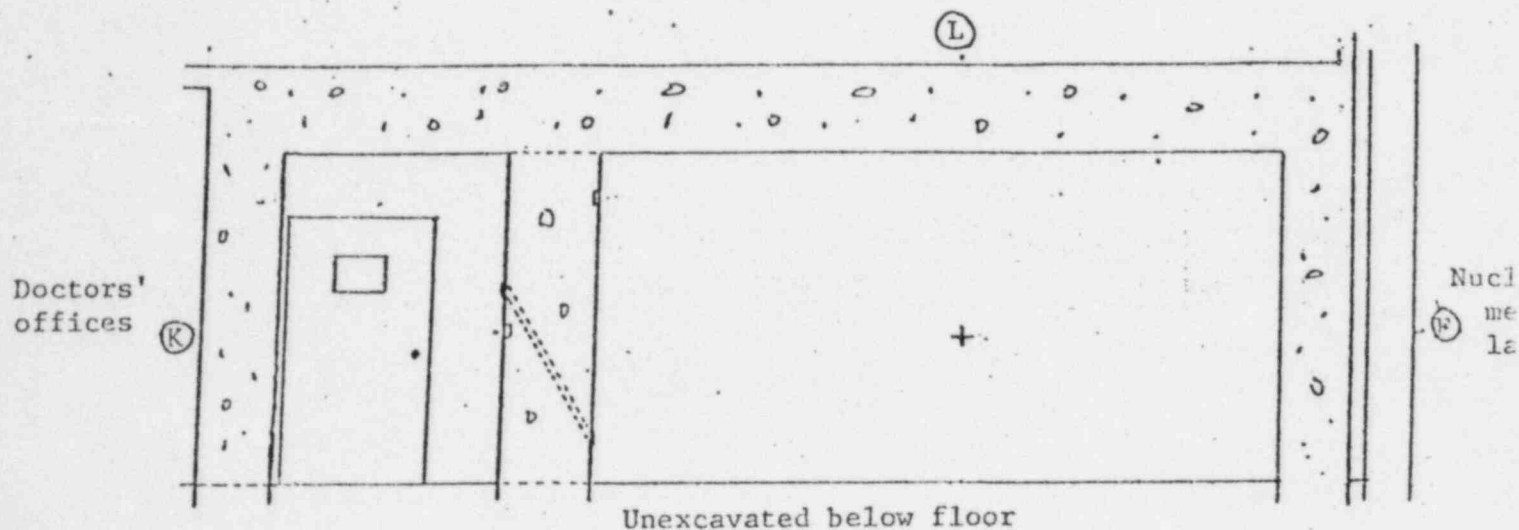
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First floor - conference room and office



View towards northeast

First floor - conference room and office



View towards northwest

Elevations of cobalt teletherapy room equipped with AECL Theratron 780 in basement of Lutheran Medical Center, Cleveland, Ohio.

Radiation levels near cobalt teletherapy room

Location	Orientation of beam	Beam absorber	Phantom	Primary-P or Scatter-S (Angle of scatter)	SSD (cm)	Gantry angle	Swivel angle	mR/hr B-Back-ground
Door A	Horizontal toward outer (NW) wall	No	No	S (90° twice)	165	315°	135°	0.2
	"	No	No	S (90° twice)	260	30°	60°	0.2
	"	Yes	Yes	S (45°)	80	90°	0°	0.1
	Nearly horizontal, slightly downwards	No	No	S (90° twice)	180	315°	105°	0.2
Control console B	Horizontal toward outer (NW) wall	No	No	S (135°)	165	315°	135°	B
	"	No	No	S (135°)	260	30°	60°	B
	Nearly horizontal, slightly downwards	No	No	S (135°)	180	315°	105°	B
	Vertical down	Yes	Yes	S (90°)	80	0°	0°	B
Corridor C, D	Vertical down	Yes	Yes	S (90°)	80	0°	0°	B
	Horizontal toward corridor	Yes	Yes	S (45°)	80	270°	0°	B
	Vertical down	No	Yes	S (90°)	75	320°	40°	B
Corridor E	Toward corridor and downwards	Yes	Yes	S (30°)	75	300°	0°	B
	"	Yes	Yes	S (45°)	75	315°	0°	B

17519

Radiation levels near cobalt teletherapy room

Location	Orientation of beam	Beam, absorber	Phantom	Primary-P or Scatter-S (Angle of scatter)	SSD (cm)	Gantry angle	Swivel angle	mR/hr B-Back- ground
Nuclear medicine dept. F	Horizontal toward corridor	Yes	Yes	S (60°)	80	270°	0°	B
Building Exterior G	Horizontal	No	No	S	165	315°	135°	0.3
	60° to Vert- ical	No	No	S	200	315°	105°	0.2
	45° to Vert- ical	No	No	S	230	315°	90°	B
Building Exterior H	Horizontal	No	No	S	165	315°	135°	0.1
	60° to Vert- ical	No	No	S	200	315°	105°	0.1
	45° to Vert- ical	No	No	S	230	315°	90°	B
Building Exterior J	Horizontal toward outer (NW) wall	No	No	P	165	315°	135°	8.0
	Toward bottom edge of wall	No	No	S (75°) off wall	200	315°	105°	0.1
	"	No	No	S (100°) off wall	230	315°	90°	B
Doctors' Offices K	Horizontal toward outer (NW) wall	No	No	S (90°) off wall	165	315°	135°	B
	"	No	No	S (90°) off wall	260	30°	60°	B
	"	Yes	Yes	S (60°)	80	90°	0°	B
First floor L	Nearly vertical upward	Yes	Yes	S (30°)	75	210°	0°	0.1
	"	Yes	Yes	S (45°)	75	225°	0°	B

~~17488~~

17519



LUTHERAN MEDICAL CENTER

2609 FRANKLIN BOULEVARD • CLEVELAND, OHIO 44113 • PHONE: 216/696-4300

PRINCIPAL STAFF			
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D/D		ADM	
A/D		PAO	
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RCAPS			
1-1-81		FILE	<input checked="" type="checkbox"/>

Pogliaro JH
EG

September 26, 1980

Mr. Francis A. St. Mary
Material Licensing Branch
Division of Fuel Cycle and Material Supply
United States Nuclear Regulatory Commission
Washington, D.C. 20555

RE: CONTROL NO. 03152
LICENSE NO. 34-01869-02

Dear Mr. St. Mary:

This is in reply to your letter dated August 25, 1980 concerning the results of the radiation survey of our AECL Theratron 780 Cobalt-60 teletherapy unit. In the following, the additional information is numbered according to the items in your letter.

- ITEM 1. The Victoreen Model 444 ion chamber survey meter used to make the radiation surveys of February 21, 1980 and February 24, 1980 had been calibrated last on June 26, 1979 by P.S. Rao and R.B. Adams together according to the procedure described and approved in the NRC License #34-05469-01.
- ITEM 2. The following are results of a survey carried out on September 25, 1980 by P.S. Rao using the same survey meter as in Item 1 above, last calibrated on June 20, 1980. No phantom was used and the beam absorber was not in the primary beam. The collimators were opened to their widest extent (35 cm. x 35 cm. at 80 cm.), and the collimator head was rotated 45° (collimator reading 225°). Locations are keyed to the accompanying plan.

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SEP 29 1980

LOCATION	ORIENTATION OF BEAM	PRIMARY (P) OR SCATTER (S)	SSD (CM)	GANTRY ANGLE	SWIVEL ANGLE	mR/h
G	Horizontal	S	165	315°	135°	0.2
	60° to vertical	S	200	315°	105°	<0.1
	45° to vertical	S	230	315°	90°	<0.1
H	Horizontal	S	165	315°	135°	<0.1
	60° to vertical	S	200	315°	105°	<0.1
	45° to vertical	S	230	315°	90°	<0.1

ITEM 3. The maximum reported exposure rate of 7.8mR/h in the survey of February 21 and February 24, 1980 agreed reasonably well with the anticipated (calculated) level of 9.76 mR/h shown in our application dated January 22, 1979, which was approved on June 19, 1979. Therein, we had requested that an exception, as provided for in 10 CFR 20.105(a), be granted to the radiation level in the unrestricted area in question. We had based the request on a calculation that we present below in a modified form. The modification has been made in light of the actual measurements.

The area in question is a grass verge which separates the exterior wall of the building from a sidewalk. The verge is approximately twelve feet (360 cm.) wide and three feet (90 cm.) above the floor level of the teletherapy room. The exposure rate of 7.8mR/h, measured close to the wall, occurs only when the beam is directed horizontally away from the primary beam absorber. This mode of operation is assumed to average no more than one hour a week. The total average weekly exposure in the area due to the teletherapy facility is then no more than 8mR. The average yearly exposure to an individual is therefore (8mR/week) x (52 weeks/year) = 416mR. Since this is less than 500mR, we request that an exception be provided to the radiation level in this unrestricted area under the provisions of 10 CFR 20.105(a).

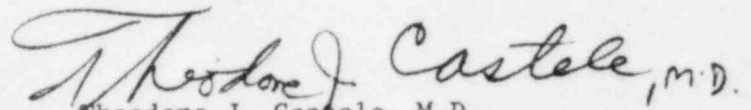
ITEM 4. The tests on the timer were run in conjunction with the tests for the ON-OFF indicators, at which time the ion chamber (connected to the electrometer) was placed in the primary beam and made to serve as an independent check on the presence of radiation.

The radiation could not be turned on unless the door was shut, the treatment mode selected (FIX, ROT, SKIP, ARC), the reset button depressed and the timer switch then turned on. At the end of the exposure, the switch went to the off position and the radiation also ceased. The radiation could not be turned on again by manipulating the timer switch alone. The timer had to be reset, the treatment mode selected, the reset button depressed, and only then could the radiation be turned on again.

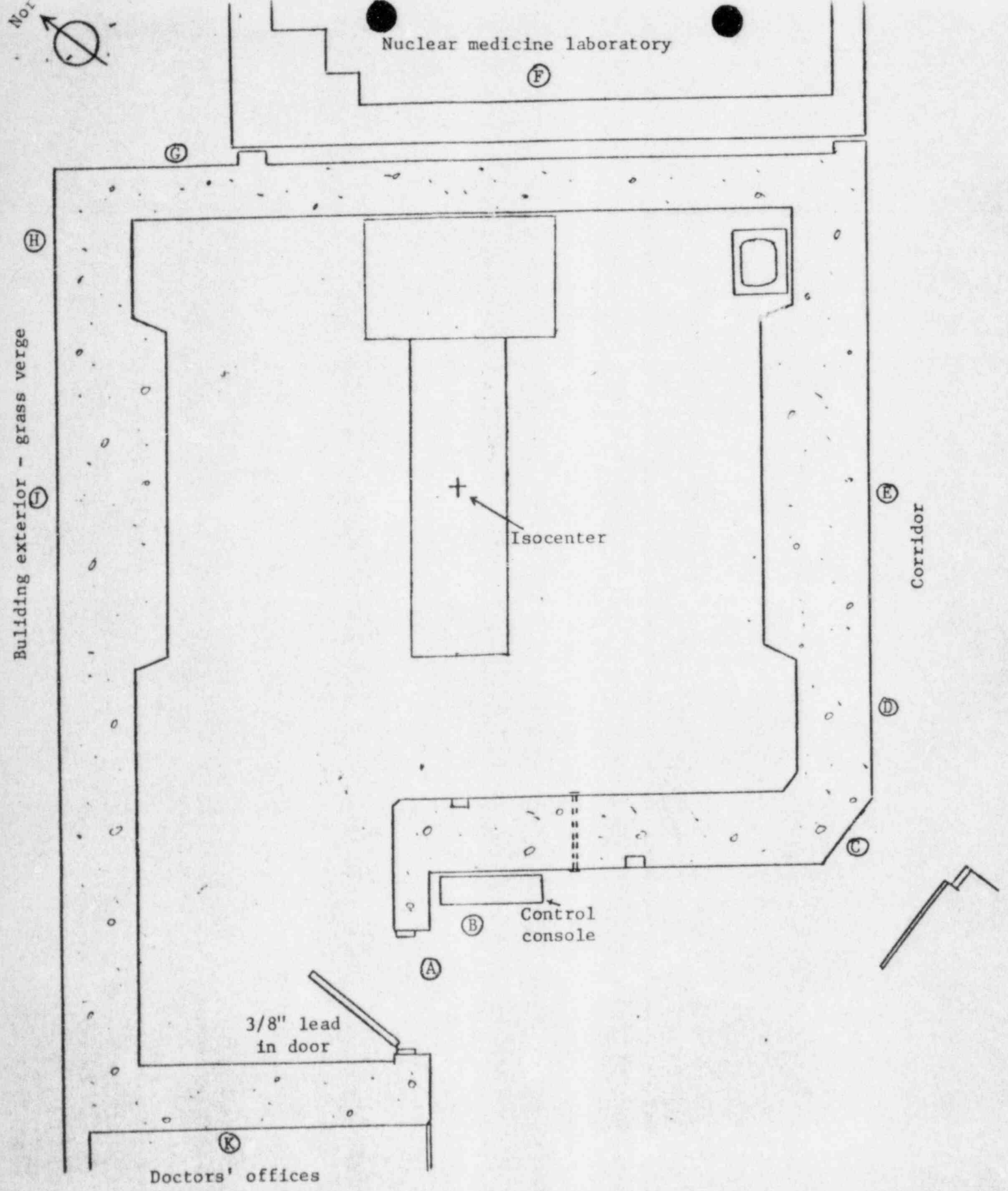
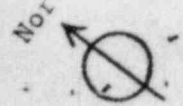
The overall accuracy of the timer was checked by setting it for integer and fractional minutes and verifying that the elapsed exposure time agreed with an independent stopwatch. The timer correction term as measured by the method explained in ANSI N 449.1 - 1978, Section 4.14.1, is - 1.1 seconds (true exposure time equals timer setting minus 1.1 seconds).

The above information was provided by P.S. Rao, Ph.D., our consulting physicist. If additional information is needed, please do not hesitate to call us or P.S. Rao. His telephone number is (216) 444-1295.

Sincerely,


Theodore J. Casale, M.D.
Director of Radiology

TJC:sh



Plan of cobalt teletherapy room equipped with AECL Theratron 780 in basement of Lutheran Medical Center, Cleveland, Ohio.

SURVEY REPORT OF COBALT TELETHERAPY UNIT

Institution

Lutheran Medical Center
2609 Franklin Boulevard
Cleveland, Ohio 44113.

NRC License No.

34-01869-02

Teletherapy Unit

AECL G2200P Theratron 780 with beam stopper.

Teletherapy Source

AECL Type C-151 Co60C, certified as containing 4614 curies of Cobalt-60 on March 20, 1979. Serial No. 2943

Date of Installation

Unit initially installed on August 30, 1979. Use of unit permitted only after February 20, 1980 following installation of room door according to design specifications.

Surveyor

P.S. Rao, PhD
Department of Radiology
University Hospitals of Cleveland
Cleveland, Ohio 44106.

Dates of Survey

February 12, 1980, February 21, 1980 and February 24, 1980.

Survey Instruments

1. Victoreen 444 ion chamber survey meter, last calibrated by P.S. Rao (see above) according to the procedure described and approved in Nrc License No. 34-05469-01.
2. Victoreen 555 electrometer with Victoreen 555-100HA chamber, last calibrated by Regional Calibration Laboratory, Victoreen Company, Cleveland, Ohio, on May 30, 1978.

Source Output

The following are representative of the complete set of exposure rates measured in air on the beam axis for a source-to-chamber distance of 80 cm:

Field size (cm x cm)	Output (R/min)
5 x 5	129.4
10 x 10	133.8
20 x 20	139.6
35 x 35	140.4

Head Survey

Radiation levels were measured at 14 points that were one meter from the teletherapy source in the "off" position. The average level was 0.2 mR/hr and the maximum was 0.4 mR/hr. Details are presented in the accompanying diagram.

Beam Orientation Limits

With the beam directed at the integral beam absorber, no restrictions existed on the orientation of the beam.

With the beam directed away from the integral beam absorber, electrical beam stops permitted the beam to be turned on only if it was within a 90° arc between vertically down and horizontally towards the outer (northwest) wall of the building. See accompanying room plans.

The above restrictions were tested by rotating the sourcehead-absorber arm to various positions (gantry angles of 0°, 30°, 60°, 90°, 270° and 315°), swivelling the sourcehead to various directions and attempting to turn the beam on. Results were as described above.

Area Survey

Radiation levels were measured in areas adjacent to the teletherapy room for a variety of beam orientations. Details are shown in the accompanying table. For these measurements, the collimators were opened to the maximum extent (35 cm x 35 cm at 80 cm). The phantom, where used, was of water and of dimensions 25 cm x 25 cm x 22 cm.

With one exception, all measured levels fell within the limit of 2 mR/hr for unrestricted areas. The exception was the area just outside the outer wall, where a maximum of 7.8 mR/hr was measured. This was for a beam orientation in which the beam was directed horizontally at the wall and the beam axis was 175 cm (5' 9") above the ground. For more likely orientations, the radiation levels were within 2 mR/hr.

Door Interlock

The electrical interlock on the door was found to operate properly. When the door was open, the beam could not be turned on. After the door was shut, the beam was turned on. When the door was opened again, the beam was shut off immediately. To turn it on again, the timer switch had to be turned off, the reset button depressed and the timer switch turned on again.

On-Off Indicators

All on-off indicators were found to operate properly. They were tested during the calibration phase of the survey, when the electrometer and ion chamber served as an independent check on the presence of the radiation beam.

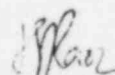
When the beam was turned on, lights glowed on the control console and over the door. Using the TV monitor, one could observe a light on the sourcehead, as well as a portion of the source drawer which protruded from the sourcehead. An area radiation monitor inside the teletherapy room had been set so that a light over the control console flashed on and off whenever the beam was on. The monitor would sound an alarm only if the door were open.

Timer

The timer was checked against an independent stopwatch and was found to operate properly when set for both integral and fractional minutes.

Viewing System

A TV camera and monitor were used to view the patient during treatments.



P.S. Rao, PhD
Radiologic Physicist

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	0.1
2	0.2
3	0.3
4	0.3

View B 5	0.1
6	0.1
7	0.1
8	0.3

View C 9	0.2
10	0.3

View D 11	0.1
12	0.1
13	0.4
14	0.2

Average value 0.2

Maximum value 0.4

Instrument used Victoreen 444

RHM 98.5 Rmm

Curies 4614

Date on Mar 20, 1979

Survey on

Manufacturer's Feb 12, 1980

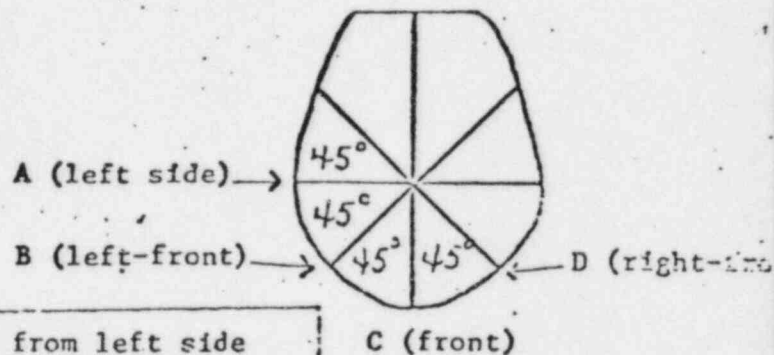
name & model of

of teletherapy

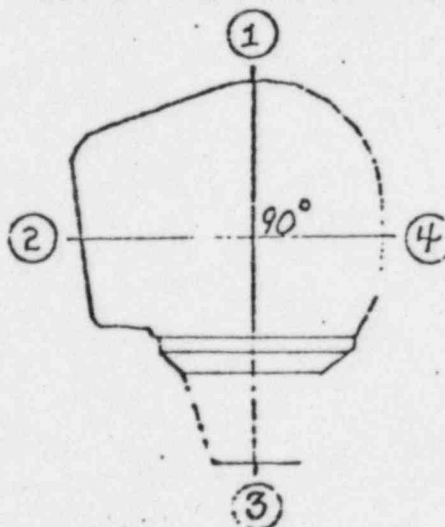
unit

AECL Theratron 780

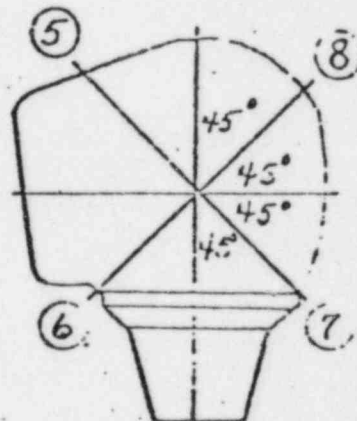
Rear



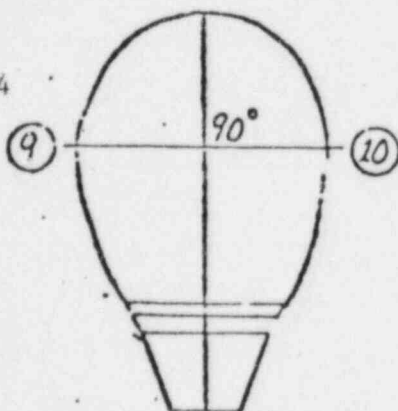
View A - Vertical from left side



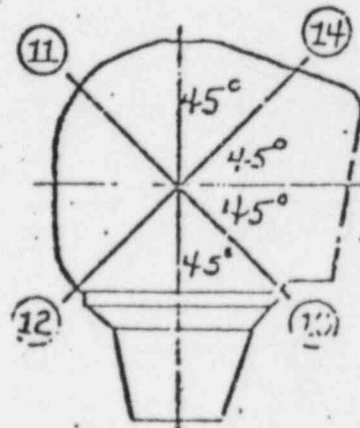
View B - Vertical from left-front

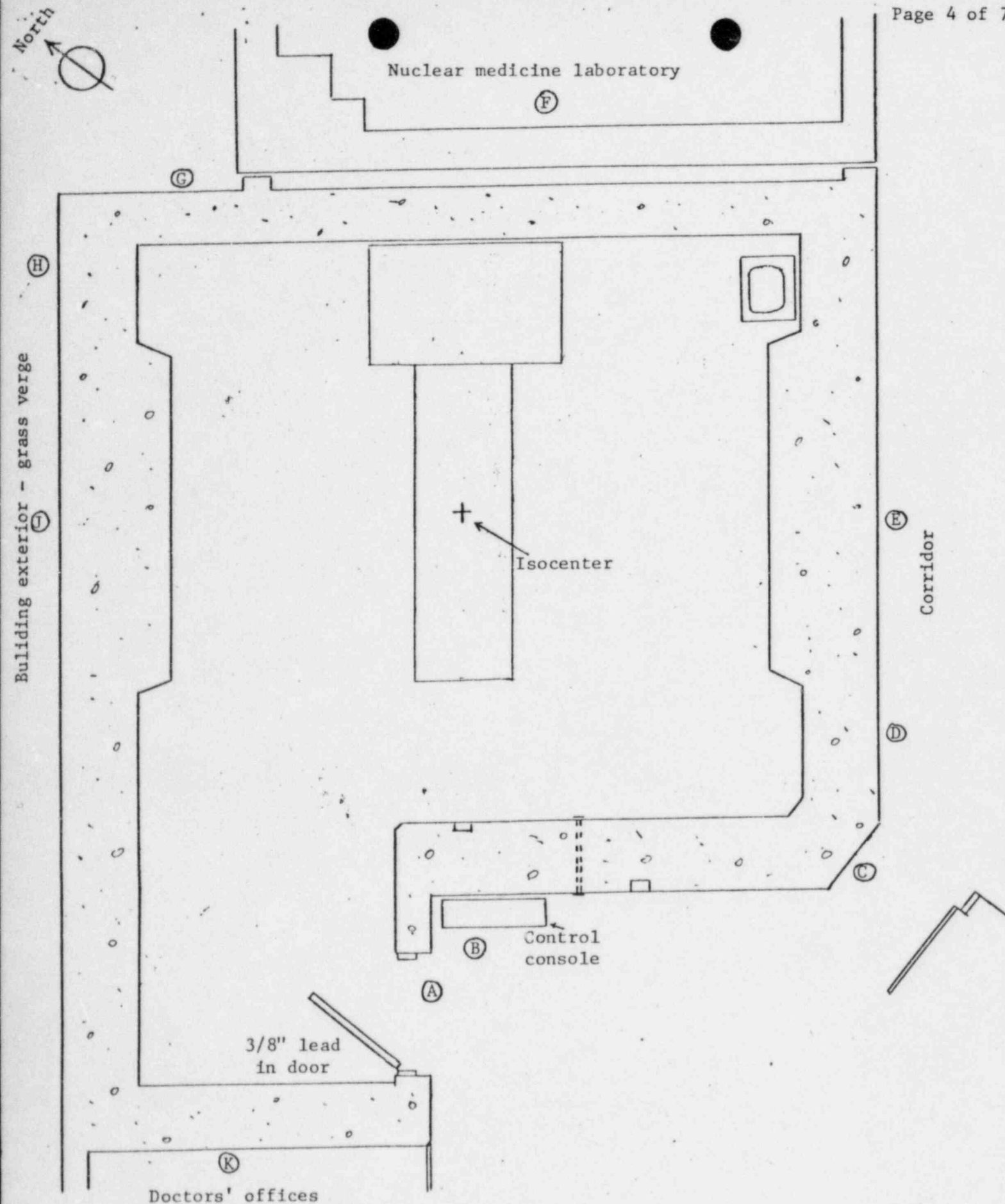


View C - Vertical from front



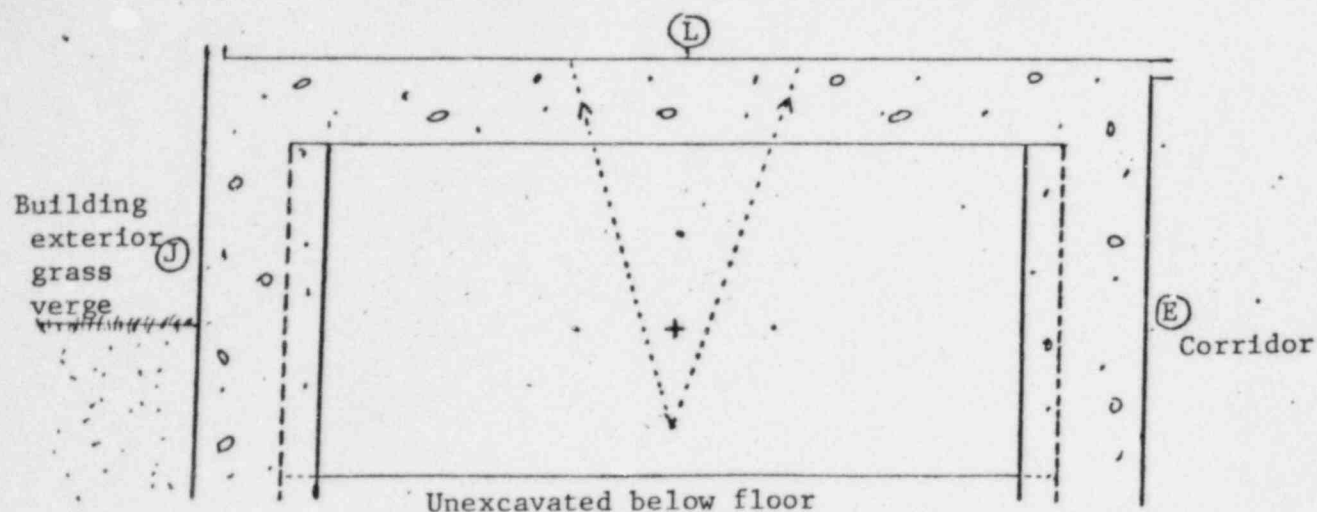
View D - Vertical from right-front





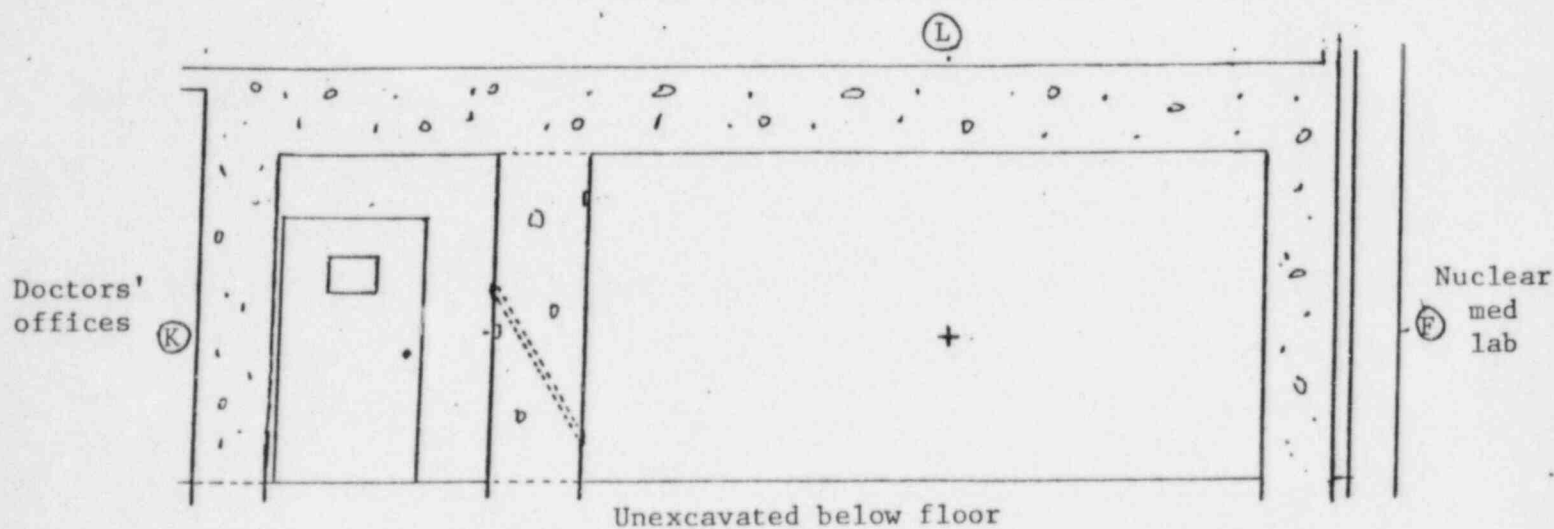
Plan of cobalt teletherapy room equipped with AECL Theratron 780 in basement of Lutheran Medical Center, Cleveland, Ohio.

First floor - conference room and office



View towards northeast

First floor - conference room and office



View towards northwest

Elevations of cobalt teletherapy room equipped with AECL Theratron 780
in basement of Lutheran Medical Center, Cleveland, Ohio.

Radiation levels (above background) near cobalt teletherapy room

Location	Orientation of beam	Beam absorber	Phantom	Primary-P or Scatter-S (Angle of scatter)	SSD (cm)	Gantry angle	Swivel angle	mR/hr
Door A	Horizontal toward outer (NW) wall	No	No	S (90° twice)	165	315°	135°	0.1
	"	No	No	S (90° twice)	260	30°	60°	0.2
	"	Yes	Yes	S (45°)	75	90°	0°	<0.1
	Nearly horizontal, slightly downwards	No	No	S (90° twice)	180	315°	105°	0.2
Control console B	Horizontal toward outer (NW) wall	No	No	S (135°)	165	315°	135°	<0.1
	"	No	No	S (135°)	260	30°	60°	<0.1
	Nearly horizontal, slightly downwards	No	No	S (135°)	180	315°	105°	<0.1
	Vertical down	Yes	Yes	S (90°)	75	0°	0°	<0.1
Corridor C, D	Vertical down	Yes	Yes	S (90°)	75	0°	0°	<0.1
	Horizontal toward corridor	Yes	Yes	S (45°)	75	270°	0°	<0.1
	Vertical down	No	Yes	S (90°)	100	60°	300°	<0.1
Corridor E	Toward corridor and downwards	Yes	Yes	S (30°)	75	300°	0°	<0.1
	"	Yes	Yes	S (45°)	75	315°	0°	<0.1

0.2