FORM NRC-313M (8-78) 10 CFR 35	U.S. NUCLEAR REGULATORY COMMISSION **APPLICATION FOR MATERIALS LICENSE – MEDICAL**	Approved: GAO R0557

INSTRUCTIONS – *Complete Items 1 through 26 if this is an initial application or an application for renewal of a license. Use supplemental sheets where necessary. Item 26 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 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 26 and the appropriate fee enclosed.*

1.a. NAME AND MAILING ADDRESS OF APPLICANT *(Institution, firm, clinic, physician, etc.)* INCLUDE ZIP CODE

LUTHERAN MEDICAL CENTER
2609 Franklin Blvd.
Cleveland, Ohio 44113

TELEPHONE NO.: AREA CODE (216) 696 - 4300

1.b. STREET ADDRESS(ES) AT WHICH RADIOACTIVE MATERIAL WILL BE USED *(If different from 1.a.)* INCLUDE ZIP CODE

2. PERSON TO CONTACT REGARDING THIS APPLICATION

Theodore J. Castele, M.D.

TELEPHONE NO.: AREA CODE (216) 696- 4300

3. THIS IS AN APPLICATION FOR: *(Check appropriate item)*

a. ☐ NEW LICENSE
b. ☒ AMENDMENT TO LICENSE NO. 34-01869-02
c. ☒ RENEWAL OF LICENSE NO. 34-01869-02

4. INDIVIDUAL USERS *(Name individuals who will use or directly supervise use of radioactive material. Complete Supplements A and B for each individual.)*

Theodore J. Castele, M.D.
Reynaldo Guillermo, M.D.
Celia Yap, M.D.

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.)*

Pijavar S. Rao, Ph.D.

6.a. RADIOACTIVE MATERIAL FOR MEDICAL USE

RADIOACTIVE MATERIAL LISTED IN:	ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS (In millicuries)
10 CFR 31.11 FOR IN VITRO STUDIES		
10 CFR 35.100, SCHEDULE A, GROUP I		AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP II		AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP III		
10 CFR 35.100, SCHEDULE A, GROUP IV		AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP V		AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP VI		

ADDITIONAL ITEMS:	MARK ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS (In millicuries)
IODINE-131 AS IODIDE FOR TREATMENT OF HYPERTHYROIDISM		
PHOSPHORUS-32 AS SOLUBLE PHOSPHATE FOR TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA AND BONE METASTASES		
PHOSPHORUS-32 AS COLLOIDAL CHROMIC PHOSPHATE FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.		
GOLD-198 AS COLLOID FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.		
IODINE-131 AS IODIDE FOR TREATMENT OF THYROID CARCINOMA		
XENON-133 AS GAS OR GAS IN SALINE FOR BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES.		

6.b. RADIOACTIVE MATERIAL FOR USES NOT LISTED IN ITEM 6.a. *(Sealed sources up to 3 mCi used for calibration and reference standards are authorized under Section 35.14(d), 10 CFR Part 35, and NEED NOT BE LISTED.)*

ELEMENT AND MASS NUMBER	CHEMICAL AND/OR PHYSICAL FORM	MAXIMUM NUMBER OF MILLICURIES OF EACH FORM	DESCRIBE PURPOSE OF USE
COBALT-60	Teletherapy Sealed Sources	24,000 curies (Maximum 6,000 in one source)	Please refer to application for license no. 34-01869-02, to subsequent application for it's renewal and amendments one (1) through nine (9).

7902280393 32 pp.

INFORMATION REQUIRED FOR ITEMS 7 THROUGH 23

For Items 7 through 23, 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 medical licensing guide will be followed, do not submit the pages, but specify the revision number and date of the referenced guide: Regulatory Guide 10.8 , Rev. _____ Date: _____

7. MEDICAL ISOTOPES COMMITTEE	
X	Names and Specialties Attached; and
	Duties as in Appendix B; or *(Check One)*
X	Equivalent Duties Attached
8. TRAINING AND EXPERIENCE	
X	Supplements A & B Attached for Each Individual User; and
X	Supplement A Attached for RSO.
9. INSTRUMENTATION *(Check One)*	
	Appendix C Form Attached; or
X	List by Name and Model Number
10. CALIBRATION OF INSTRUMENTS	
	Appendix D Procedures Followed for Survey Instruments; or *(Check One)*
X	Equivalent Procedures Attached; and
	Appendix D Procedures Followed for Dose Calibrator; or *(Check One)*
	Equivalent Procedures Attached
11. FACILITIES AND EQUIPMENT	
	Description and Diagram Attached
12. PERSONNEL TRAINING PROGRAM	
	Description of Training Attached
13. PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL	
	Detailed Information Attached
14. PROCEDURES FOR SAFELY OPENING PACKAGES CONTAINING RADIOACTIVE MATERIALS *(Check One)*	
	Appendix F Procedures Followed; or
	Equivalent Procedures Attached

15. GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL *(Check One)*	
	Appendix G Rules Followed; or
	Equivalent Rules Attached
16. EMERGENCY PROCEDURES *(Check One)*	
	Appendix H Procedures Followed; or
X	Equivalent Procedures Attached
17. AREA SURVEY PROCEDURES *(Check One)*	
	Appendix I Procedures Followed; or
	Equivalent Procedures Attached
18. WASTE DISPOSAL *(Check One)*	
	Appendix J Form Attached; or
	Equivalent Information Attached
19. THERAPEUTIC USE OF RADIOPHARMACEUTICALS *(Check One)*	
	Appendix K Procedures Followed; or
	Equivalent Procedures Attached
20. THERAPEUTIC USE OF SEALED SOURCES	
	Detailed Information Attached; and
	Appendix L Procedures Followed; or *(Check One)*
	Equivalent Procedures Attached
21. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE GASES (e.g., Xenon – 133)	
	Detailed Information Attached
22. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL IN ANIMALS	
	Detailed Information Attached
23. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL SPECIFIED IN ITEM 6.b	
	Detailed Information Attached

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24. PERSONNEL MONITORING DEVICES

TYPE (Check appropriate box)			SUPPLIER	EXCHANGE FREQUENCY
a. WHOLE BODY	X	FILM	R.S. Landauer, Company	Two (2) weeks
		TLD		
		OTHER (Specify)		
b. FINGER		FILM		
		TLD		
		OTHER (Specify)		
c. WRIST		FILM		
		TLD		
		OTHER (Specify)		

d. OTHER (Specify)

25. FOR PRIVATE PRACTICE APPLICANTS ONLY

a. HOSPITAL AGREEING TO ACCEPT PATIENTS CONTAINING RADIOACTIVE MATERIAL

NAME OF HOSPITAL

MAILING ADDRESS

CITY | STATE | ZIP CODE

b. ATTACH A COPY OF THE AGREEMENT LETTER SIGNED BY THE HOSPITAL ADMINISTRATOR.

c. WHEN REQUESTING THERAPY PROCEDURES, ATTACH A COPY OF RADIATION SAFETY PRECAUTIONS TO BE TAKEN AND LIST AVAILABLE RADIATION DETECTION INSTRUMENTS.

26. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 1a certify 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 any supplements attached hereto, is true and correct to the best of our knowledge and belief.

a. LICENSE FEE REQUIRED *(See Section 170.31, 10 CFR 170)*

(1) LICENSE FEE CATEGORY: 7 A

(2) LICENSE FEE ENCLOSED: $ 310.00 ($ 40 - Amendment) ($270 - Renewal)

b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)*

Theodore J. Castele, M.D.

(1) NAME *(Type or Print)*

Director of Radiology

(2) TITLE

1-22-79

c. DATE

FORM NRC-313M (8-78)

FORM NRC-313M-SUPPLEMENT A
(8-78)

U.S. NUCLEAR REGULATORY COMMISSION

TRAINING AND EXPERIENCE
AUTHORIZED USER OR RADIATION SAFETY OFFICER

1. NAME OF AUTHORIZED USER OR RADIATION SAFETY OFFICER	2. STATE OR TERRITORY IN WHICH LICENSED TO PRACTICE MEDICINE
Theodore J. Castele, M.D.	

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C
DR. THEODORE J. CASTELE, M.D. HAS BEEN PREVIOUSLY AUTHORIZED TO USE RADIOACTIVE MATERIAL. PLEASE REFER TO LICENSE NO. 34-01869-02.		

4. TRAINING RECEIVED IN BASIC RADIOISOTOPE HANDLING TECHNIQUES

FIELD OF TRAINING A	LOCATION AND DATE(S) OF TRAINING B	TYPE AND LENGTH OF TRAINING	
		LECTURE/ LABORATORY COURSES *(Hours)* C	SUPERVISED LABORATORY EXPERIENCE *(Hours)* D
a. RADIATION PHYSICS AND INSTRUMENTATION			
b. RADIATION PROTECTION			
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY			
d. RADIATION BIOLOGY			
e. RADIOPHARMACEUTICAL CHEMISTRY			

5. EXPERIENCE WITH RADIATION. *(Actual use of Radioisotopes or Equivalent Experience)*

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE

FORM NRC-313M-SUPPLEMENT A (8-78) — U.S. NUCLEAR REGULATORY COMMISSION

TRAINING AND EXPERIENCE
AUTHORIZED USER OR RADIATION SAFETY OFFICER

1. NAME OF AUTHORIZED USER OR RADIATION SAFETY OFFICER	2. STATE OR TERRITORY IN WHICH LICENSED TO PRACTICE MEDICINE
Pejavar Sridhar Rao, Ph.D.	

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C
American Board of Radiology	Radiological Physics	December 1976

4. TRAINING RECEIVED IN BASIC RADIOISOTOPE HANDLING TECHNIQUES

FIELD OF TRAINING A	LOCATION AND DATE(S) OF TRAINING B	TYPE AND LENGTH OF TRAINING: LECTURE/LABORATORY COURSES (Hours) C	TYPE AND LENGTH OF TRAINING: SUPERVISED LABORATORY EXPERIENCE (Hours) D
a. RADIATION PHYSICS AND INSTRUMENTATION	Case Western Reserve University/University Hospitals January 1971 - December 1972	20	1000
b. RADIATION PROTECTION	" "	20	1000
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	" "	20	-
d. RADIATION BIOLOGY	" "	15	-
e. RADIOPHARMACEUTICAL CHEMISTRY	" "	5	-

5. EXPERIENCE WITH RADIATION. *(Actual use of Radioisotopes or Equivalent Experience)*

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE

FORM NRC-313M-SUPPLEMENT A
(8-78)

U.S. NUCLEAR REGULATORY COMMISSION

TRAINING AND EXPERIENCE
AUTHORIZED USER OR RADIATION SAFETY OFFICER

1. NAME OF AUTHORIZED USER OR RADIATION SAFETY OFFICER	2. STATE OR TERRITORY IN WHICH LICENSED TO PRACTICE MEDICINE
Dr. Reynaldo F. Guillermo	Ohio, New York, Florida

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C
General Radiology Written Only		

4. TRAINING RECEIVED IN BASIC RADIOISOTOPE HANDLING TECHNIQUES

FIELD OF TRAINING A	LOCATION AND DATE(S) OF TRAINING B	TYPE AND LENGTH OF TRAINING	
		LECTURE/ LABORATORY COURSES (Hours) C	SUPERVISED LABORATORY EXPERIENCE (Hours) D
a. RADIATION PHYSICS AND INSTRUMENTATION	Albert Einstein College Hospital Dept.-Radiotherapy, Bronx, NY	140 hrs.	90 hrs.
b. RADIATION PROTECTION	" "	120 hrs.	70 hrs.
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	" "	140 hrs.	90 hrs.
d. RADIATION BIOLOGY	" " Montefiore Hosp. Bronx, NY	30 hrs. 20 hrs.	
e. RADIOPHARMACEUTICAL CHEMISTRY	" "	50 hrs.	

5. EXPERIENCE WITH RADIATION. *(Actual use of Radioisotopes or Equivalent Experience)*

	ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
1)	Cs^{137}	25-30 mg.	Albert Einstein College Hospital, Bronx, NY	3 Years	Intracavitary
2)	Radium	5-15 mg.	"	3 Years	Interstitial (Head & Neck)
3)	Struntion ^{90}		"	3 Years	Contact
4)	IR-192	10-20 mg.	"	1 Year	Interstitial

FORM NRC-313M-SUPPLEMENT B
(8-78)

U. S. NUCLEAR REGULATORY COMMISSION

PRECEPTOR STATEMENT

Supplement B must be completed by the applicant physician's preceptor. If more than one preceptor is necessary to document experience, obtain a separate statement from each.

1. APPLICANT PHYSICIAN'S NAME AND ADDRESS

FULL NAME
REYNALDO F GUILLERMO

STREET ADDRESS LUTHERAN MEDICAL CENTER
DEPT OF RADIOLOGY
2609 FRANKLIN BLVD

CITY	STATE	ZIP CODE
CLEVELAND	OHIO	44113

KEY TO COLUMN C

PERSONAL PARTICIPATION SHOULD CONSIST OF:

1-Supervised examination of patients to determine the suitability for radioisotope diagnosis and/or treatment and recommendation for prescribed dosage.

2-Collaboration in dose calibration and actual administration of dose to the patient including calculation of the radiation dose, related measurements and plotting of data.

3-Adequate period of training to enable physician to manage radioactive patients and follow patients through diagnosis and/or course of treatment.

2. CLINICAL TRAINING AND EXPERIENCE OF ABOVE NAMED PHYSICIAN

ISOTOPE A	CONDITIONS DIAGNOSED OR TREATED B	NUMBER OF CASES INVOLVING PERSONAL PARTICIPATION C	COMMENTS *(Additional information or comments may be submitted in duplicate on separate sheets.)* D
I-131 or I-125	DIAGNOSIS OF THYROID FUNCTION		
	DETERMINATION OF BLOOD AND BLOOD PLASMA VOLUME		
	LIVER FUNCTION STUDIES		
	FAT ABSORPTION STUDIES		
	KIDNEY FUNCTION STUDIES		
	IN VITRO STUDIES		
OTHER			
I-125	DETECTION OF THROMBOSIS		
I-131	THYROID IMAGING		
P-32	EYE TUMOR LOCALIZATION		
Se-75	PANCREAS IMAGING		
Yb-169	CISTERNOGRAPHY		
Xe-133	BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES		
OTHER			
Tc-99m	BRAIN IMAGING		
	CARDIAC IMAGING		
	THYROID IMAGING		
	SALIVARY GLAND IMAGING		
	BLOOD POOL IMAGING		
	PLACENTA LOCALIZATION		
	LIVER AND SPLEEN IMAGING		
	LUNG IMAGING		
	BONE IMAGING		
OTHER			

PRECEPTOR STATEMENT *(Continued)*

2. CLINICAL TRAINING AND EXPERIENCE OF ABOVE NAMED PHYSICIAN *(Continued)*

ISOTOPE A	CONDITIONS DIAGNOSED OR TREATED B	NUMBER OF CASES INVOLVING PERSONAL PARTICIPATION C	COMMENTS *(Additional information or comments may be submitted in duplicate on separate sheets.)* D
P-32 *(Soluble)*	TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA, AND BONE METASTASES	0	
P-32 *(Colloidal)*	INTRACAVITARY TREATMENT	3	
I-131	TREATMENT OF THYROID CARCINOMA	81	
	TREATMENT OF HYPERTHYROIDISM	0	
Au-198	INTRACAVITARY TREATMENT	0	
Co-60 or Cs-137	INTERSTITIAL TREATMENT	20	
	INTRACAVITARY TREATMENT	110	
I-125 or Ir-192	INTERSTITIAL TREATMENT	3	
Co-60 or Cs-137	TELETHERAPY TREATMENT	600	
Sr-90	TREATMENT OF EYE DISEASE	40	
	RADIOPHARMACEUTICAL PREPARATION		
Mo-99/ Tc-99m	GENERATOR		
Sn-113/ In-113m	GENERATOR		
Tc-99m	REAGENT KITS		
Other			

3. DATES AND TOTAL NUMBER OF HOURS RECEIVED IN CLINICAL RADIOISOTOPE TRAINING

1/77 - 3/77 480 hrs

4. THE TRAINING AND EXPERIENCE INDICATED ABOVE WAS OBTAINED UNDER THE SUPERVISION OF:

a. NAME OF SUPERVISOR

J. BOSWORTH M.D.

b. NAME OF INSTITUTION

Albert Einstein College of Medicine

c. MAILING ADDRESS

1825 Eastchester Rd

d. CITY

Bronx N.Y. 10461

5. MATERIALS LICENSE NUMBER(S)

as part of NRC Institutional permit - 88-3

6. PRECEPTOR'S SIGNATURE

7. PRECEPTOR'S NAME *(Please type or print)*

8. DATE

FORM NRC-313M-SUPPLEMENT B
(8-78)

FORM NRC-313M-SUPPLEMENT A
(8-78)

U.S. NUCLEAR REGULATORY COMMISSION

TRAINING AND EXPERIENCE
AUTHORIZED USER OR RADIATION SAFETY OFFICER

1. NAME OF AUTHORIZED USER OR RADIATION SAFETY OFFICER	2. STATE OR TERRITORY IN WHICH LICENSED TO PRACTICE MEDICINE
CELIA YAP, M.D.	OHIO

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C
RADIOLOGY		DEC, 1974

4. TRAINING RECEIVED IN BASIC RADIOISOTOPE HANDLING TECHNIQUES

FIELD OF TRAINING A	LOCATION AND DATE(S) OF TRAINING B	TYPE AND LENGTH OF TRAINING	
		LECTURE/ LABORATORY COURSES (Hours) C	SUPERVISED LABORATORY EXPERIENCE (Hours) D
a. RADIATION PHYSICS AND INSTRUMENTATION	CASE WESTERN RESERVE UNIVERSITY 1970-1971, 1972-1973	1 hr/wk	
b. RADIATION PROTECTION	CASE WESTERN RESERVE UNIVERSITY 1970-1971, 1972-1973	1 hr/wk	
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	CASE WESTERN RESERVE UNIVERSITY 1970-1971, 1972-1973	1 hr/wk	
d. RADIATION BIOLOGY	CASE WESTERN RESERVE UNIVERSITY 1969-1970, 1971-1972	1 hr/wk	
e. RADIOPHARMACEUTICAL CHEMISTRY	CASE WESTERN RESERVE UNIVERSITY 1969-1970, 1971-1972	1 hr/wk	

5. EXPERIENCE WITH RADIATION. (Actual use of Radioisotopes or Equivalent Experience)

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE
		Mount Sinai Hospital Cleveland Ohio Lutheran Medical Center Cleveland Ohio	1972 - as part of residency program 1974 - present

PRECEPTOR STATEMENT *(Continued)*

2. CLINICAL TRAINING AND EXPERIENCE OF ABOVE NAMED PHYSICIAN *(Continued)*

ISOTOPE A	CONDITIONS DIAGNOSED OR TREATED B	NUMBER OF CASES INVOLVING PERSONAL PARTICIPATION C	COMMENTS *(Additional information or comments may be submitted in duplicate on separate sheets.)* D
P-32 *(Soluble)*	TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA, AND BONE METASTASES	0	
P-32 *(Colloidal)*	INTRACAVITARY TREATMENT	0	
I-131	TREATMENT OF THYROID CARCINOMA	0	
	TREATMENT OF HYPERTHYROIDISM	10	
Au-198	INTRACAVITARY TREATMENT	0	
Co-60 or Cs-137	INTERSTITIAL TREATMENT	2	
	INTRACAVITARY TREATMENT	5	
I-125 or Ir-192	INTERSTITIAL TREATMENT	0	
Co-60 or Cs-137	TELETHERAPY TREATMENT	~ 20 ~ 25 patients/day for 9 months	
Sr-90	TREATMENT OF EYE DISEASE	2	
	RADIOPHARMACEUTICAL PREPARATION		
Mo-99/ Tc-99m	GENERATOR		
Sn-113/ In-113m	GENERATOR		
Tc-99m	REAGENT KITS		
Other			

3. DATES AND TOTAL NUMBER OF HOURS RECEIVED IN CLINICAL RADIOISOTOPE TRAINING

4. THE TRAINING AND EXPERIENCE INDICATED ABOVE WAS OBTAINED UNDER THE SUPERVISION OF:

a. NAME OF SUPERVISOR

b. NAME OF INSTITUTION

c. MAILING ADDRESS

d. CITY

5. MATERIALS LICENSE NUMBER(S)

6. PRECEPTOR'S SIGNATURE

× SEE ATTACHED LETTER.

7. PRECEPTOR'S NAME *(Please type or print)*

8. DATE

FORM NRC-313M-SUPPLEMENT B
(5-78)

CUYAHOGA COUNTY HOSPITAL

• CLEVELAND METROPOLITAN GENERAL HOSPITAL •
3395 SCRANTON ROAD • CLEVELAND, OHIO 44109 • 216-398-6000

HENRY E. MANNING
PRESIDENT

GLENN E. POTTER
VICE PRESIDENT OPERATIONS

January 29, 1979

Nuclear Regulatory Commission
Materials Licensing Division
Washington, D.C. 20555

Celia L. Yap, M.D.

Gentlemen:

As former Acting Director of the Department of Radiology at Cleveland Metropolitan General Hospital, I have been asked by Dr. Celia L. So Yap to forward a summary of her training and experience in Nuclear Medicine and Radiation Therapy.

Dr. Yap was a resident in the Department of Radiology at Cleveland Metropolitan General Hospital from July 1, 1969 through June 30, 1972. She had her Nuclear Medicine rotation at Mt. Sinai Hospital of Cleveland for three months and spent approximately 500 hours in clinical radioisotope training. She participated in approximately 900 examinations.

She has training and experiences with the following radioisotopes:

Tc^{99m} for bone imaging, lung imaging, liver and spleen imaging, brain imaging, thyroid imaging, cardiac imaging, blood pool imaging and placenta localization.

I-125 and I-131 for in vitro and in vivo thyroid studies, thyroid imaging, liver function studies, kidney function studies, determination of blood and blood plasma volume, fat absorption studies and cisternography.

Se-75 for pancreas imaging and Xe-133 for pulmonary function studies.

As part of the residency program, she spent nine months in Radiation Therapy and treated an average of 20-25 patients per day. She participated in the treatment of patients using the following modalities:

Cobalt-60 teletherapy, Superficial therapy, Sr-90 application for the treatment of eye diseases and interstitial and intracavitary treatment with Cs-137 needles.

Sincerely yours,

Alvin Segel, M.D.
Associate Radiologist
Cuyahoga County Hospital

AS:iwj

NUCLEAR MEDICINE (ISOTOPE) COMMITTEE

The Nuclear Medicine Committee of Lutheran Medical Center was formed in compliance with Section 35.11(B)10CFR35 which requires an institutional licensee to appoint a Medical Isotope Committee to review and evaluate all proposals for research, diagnostic and therapeutic uses of radioisotopes within the institution. The committee's duties and responsibilities are set out in Section 35.11(B)10CFR35. In particular, the Nuclear Medicine Committee of Lutheran Medical Center and the Divisions of Nuclear Medicine and Radiation Therapy carry out their responsibilities and functions as prescribed in Federal Law using guidelines endorsed by recognized organizations having to do with radiation i.e. American College of Radiology, American Association Physicists in Medicine, The American Radium Society, The Society of Therapeutic Radiologist, Society of Nuclear Medicine, The National Committee for Radiation Protection, The International Atomic Energy Agency, and The International Committee of Radiation Protection.

The Nuclear Medicine Committee is established by authority of the Medical Chief of Staff. The Committee reports directly to the Medical Council of the Center and gives an annual report of it's continuing activities to the Medical Staff, as well as, periodic reports throughout the year in conjuncture with necessity. The Committee is made up as follows:

Howard Neiberg, M.D. (Committee Chairman and Radiologist)
William Forsythe III, M.D. (Urologist)
William Sinclair, M.D. (Pathologist)
Harris Taylor, M.D. (Endocrinology)
John Sampliner, M.D. (Radiologist)
Pejavar Sridhar Rao, Ph.D. (Radiation Physicist)
Janet Dostal, R.T. (A.R.R.T)
Rajni Patel, R.T. (Nuclear Medicine)

This Committee acts in advisory and consultative capacity to the Divisions of Nuclear Medicine and Radiation Therapy and the Director of the Department of Radiology, Theodore J. Castele, M.D. Day to day responsibility for the running of the department is assigned to specific individuals. Responsibility for radiation safety in the entire Department of Radiology is delegated to the Radiation Physicist.

Duties of the Committee also include the responsibility for the maintenance or written records of the following: receipts, storage and disposal of all radioisotopes used in the Medical Center, staff radiation exposure, and all proceedings of the Committee. The Committee is also responsible for dissemination of all information pertaining to radioisotopes in the Medical Center and is kept informed of all NRC rules and regulations. In turn, the NRC is kept informed of all changes in membership of the Committee.

The Committee assembles for an annual meeting at which time a report from the Director of the Department of Radiology on the work of the department for the preceding year is delivered. This report includes a summary of the radiation safety records of the department, results of the radioisotope procedures carried out in the Division of Nuclear Medicine, and a discussion of equipment and radiopharmaceutical performance. In the light of this report the Committee recommends any necessary modification to procedures with a view to improving safety for both staff and patients. All new procedures and/or modifications in procedure are presented to the Committee for review and evaluation.

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Additional meeting of the Committee may take place periodically during the year, as deemed necessary, in order to deal with current and specific radioisotope procedures and/or equipment and radio-pharmaceutical performance witnin the Division of Nuclear Medicine.

RADIATION SURVEY AND MONITORING INSTRUMENTATION

INSTRUMENT	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE	WINDOW THICKNESS	USE
Jordan Radector AGB-500 B-SR has 10 uCi. Krypton-85 source substituted for original 10 uCi. SR-90 source.	1	Gamma Beta	0-500,000 0-500		Monitoring, Surveying, Measuring.
Jordan Radiation Survey Meter, Model 710	1	Gamma	0-500 0-5,000 0-50,000		Monitoring, Surveying, Measuring.
Anton Electronic Lab, Inc. Radiological Survey Meter, Model CDV-700.	1	Gamma Beta	0-500 0-5,000 0-500,000		Monitoring, Surveying.
Nuclear-Chicago RIDL Module, Model 40-12B, 33-13A, 49-26, 54-7 with a 2-inch NaI Thallium-Activated Crystal in a NRD Instrument Co Lead-Collimated Shield.	1	Gamma	NOT CALIBRATED FOR ROENTGENS	300 mgm./cm.^{2}	Measuring
Victoreen Model 444 Portable Health Physics Instrument.	1	Alpha, Beta,	0-3mR/hr. Full Scale to 0-300 R/hr. Full scale in 10 ranges.	1.5mg./cm.^{2}	Surveying, Monitoring.
NRD Instrument Co. Well Scintillation Counter, Model CS-660	1	Gamma	300 mgm./cm.^{2}		Measuring
Tobor Large Sample Counting System, Model 825 with two opposing Movable 3x3 inch Sodium Iodide Thallium -Activated Crystals	1	Gamma	NOT CALIBRATED FOR ROENTGENS		Measuring
Nuclear-Chicago Analyzer Scaler, Model No. 8725 with Franklin Digital Printer Model 812830	1				Measuring
Victoreen Radocon II Model 555	1	Gamma	Rate 0.3 mr. per minute to 1,000 r. per minute Integrate 3 mr. to 10,000r.	Air equivalent plastic for all four chambers.	Calibration.

LEAK TESTING

Leak tests are performed by P. S. Rao, Ph.D., consulting RSO, or by members of Ray-Con, the group of radiologic physicists at the Department of Radiology, University Hospitals, Cleveland, Ohio.

LEAK TEST PROCEDURE AS FOLLOWED BY RAY-CON

a) Method of taking samples:

1. Gather materials used - 4 wipe sticks (Q-tips), 4 strips of polyethylene, adhesive tape, 1 plastic vial, 1 pair gloves, 1 plastic bag, GM survey meter.

2. Mark the wipe sticks on the stems near the cotton swabs with indelible ink so that they are distinguishable from each other. Moisten the swabs.

3. Ascertain that the source is in the OFF position. Wear personnel monitoring device. Put gloves on.

4. Wipe four different accessible areas on sourcehead with the four swabs, noting which swab wiped a particular area. (On the Theratron F, the four areas are (i) sourcehead-collimator junction, (ii) bottom of collimator, (iii) collimator adjustment knobs, and (iv) inside of emergency shutter release screw.)

5. Break each stick so that part including swab and distinguishing mark is about 2" long. Wrap each stick in cellophane strip and seal with adhesive tape. Insert all four sticks in plastic vial.

6. Monitor gloves, and if no activity above background is detected, insert into plastic bag. Discard bag only after later analysis has shown that no contamination is present.

7. Wash hands and monitor for activity over background.

8. Monitor plastic vial for activity over background.

9. Analyse vial in well counter as described below.

10. If contamination is detected, analyse sticks individually to locate source of contamination.

b) Instruments:

1. NMC (Nuclear Measurements, Indianapolis) well type scintillation counter and pulse height analyser Model PHA-1CA.

2. Packard scaler and timer Model 47-26 with printer.

3. Co-60 standard source of known activity.

LEAK TESTING (CONTINUED)

c) Method of Analysis:

1. High Voltage and window of the counting system are set to count Co-60 radiation.

2. Count the background and determine the background count/minute.

3. Count the sample and determine the net sample count perminute, N_s.

4. Count the Co-60 standard and determine the net count/minute of the standard, N.

5. Activity of the sample in micro curie = $\frac{A}{N} \times N_s$ where A is the activity of the standard in microcurie.

d) Sensitivity of the Counting System:

By counting the background and sample for 2 hours each, the minimum detectability is 4×10^{-6} microcurie. Criteria used for the minimum detectability is net count/minute of the sample = 3 times the standard deviationion of the background count per minute.

CALIBRATION OF SURVEY INSTRUMENTS

Check appropriate items

X 1. Survey instruments will be calibrated at least annually and following repair.

X 2. Calibration will be performed at two points on each scale. The two points will be approximately 1/3 and 2/3 of full scale. A survey instrument may be considered properly calibrated when the instrument readings are within ± 10% of the calculated or known values for each point checked. Readings within ± 20% are considered acceptable if a calibration chart or graph is prepared and attached to the instrument.

X 3. Survey instruments will be calibrated

____ a. By the manufacturer

____ b. At the licensee's facility

(i) Calibration source
Manufacturer's name _____
Model no. _____
Activity in millicuries _____
Accuracy _____
Traceability to primary standard _____

(ii) The calibration procedures in Appendix D, Section I will be used.

or

(iii) The step-by-step procedures, including radiation safety procedures are attached.

X c. By a consultant or outside firm

(i) Name Ray-con (Group of Radiologic Physicists)

(ii) Location Radiology Department University Hospitals, Cleveland, Ohio 44106

(iii) Procedures and sources

X have been approved by NRC and are on file in License No. 34-05469-01

____ are attached

TELETHERAPY UNIT EMERGENCY PROCEDURE

In the event of equipment failure resulting in the source remaining on, immediately enter the treatment room and proceed with the following:

STEP 1: Close adjustable field definer.

STEP 2: Remove patient from treatment room.

STEP 3: Close, lock and post treatment room door.

STEP 4: Telephone: Dr. Guillermo (524-2510)

General Electric Company (362-4351)

To manually close the emergency shutter perform the following:

1. Remove large thumb screw from front of head.
2. Remove steel rod clipped to top of head.
3. Insert rod into thumb screw and thumb screw hole and push emergency shutter closed.

CAUTION: STAY OUT OF DIRECT BEAM AT ALL TIMES!

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SERVICE

All service operations on the teletherapy unit including installation, exchange and removal of the source, maintenance or repair of mechanism involving source exposure are handled by General Electric Company - Medical Systems Division of Milwaukee, Wisconsin.

Local Service Division: 1200 Valley Belt Drive
Brooklyn Heights, Ohio 44131

telephone: (216) 362-4350

General Electric Source Handler Number: 48-00337-06

ADDITIONAL INFORMATION

A.) INFORMATION REGARDING EXISTING CO-60 TELETHERAPY UNIT

1. Unit: AECL Theratron F with integral beam absorber
   Source: AEC Model C146
   Source Serial No.: S2798
   Source Activity: 4760 curies on April 21, 1978

2. Beam Stops: No restrictions exist on the orientation of the primary beam when it is directed at the integral beam absorber. When the beam absorber is not in the primary beam, interlocks prevent the beam from turning on if (a) the sourcehead is swiveled more than 45° in a counter-clockwise direction (looking at the gantry), (b) it is tilted backwards (towards the gantry) more than 20° or (c) it is tilted forward more than 90°, all angles being measured from the vertical. A change in the last condition is being incorporated, whereby the sourcehead will not be able to tilt forward more than 60°.

3. Viewing System: This consists of a convex mirror mounted on the wall of the treatment room and a viewing window in the door to the room. The window is of leaded glass and is $\frac{1}{4}$" lead equivalent. It is 12" wide and 24" high, and it is centered 4' 9" above the ground. No change will be made in this existing system.

B.) INFORMATION REGARDING PROPOSED CO-60 TELETHERAPY UNIT

1. Unit: AECL Theratron 780, with integral beam absorber.
Source: AECL Model C-146 or C-151
Source output: 100 Rmm

2. Beam Stops: No restrictions will exist on the orientation of the primary beam when it is directed at the integral beam absorber. When the beam absorber is not in the primary beam, interlocks will permit the beam to turn ON only if the sourcehead is swiveled sideways up to 90° from the vertical in the direction of the northwest wall.

3. Plan and Elevation Details: Please see the attached drawings. These have been based on the drawing no. SK-C (job no. 619) by Visnapuu & Gaede, Architects and Planner, Cleveland, Ohio, and dated 5-7-70, revised 9-2-70. The walls and ceiling are of concrete of density 147 lb/ft^3 (2.35 g/cm^3).
The drawings indicate the maximum extent of the primary beam when directed at the walls and ceiling. The maximum extent corresponds to the diagonal of the largest field attainable, namely 35cm x 35cm at 80cm. The diagonal then subtends an angle of 34° at the source.

4. Viewing System: This will consist of a convex mirror on the northwest wall of the treatment room and a viewing window in the door to the room. The window will be of leaded glass and will be equivalent to $\frac{1}{4}$" lead.

5. Penetrations and Voids: A 3" stainless steel electrical pipe with endcaps runs at an angle of 30° to the vertical through the wall near the control console, which is in a restricted area. The horizontal extent of the void is 3.5" or 8.8cm which is equal to (8.8/6.2 =) 1.4 half-value layers. The void increases the exposure rate by a factor of ($2^{1.4}$=) 2.7. Since the maximum instantaneous exposure rate in the absence of the void is 0.3 mR/h, an increase to (2.7 x 0.3 =) 0.8 mR/h in the region of the void does not call for extra shielding, especially for a restricted area.
Two 2" deep recesses for TV connections in the same wall also do not require special shielding.

6. Door Interlocks: An interlock will require the door to the treatment room to be shut when the source is in the ON condition. If the door is opened during exposure, the source will move to the OFF position, and will remain there until the door is shut again and the system is reset at the control panel.

B.) INFORMATION REGARDING PROPOSED CO-60 TELETHERAPY UNIT (CONTINUED)

7. Calculations of Radiation Levels: The following assumptions have been made:

a) Room dimensions are as shown on the drawings described above in paragraph 3. Radiation levels have been calculated for the points indicated there on.

b) The source output is 100 R/min at 1 meter.

c) The leakage radiation 1 meter from the source is 10 mR/h when the beam is OFF and 0.1 R/min when the beam is ON, regardless of direction.

d) The integral beam absorber absorbs 99.7% of the primary beam. Calculations assume that 30° scatter radiation is present even though the manufacturer specifies that the beam absorber intercepts up to 35° scatter.

e) The SSD is 80cm.

f) The average beam ON time is 11 hours per week (corresponding to a weekly workload of 66,000 R at 1 meter). This time is divided between the permissible orientations of the sourcehead as follows:

RADIATION CONDITION	DIRECTED TOWARDS BEAM ABSORBER	ORIENTED TOWARDS	Hrs/WEEK	FRACTION OF 1 HOUR (AVERAGE)
I	yes	Floor	2.5	1/16
II	yes	S.E. wall	2.5	1/16
III	yes	Ceiling	2.5	1/16
IV	yes	N.W. wall	2.5	1/16
V	no	N.W. wall	1.0	1/40

In arriving at the last column, a 40 hour work-week has been used.

For V, the sourcehead is assumed to be at its highest position.

To calculate radiation levels at three points (E, J, L) which are subject to primary radiation, the above have been modified:

See next page.

B.) INFORMATION REGARDING PROPOSED CO-60 TELETHERAPY UNIT (CONTINUED)

(7f)

POINT	INSTEAD OF	CHANGE TO	BEAM ABSORBER	ORIENTED TOWARDS	Hrs/ WEEK	FRACTION OF 1 HOUR
E	II	II	yes	S.E. WALL, HORIZONTAL	1.25	1/32
		II'	yes	S.E. WALL, 30° to HORIZONTAL	1.25	1/32
J	IV	IV	yes	N.W. WALL, HORIZONTAL	1.25	1/32
		IV'	yes	N.W. WALL, 30° to HORIZONTAL	1.25	1/32
L	III	III	yes	CEILING, VERTICAL	1.25	1/32
		III'	yes	CEILING, 30° to VERTICAL	1.25	1/32

B.) INFORMATION REGARDING PROPOSED CO-60 TELETHERAPY UNIT (CONTINUED)

7. g.)

The instantaneous exposure rate $\dot{X}$ is calculated using the following expressions:

(i) For primary radiation,

$$\dot{X} = \frac{0.003\ \dot{X}_u\ B_u}{(d_{pri})^2} \quad \text{or}$$

$$\dot{X} = \frac{\dot{X}_u\ B_u}{(d_{pri})^2}, \text{ if the integral beam absorber is not in the beam}$$

(ii) For leakage radiation,

$$\dot{X} = \frac{\dot{X}_L\ B_L}{(d_{sec})^2}$$

(iii) For scattered radiation,

$$\dot{X} = \frac{a\ \dot{X}_u\ B_s}{(d_{sca})^2\ (d_{sec})^2}$$

In the above expressions,

$\dot{X}_u$ = Exposure rate at 1 meter from source in useful beam

$\dot{X}_L$ = Exposure rate at 1 meter from source for leakage radiation

B_u = Transmission through a barrier for the useful beam, taken from NCRP Report 49, Figs. 11, 12 on pp. 101, 102

B_L = Transmission through a barrier for leakage radiation, from the same as for B_u

B_s = Transmission through barrier for scattered radiation, taken from NCRP Report 49, Figs. 14, 15 on pp. 104, 105

d_{pri} = Distance to point of interest from source

d_{sca} = Distance to scatterer from source

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d_{sec} = Distance to point of interest from source or scatterer

a = Ratio of scattered to incident exposure, taken from NCRP Report 49, Table B-2, p. 59

B.) INFORMATION REGARDING PROPOSED CO-60 TELETHERAPY UNIT (CONTINUED)

8. Calculations show that the instantaneous exposure rate at all points in the surrounding areas is always less than 2 mR/h, except at three points, namely A, J and L.

Point A is in a restricted area and is located just outside the door to the teletherapy room. A maximum of 9.4 mR/h is anticipated for an average of 1 hour per week. The total exposure to personnel at this point is 9.5 mR per week or 124 mR per quarter which falls within the limits set on a restricted area as per 10CFR20.101(a).

Point L is in an unrestricted area on the floor above the teletherapy room, and is directly over the isocenter. The area is used as a conference room for the School of Nursing, with one portion of it temporarily serving as an office. When the primary beam is directed upwards at an angle of 30° to the vertical, radiation scattered through 30° from a patient can cause an instantaneous exposure rate of 5.86 mR/h. It is planned to reduce this to under 2 mR/h by adding steel or lead over the concrete barrier. The minimum dimensions of the added barrier will be:

a square 30" on the side and at least 1.6 HVL's thick, within
a square 48" on the side and at least 1.3 HVL's thick, within
a square 60" on the side and at least 1.0 HVL thick, within
a square 80" on the side and at least 0.5 HVL thick,

all the squares being centered on the point L directly above the isocenter of the teletherapy unit. The engineering services of Lutheran Medical Center are currently studying these requirements to determine the best possible means of realizing them. With the addition of the new barrier, the region above the teletherapy room will meet the requirements on radiation levels of unrestricted areas as specified in 10CFR20.105(b).

Point J is also in an unrestricted area. It is immediately exterior to the northwest wall of the teletherapy room and is located on a grass verge separating the building from a sidewalk. The occupancy factor may be taken to be 1/16. This point can be subjected to an instantaneous exposure rate of 9.76 mR/h when the primary beam is directed away from the beam absorber and directly at the wall. This mode of use is expected to average 1 hour a week. The total average weekly exposure at this point due to all modes of operation is expected to be 10mR. If the occupancy factor of 1/16 is included, then the anticipated average yearly exposure to an individual is (10)(52)(1/16) = 32 mR. Since this is less than 500 mR, it is requested that an exception as provided for in 10CFR20.105(a) be granted to the radiation level in this area.

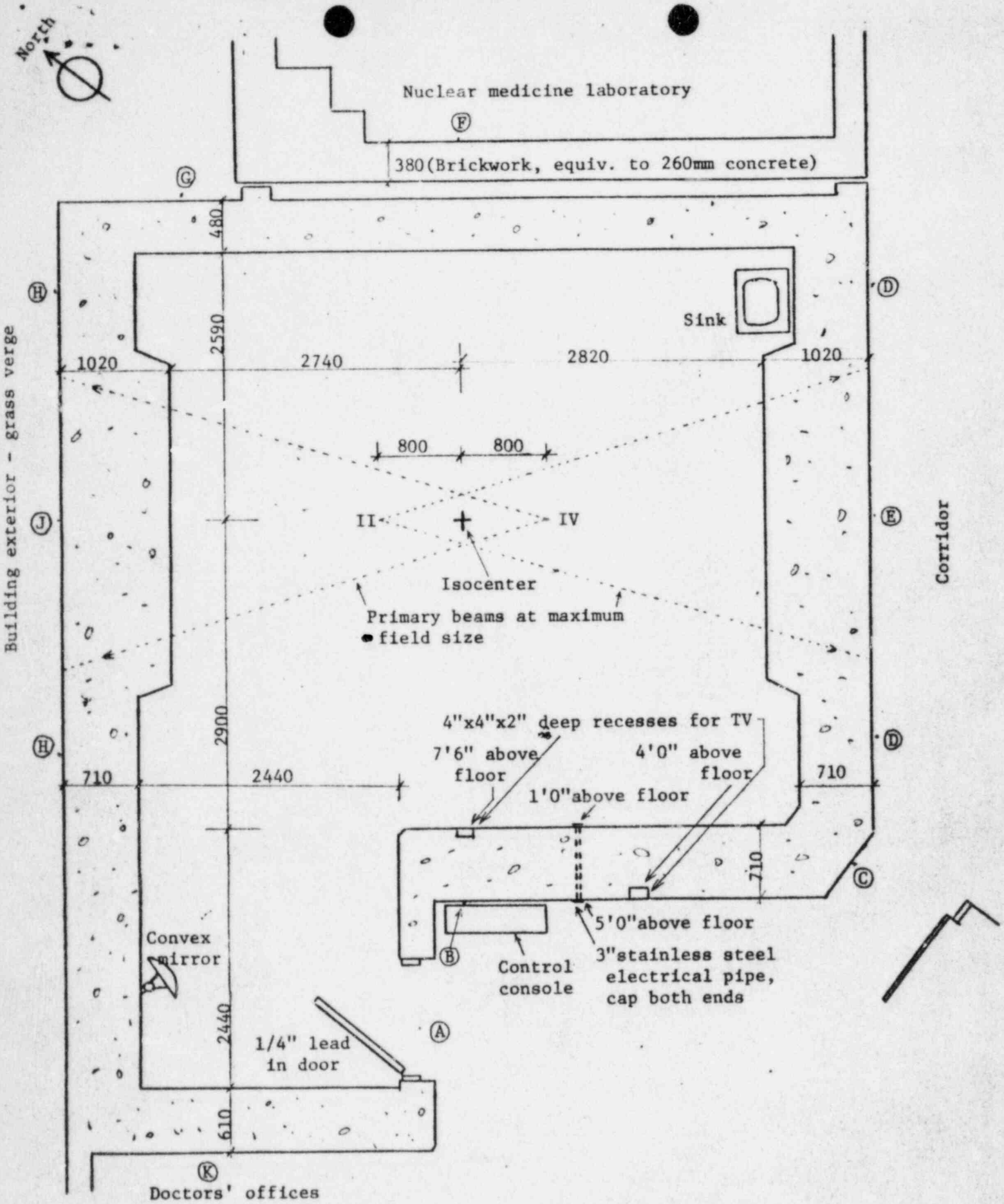
Location	Radiation Condition	Average time per hour	Average time per week	d_{pri}	d_{sec}	d_{sca}	a	S	B_u	B_L	B_s	$\dot{X}$	X_H	X_W
A	IV													
Outside door Restricted area.	45°scatter from patient, 90° from wall	1/16	2.5	-	3230	800 & 4040	0.0036 & 0.0009	9.0 lead	-	-	0.25	0.045	0.24	9.5
	V													
	90°scatter from wall	1/40	1.0	-	3810	2740	0.0009	11.1 lead	-	-	0.19	9.4		
B	I - V													
Control console. Restricted area.	Leakage	11/40	11	-	3610	-	-	710	-	6.6E-4	-	0.304	0.08	3.4
	I - IV													
	90°scatter	10/40	10	-	3610	800	0.0009	710	-	-	6.8E-6	0.004		
C	I - V													
Passageway. Unrestricted area.	Leakage	11/40	11	-	4880	-	-	710	-	6.6E-4	-	0.166	0.07	2.8
	I,III													
	90°scatter	1/8	5	-	4880	800	0.0009	710	-	-	6.8E-6	0.002		
	II													
	45°scatter	1/16	2.5	-	4880	800	0.0036	710	-	-	2.7E-4	0.383		
D	I,III													
Passageway. Receives 30°scatter	Leakage	1/8	5	-	4430	-	-	820	-	2.1E-4	-	0.064	0.05	1.8
	90°scatter	1/8	5	-	4430	800	0.0009	820	-	-	3.8E-6	0.002		
Unrestricted area.	II													
	Leakage	1/16	2.5	-	5140	-	-	790	-	2.8E-4	-	0.064		
	30°scatter	1/16	2.5	-	4430	800	0.0060	820	-	-	1.6E-4	0.459		

Location	Radiation Condition	Average time per hour	Average time per week	d_{pri}	d_{sec}	d_{sca}	a	S	B_u	B_L	B_s	$\dot{X}$	X_H	X_W
D (cont)	IV Leakage	1/16	2.5	-	3760	-	-	880	-	1.0E-4	-	0.042		
	V Leakage	1/40	1.0	-	4430	-	-	820	-	2.1E-4	-	0.064		
E Passageway. Receives primary beam. Unrestricted area	I,III Leakage	1/8	5	-	3840	-	-	1020	-	2.3E-5	-	0.009	0.005	0.2
	90°scatter	1/8	5	-	3840	800	0.0009	1020	-	-	2.1E-7	0.0001		
	II Primary	1/32	1.25	4640	-	-	-	1020	2.3E-5	-	-	0.019		
	II' 30°scatter	1/32	1.25	-	3840	800	0.0060	1020	-	-	1.8E-5	0.069		
	IV Leakage	1/16	2.5	-	3040	-	-	1020	-	2.3E-5	-	0.015		
	V Leakage	1/40	1.0	-	3840	-	-	1020	-	2.3E-5	-	0.009		
F Nuclear medicine laboratory Restricted area	I - V Leakage	11/40	11	-	3450	-	-	740	-	5.0E-4	-	0.252	0.07	2.9
	I - IV 90°scatter	10/40	10	-	3450	800	0.0009	740	-	-	1.1E-5	0.008		

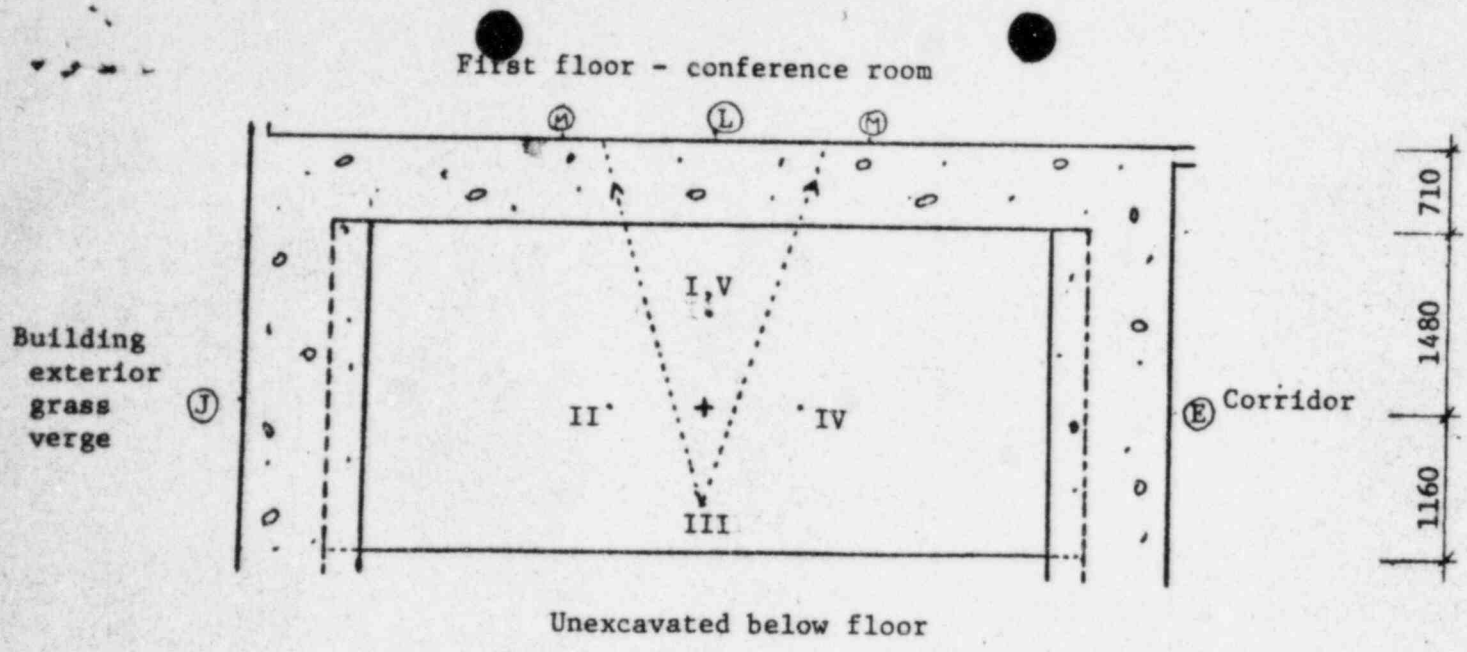
Location	Radiation Condition	Average time per hour	Average time per week	d_{pri}	d_{sec}	d_{sca}	a	S	B_u	B_L	B_s	$\dot{X}$	X_H	X_W
G	I,III													
Building	Leakage	1/8	5.0	-	4340	-	-	680	-	9.5E-4	-	0.303	0.16	6.5
exterior,	90°scatter	1/8	5.0	-	4340	800	0.0009	680	-	-	3.2E-5	0.014		
grass														
verge.	II													
Unrestricted	Leakage	1/16	2.5	-	3820	-	-	600	-	2.3E-3	-	0.946		
area.														
	IV													
	Leakage	1/16	2.5	-	4940	-	-	770	-	3.5E-4	-	0.086		
	45°scatter	1/16	2.5	-	4340	800	0.0036	680	-	-	3.2E-4	0.573		
	V													
	Leakage	1/40	1.0	-	4340	-	-	680	-	9.5E-4	-	0.303		
	90°scatter from wall	1/40	1.0	-	3070	2740	0.0009	480	-	-	6.8E-4	0.609		
H	I,III													
Building	Leakage	1/8	5.0	-	4340	-	-	820	-	2.1E-4	-	0.067	0.05	1.9
exterior,	90°scatter	1/8	5.0	-	4340	800	0.0009	820	-	-	3.8E-6	0.002		
grass														
verge.	II													
Unrestricted	Leakage	1/16	2.5	-	3670	-	-	880	-	1.0E-4	-	0.045		
area.														
Receives	IV													
30°scatter	Leakage	1/16	2.5	-	5050	-	-	790	-	2.8E-4	-	0.066		
	30°scatter	1/16	2.5	-	4340	800	0.0060	820	-	-	1.6E-4	0.478		
	V													
	Leakage	1/40	1.0	-	4340	-	-	820	-	2.1E-4	-	0.067		

Location	Radiation Condition	Average time per hour	Average time per week	d_{pri}	d_{sec}	d_{sca}	a	S	B_u	B_L	B_s	$\dot{X}$	X_H	X_W
J	I,III													
Building exterior, grass verge.	Leakage	1/8	5.0	-	3760	-	-	1020	-	2.3E-5	-	0.010	0.25	10
	90°scatter	1.8	5.0	-	3760	800	0.0009	1020	-	-	2.1E-7	0.0001		
Receives primary radiation.	II													
	Leakage	1/16	2.5	-	2960	-	-	1020	-	2.3E-5	-	0.016		
Unrestricted area.	IV													
	Primary	1/32	1.25	4560	-	-	-	1020	2.3E-5	-	-	0.020		
	IV'													
	30°scatter	1/32	1.25	-	3760	800	0.0060	1020	-	-	1.8E-5	0.072		
	V													
	Primary	1/40	1.0	3760	-	-	-	1020	2.3E-5	-	-	9.76		
K	I - V													
Doctor's office.	Leakage	11/40	11	-	6870	-	-	700	-	7.5E-4	-	0.095	0.03	1.3
Restricted area.	I,III													
	90°scatter	1/8	5.0	-	6870	800	0.0009	700	-	-	2.4E-5	0.004		
	IV													
	60°scatter	1/16	2.5	-	6870	800	0.0023	700	-	-	2.1E-4	0.096		
	V													
	90°scatter from wall	1/40	1.0	-	5950	2740	0.0009	610	-	-	1.0E-4	0.002		

Location	Radiation Condition	Average time per hour	Average time per week	d_{pri}	d_{sec}	d_{sca}	a	S	B_u	B_L	B_s	$\dot{X}$	X_H	X_W
L	Leakage (Beam OFF)	-	157	-	1390	-	-	710	-	6.6E-4	-	0.003	0.46	19
Floor above, conference room. Receives primary beam. Unrestricted area	I,V Leakage	3.5/40	3.5	-	1390	-	-	710	-	6.6E-4	-	2.05		
	II,IV Leakage	1/8	5.0	-	2330	-	-	760	-	3.8E-4	-	0.420		
	90°scatter	1/8	5.0	-	2190	800	0.0009	710	-	-	6.8E-6	0.012		
	III Primary	1/32	1.25	2990	-	-	-	710	6.6E-4	-	-	1.33		
	III' 30°scatter	1/32	1.25	-	2190	800	0.0060	710	-	-	5.0E-4	5.86		
M	I,V Leakage	3.5/40	3.5	-	1880	-	-	960	-	4.6E-5	-	0.078	0.15	5.9
Floor above, conference room. Receives 30°scatter. Unrestricted area.	II Leakage	1/16	2.5	-	3010	-	-	980	-	3.6E-5	-	0.024		
	60°scatter	1/16	2.5	-	2530	800	0.0023	820	-	-	4.8E-5	0.162		
	III Leakage	1/16	2.5	-	3250	-	-	770	-	3.5E-4	-	0.199		
	30°scatter	1/16	2.5	-	2530	800	0.0060	820	-	-	1.4E-4	1.23		
	IV Leakage	1/16	2.5	-	2240	-	-	730	-	5.4E-4	-	0.646		
	120°scatter	1/16	2.5	-	2530	800	0.0008	820	-	-	1.1E-6	0.001		

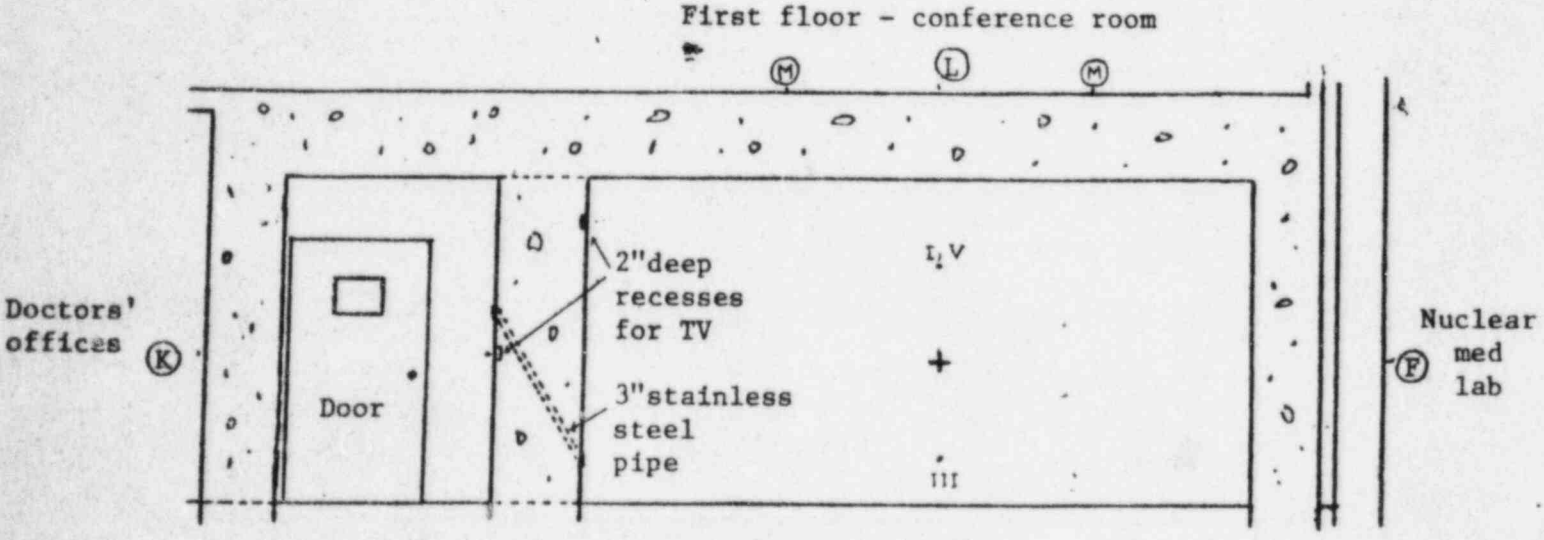


Plan of Cobalt teletherapy room to be equipped with AECL Theratron 780 in Lutheran Medical Center, Cleveland, Ohio.
Scale: 1/4 inch = 1 foot. Dimensions shown are in millimeters.



Unexcavated below floor

View towards northeast



Unexcavated below floor

View towards northwest

Elevations of Cobalt teletherapy room to be equipped with Theratron 780 in Lutheran Medical Center, Cleveland, Ohio.
Scale: 3/16 inch = 1 foot. Dimensions shown are in millimeters.