NRC FORM 313M
(9-81)
10 CFR 35

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIALS LICENSE – MEDICAL

Approved by OMB
3150-0041
Expires 9-30-83

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

Forkosh Memorial Hospital
2544 W. Montrose Ave.
Chicago, IL 60618

TELEPHONE NO.: AREA CODE (312) 267 2200

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

2544 W. Montrose
Chicago, IL 60618

2. PERSON TO CONTACT REGARDING THIS APPLICATION

Lewis I. Segal, M.D.
Director of Radiology
TELEPHONE NO.: AREA CODE (312) 267 2200

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

a. ☐ NEW LICENSE
b. ☐ AMENDMENT TO LICENSE NO. _____
c. ☒ RENEWAL OF LICENSE NO. 12-12112-01

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

Lewis I. Segal, M.D.
Gabriel Angres, M.D.
Curtis Poor, 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.)*

Lewis I. Segal, M.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	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP II	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP III		
10 CFR 35.100, SCHEDULE A, GROUP IV	X	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	X	20 mCi
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.	X	50 mCi

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 57 $137_{C}s$ $133_{B}a$	Cobalt Cesium Barium	0 mCi 1982 229 uCi 1979 276 uCi 1979	Calibration (reference) sealed source for dose calibrator

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REGION III
REGULATORY FILE BRANCH

NRC FORM 313M
(9-81)

Rec'd 11/2/84

8505280226 850508
REG3 LIC30
12-12112-01 PDR

8348

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

15. GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL *(Check One)*	
X	Appendix G Rules Followed; or
	Equivalent Rules Attached
16. EMERGENCY PROCEDURES *(Check One)*	
X	Appendix H Procedures Followed; or
	Equivalent Procedures Attached
17. AREA SURVEY PROCEDURES *(Check One)*	
X	Appendix I Procedures Followed; or
	Equivalent Procedures Attached
18. WASTE DISPOSAL *(Check One)*	
X	Appendix J Form Attached; or
	Equivalent Information Attached
19. THERAPEUTIC USE OF RADIOPHARMACEUTICALS *(Check One)*	
	Appendix K Procedures Followed; or
X	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)	
X	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	
X	Detailed Information Attached

24. PERSONNEL MONITORING DEVICES				
TYPE (Check appropriate box)			SUPPLIER	EXCHANGE FREQUENCY
a. WHOLE BODY	X	FILM	Siemens Gammasonics	Monthly
		TLD		
		OTHER (Specify)		
b. FINGER	X	FILM	Siemens Gammasonics	Monthly
		TLD		
		OTHER (Specify)		
c. WRIST		FILM		
		TLD		
		OTHER (Specify)		

d. OTHER (Specify)

RECEIVED BY LFMB
Date 11/7/84
Log Doc 7
By
Orig. To R
Action Compl

Applicant 204118 ($150)
Check No. 204218 ($430)
Amount Fee
Type of Fee Ren
Date Check Rec'd 11/7/84
Received By
($430 addl fee due)

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.

'84 NOV 2 AM 9:05

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

(1) LICENSE FEE CATEGORY: 7 b.

(2) LICENSE FEE ENCLOSED: $ 150.00

b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)*

(1) NAME *(Type or Print)* Barry Weinbaum

(2) TITLE Administrator

c. DATE 10/30/84

NRC FORM 313M (9-81)

PRIVACY ACT STATEMENT

Pursuant to 5 U.S.C. 552a(e)(3), enacted into law by section 3 of the Privacy Act of 1974 (Public Law 93-579), the following statement is furnished to individuals who supply information to the Nuclear Regulatory Commission on NRC Form 313M. This information is maintained in a system of records designated as NRC-3 and described at 40 Federal Register 45334 (October 1, 1975).

1. **AUTHORITY** Sections 81 and 161(b) of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2111 and 2201(b)).

2. **PRINCIPAL PURPOSE(S)** The information is evaluated by the NRC staff pursuant to the criteria set forth in 10 CFR Parts 30-36 to determine whether the application meets the requirements of the Atomic Energy Act of 1954, as amended, and the Commission's regulations, for the issuance of a radioactive material license or amendment thereof.

3. **ROUTINE USES** The information may be used: (a) to provide records to State health departments for their information and use; and (b) to provide information to Federal, State, and local health officials and other persons in the event of incident or exposure, for their information, investigation, and protection of the public health and safety. The information may also be disclosed to appropriate Federal, State, and local agencies in the event that the information indicates a violation or potential violation of law and in the course of an administrative or judicial proceeding. In addition, this information may be transferred to an appropriate Federal, State, or local agency to the extent relevant and necessary for a NRC decision or to an appropriate Federal agency to the extent relevant and necessary for that agency's decision about you. A copy of the license issued will routinely be placed in the NRC's Public Document Room, 1717 H Street, N.W., Washington, D.C.

4. **WHETHER DISCLOSURE IS MANDATORY OR VOLUNTARY AND EFFECT ON INDIVIDUAL OF NOT PROVIDING INFORMATION** Disclosure of the requested information is voluntary. If the requested information is not furnished, however, the application for radioactive material license, or amendment thereof, will not be processed.

5. **SYSTEM MANAGER(S) AND ADDRESS** Director, Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

NRC FORM 313M SUPPLEMENT A (9-81) — 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
Lewis Irwin Segal, M.D.	ILL 036-040498

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C
American Board of Radiology	Diagnostic Radiology	July 1973

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	Michael Reese Hospital Chicago, IL March, April, May 1972		
b. RADIATION PROTECTION		Please see previous documentation	
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY			
d. RADIATION BIOLOGY	Michael Reese Hospital Refresher Course 6/21/82- 7/2/82		
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
		Radiation Safety Officer United States Air Force	1966-1968	Nuclear Weapons
		Attending Physician Louis A. Weiss Hosp. Chicago, IL	1972-1982	Diagnostic Radiology
99Tc 133Xe 131I 123I		Director Diagn. Radiol Forkosh Mem. Hosp. Chicago, IL	July 1982 thru Oct. 1984	Diagnostic Radiology & Nuclear Medicine

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. Curtis Poor	

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C

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	Loyola Univ. Med. Center October and November 1982 and July 1983	133	
b. RADIATION PROTECTION	"	40	
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	"	28	
d. RADIATION BIOLOGY	"	44	
e. RADIOPHARMACEUTICAL CHEMISTRY	"	40	

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

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
Tc-99m	25 mCi	Loyola Univ. Med. Ctr	3 mos.	Bone, Lung, Brain, Liver, Blood Pool & Thyroid
Xe-133	20 mCi	"	"	Lung
I-131	150 mCi	"	"	Thyroid, Ca Rx, Renal Function
I-125	100 uCi	"	"	Deep Vein Thrombosis
In-III	500 uCi	"	"	Cisternography
Tl-201	2 mCi	"	"	Infarct Heart

NRC FORM 313M SUPPLEMENT A (9-81) 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
Gabriel Angres, M.D.	IL - 036-041832

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C
American Board of Radiology	Diagnostic Radiology	July, 1975

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	Michael Reese Hospital, Chicago, IL July, Aug., Sept., Oct. 1974	See attached letters	
b. RADIATION PROTECTION			
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY			
d. RADIATION BIOLOGY	Michael Reese Hospital Refresher Course Oct. 25 - Nov. 5, 1982		
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
99TC 133Xe 131 I		Michael Reese Hospital Dept. Nuclear Med. Chicago, IL	July - Oct. 1974	Diagnostic & Therapeutic Nuclear Medicine
123 I		Attending Physician Louis A. Weiss Memorial Hosp. Chicago, IL	1976 - 1983	Diagnostic Radiology
		Forkosh Memorial Hospital	1982 - 84	Diagnostic Radiology & Nuclear Medicine.

RADIATION SAFETY COMMITTEE

Lewis Segal, M.D. Chairman	Radiology
Joe Recendez, C.N.M.T.	Nuclear Medicine
Louis Sidney, R.T. Adm. Tech.	Radiology
Mary Niederhauser, R.N., Asst. Admin.	Administration

Duties as in Appendix B

APPENDIX C

INSTRUMENTATION

1. Survey meters

   a. Manufacturer's name: PICKER INC.

   Manufacturer's model number: 600-180 D

   Number of instruments available: 1

   Minimum range: .01 mr/hr to .5 mr/hr

   Maximum range: 1.0 mr/hr to 50 mr/hr

   b. Manufacturer's name: TECHNICAL ASSOCIATES

   Manufacturer's model number: P U G - 1 / P 11

   Number of instruments available: 1

   Minimum range .15 mr/hr to .02 mr/hr

   Maximum range 2.0 mr/hr to 15.0 mr/hr

   Not Applicable (no generator on hand)

2. Dose calibrator

Manufacturer's name: RAD X

Manufacturer's model number: MARK V 2014-69

Number of instruments available: 1

3. Diagnostic instruments

Type of Instrument	Manufacturer's Name	Model No.
3 in. MAGNASCANNER	PICKER NUCLEAR	2806H
GAMMA CAMERA	TECHNICARE	438

4. Other

CALIBRATION OF SURVEY INSTRUMENTS

Check appropriate items

x 1. Survey instruments will be calibrated atleast 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

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

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

or

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

x C. By a consultant or outside firm

(1) Name HEALTH PHYSICS ASSOCIATES LTD.

(2) Location 3304 Commercial Ave., Northbrook, Il. 60062

(3) Procedures and sources

x have been approved by NRC and are on file in License No. 12-09160-01

CALIBRATION OF DOSE CALIBRATOR

A. Sources Used for linearity Test:

Check as appropriate

_____ First elution from new Mo-99/Tc-99M generator

or

__x__ other* (specify) __30 mCi Tc 99m__

B. Sources Used for Instrument Accuracy and Constancy Tests:

Radionuclide	Activity (mCi)	Accuracy
57 Co	5.0 mCi	5%
133 Ba	276 uCi	5%
137 Cs	229 uCi	5%
other		

C. __x__ The procedures described in Appendix D section 2 will be used for calibratin of the dose calibrator.

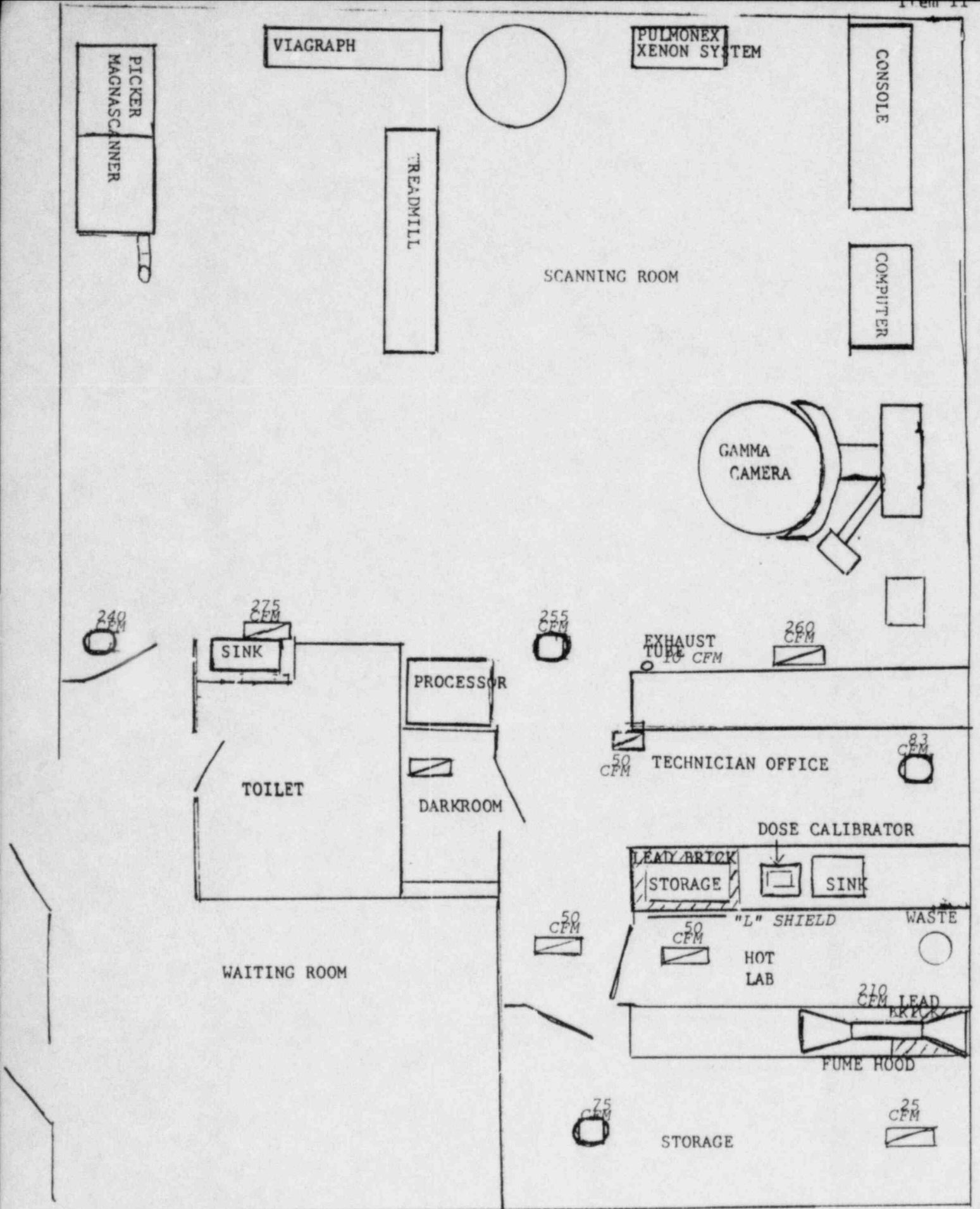
or

_____ Equivalent procedures are attached.

* Must be equivalent to the highest activity used.

FACILITIES AND EQUIPMENT

The Nuclear Medicine Department (see sketch) consists of a camera room with a Picker Magnascanner, Technicare Gamma camera w/computer, and a Pulmonex Zenon System; a technician's office; a hot lab consisting of a fume hood, radioisotope preparation area, sink, refrigerator, assay unit, and waste can; a storage area; a film processing unit; a waiting room; and a toilet.



FORKOSH MEMORIAL HOSPITAL NUC. MED. DEPT.

SUPPLY VENT

EXHAUST VENT

SCALE 1"

Item 11

PERSONNEL TRAINING PROGRAM

The Nuclear Medicine Department personnel consists of a Nuclear Medicine Technologist and a registered radiologic technologist, as a back-up.

The Nuclear Medicine Technologist is registered with the American Registry of Radiologic Technologist in Nuclear Medicine. The Nuclear Medicine Technologist has completed approved courses in Nuclear Medicine including nuclear science, clinical nuclear medicine, all safety procedures and potential hazards with radioactive material. He has attended in-service training programs applicable to the use of radioactive material. This includes department set up, pertinent NCR regulations, rules and terms of the license, obligation to report unsafe conditions, appropriate responses to unsafe conditions, and the right to be informed of their radiation exposures.

The Nuclear Medicine Department personnel will wear film badges and ring badges.

Housekeeping, whether escorted or not, enter the Nuclear Medicine Department under the supervision of the Nuclear Medicine Technologist. They are informed of the potential hazards of radioactivity.

Security personnel are informed to report unsafe conditions. Security does no handling of radiopharmaceuticals because all incoming packages are delivered by the nuclear pharmacy directly to the hot lab. Security will contact the Radiation Safety Officer if any incoming packages appear damaged.

PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL

1. The Nuclear Medicine Technologist will place all orders for radioactive material and will ensure that the requested materials and quantities are authorized by the license and that possession limits are not exceeded.

2. During normal working hours carriers will be instructed to deliver radioactive packages directly to the Nuclear Medicine Department.

3. During off-duty hours security personnel will accept delivery of radioactive packages in accordance with the procedures outlined in the memorandum from Lewis Segal, M.D. (see attached copy)

4. The door to the Nuclear Medicine Department will remain locked when the Technologist is not present. Only the Nuclear Medicine Technologist, Adm. Chief Technologist, and security guard have keys to the Nuclear Medicine Department.

5. There will be no radioactive material in unauthorized areas. All incoming packages will go directly to the Nuclear Medicine Hot Lab.

MEMORANDUM FOR: Security Personnel
FROM: Lewis Segal, M.D.

SUBJECT: RECEIPT OF PACKAGES CONTAINING RADIOACTIVE MATERIALS

1. All radiopharmaceuticals are in precalibrated doses and are delivered by the radiopharmacy to the Nuclear Medicine Department and placed in the hot lab.

2. If the Nuclear Medicine Department is locked,the carrier shall go to security personnel and security personnel will unlock the door to Nuclear Medicine. The radiopharmaceuticals will be placed in the hot lab and door to Nuclear Medicine will be relocked.

3. If the radiopharmaceuticals suitcase appears to be damaged, the security personnel or Nuclear Medicine Technologist will immediately contact the hospital Radiation Safety Officer. Ask the carrier to remain at the hospital until it can be determined that neither he nor delivery vehicle is contaminated.

Radiation Safety Officer: Lewis Segal, M.D.
Office Phone: (312) 267-2200
Home Phone: (312) 835-4208

RADIOACTIVE SHIPMENT RECEIPT REPORT

Because all radiopharmaceuticals come into the Nuclear Medicine Department in precalibrated doses, radioactive shipment receipt reports are not made out on each shipment. Instead the condition of the suitcase, number of doses, types of doses, survey and dates are logged daily.*

** Syncor NRC license #12-19333-01MD*

PROCEDURES FOR OPENING PACKAGES CONTAINING RADIOACTIVE MATERIAL

1. All radiopharmaceuticals come to the Department from a nuclear pharmacy (Syncor) in precalibrated doses. Each suitcase is visually inspected for any sign of damage. If damage is noted procedure stopped and Radiation Safety Officer is notified.

2. Measure exposure rate at 3 feet from package surface and record. If > 10 mR/hr stop procedure and notify Radiation Safety officer.

3. Measure surface exposure rate and records. If > 200 mR/hr stop procedure and notify Radiation Safety Officer.

4. Put on gloves.

5. After survey of incoming doses as stated above, all precalibrated doses are logged as to number, type, and condition.

6. Each dose is visually inspected, checked in the dose calibrator, and compared to the label before injection.

7. At end of each day, all syringes, bottles, capsules, (used or unused) are returned to the radiopharmacy.

8. There is no packing material to deal with.

9. There is very little waste to deal with since everything is returned to the pharmacy.

10. All radiation labels are obliterated before discarded in waste.

* Syncor NCR license #12-19333-01 MD

GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL

Appendix G Rules Followed

EMERGENCY PROCEDURES

Appendix H Procedures Followed

AREA SURVEY PROCEDURES

Appendix I Procedures Followed

APPENDIX J

WASTE DISPOSAL PROCEDURES

1. Liquid Waste will be disposed of

Check as appropriate

_____ By commercial waste disposal service (See also No. 4 below)

_____ In the sanitary sewer system in accordance with Section 20.303 of 10 CFR Part 20.

__x__ Other (specify): All liquid waste is returned to the radiopharmacy

2. Mo-99/Tc-99m generators will be:

Check as appropriate

_____ Returned to the manufacturer for disposal

_____ Held for decay until radiation levels as measured with a low-level survey meter and with all shielding removed, have reached background levels. All radiation labels will be removed or obliterated and the generators disposed of as normal trash. (Note: This method of disposal may be practical for generators containing long-lived radioactive contaminants)

_____ Disposed of by commercial waste disposal service (See also No 4 below)

__x__ Other (specify): A generator is not used. All Tc99m doses come precalibrated in individual dose shielded syringes

3. Other Solid Waste will be :

Check as appropriate

__x__ Held for decay until radiation levels as measured with a low-level survey meter and with all shielding removed have reached background levels, All radiation labels will be removed or obliterated and the waste will be disposed of in normal trash

THERAPEUTIC DOSES OF RADIOPHARMACEUTICALS

Therapeutic doses of I 131 for hyperthyroidism are ordered from our nuclear pharmacy, Syncor, in capsule form. There is never more than 20 mCi of I 131 therapy on hand at any one time. All patients given hyperthyroid therapy are treated as out patients. They are informed that they must notify the Radiation Safety Officer if they vomit within 24 hours of receiving the therapy dose. We do not do any thyroid carcinoma therapy.*

** Syncor NCR license #12-19333-01MD*

THERAPEUTIC USE OF RADIOPHARMACEUTICALS

Not Applicable

INFORMATION FOR THE USE OF XENON-133

A. Quantities to be used:

1. Patient information

   a. 2 studies per week
   b. 10 mCi Xe-133 per patient, average

2. 50 mCi possession limit

B. Use and Storage areas:

1. Area for storage is a closed, separately vented to roof fume hood in the hot lab. Usage takes place in the scanning room. (see diagram)

2. See diagram for location of supply and exhaust vents. 100 % of the air is exhausted from the fume hood area, where the Xenon is stored. This hood exhaust is on continously when the Xenon is stored in this room. The balance of the area recirculates the air.

3. The total exhaust rate (measured) is 873 cfm. The total supply rate (measured) is 535 cfm. As noted in B.2 the fume hood will be on at all times when Xenon is present in the department. The area is under negative pressure. Air flow rates will be checked semiannually.

C. Procedures for routine use:

1. Xe 133 is received from Syncor Corp., in a single dose dispensor. This single dose unit contains 10 mCi of Xe 133 gas for medical use in a sealed tube contained in a metal shield valve assemble. This is stored in the hot lab under the fume hood. The manufacturer states that there is no detectable leakage of Xe 133 gas from the sealed tube, and that the radiation flux at the surface of the metal shield valve assemble when it contains 10 mCi of Xe 133 is less than 1 mr/hr. Adequate lead shielding in the form of lead bricks will be kept under the hood to keep any external radiation to less than MPD values.
   We utilize the Pulmonex Xenon System, which is a special apparatus for the administration and collection of Xe 133. (see copy of brochure)
   Following completion of the study, the entire system may be hooked up to an exhaust pipe connected to the fume hood and exhausted directly to the roof. The air flow of the hood (measured) is 210 cfm. The weekly average concentration of the Xe 133 in the fume hood exhaust for each 10 mCi is calculated to be much less than 3×10^{-10} mCi/ml (NRC standards). The fume hood air exhausts onto the roof area for which there is no occupancy for atleast 20 feet. After exhausting the Xe gas from the dispenser, the used unit will be disposed of as regular solid radioactive waste. The safety procedure to be in the patient administration area will concern itself with keeping the patient breathing into the lead lined system and if need be exhausting the system directly to the roof

D. Emergency Procedures

1. In the event of the accidental release of Xe 133 outside of the fume hood area, we will evacuate the room and close the door for 10 minutes. The volume of the room is 4680 cf (20x26x9). With the noted exhaust rate in the scanning area the mean turnover time is about 11 minutes. The Xe 133 concentration would be reduced by about 2/3 during the ten minute evacuation if uniform mixing is assumed.

E. Air Concentrations of Xe 133

1. Restricted Areas
20 mCi/wk usage
Assume extreme loss of 100% (f=1)

$$V = \frac{A \times F}{1 \times 10^{-5}\ uCi/ml} = \frac{20 \times 10^{3}}{1 \times 10^{-5}} = 2 \times 10^{9}\ ml/wk$$

The required ventilation rate is

$$\frac{2 \times 10^{9}}{40 \times 1.7 \times 10^{6}} = 29.4\ cfm$$

The total exhaust rate of the entire department is 873 cfm of which 495 cfm is in the scanning room area. Therefore, there exist very adequate ventilation and dilution in the restricted areas.

2. Air concentrations of Xe 133 in un-restricted areas. Assumed leakage of the total activity percentage ordered and stored at aloss rate of 20%. (f=.2)

$$A \times F = 20 \times 10^{3} \times .2 \times 52 = 2.1 \times 10^{5}\ uCi/yr$$

$$V = 210 \times 1.48 \times 10^{10} = 3.1\ E\ 12$$

$$C = \frac{AF}{V} = \frac{2.1 \times 10^{5}}{3.1 \times 10^{12}} = 6.8 \times 10^{-8}\ uCi/ml$$

This is below the limit of 20.106 of 10 CFR Part 20

We will not exceed 3×10^{-7} uCi/ml

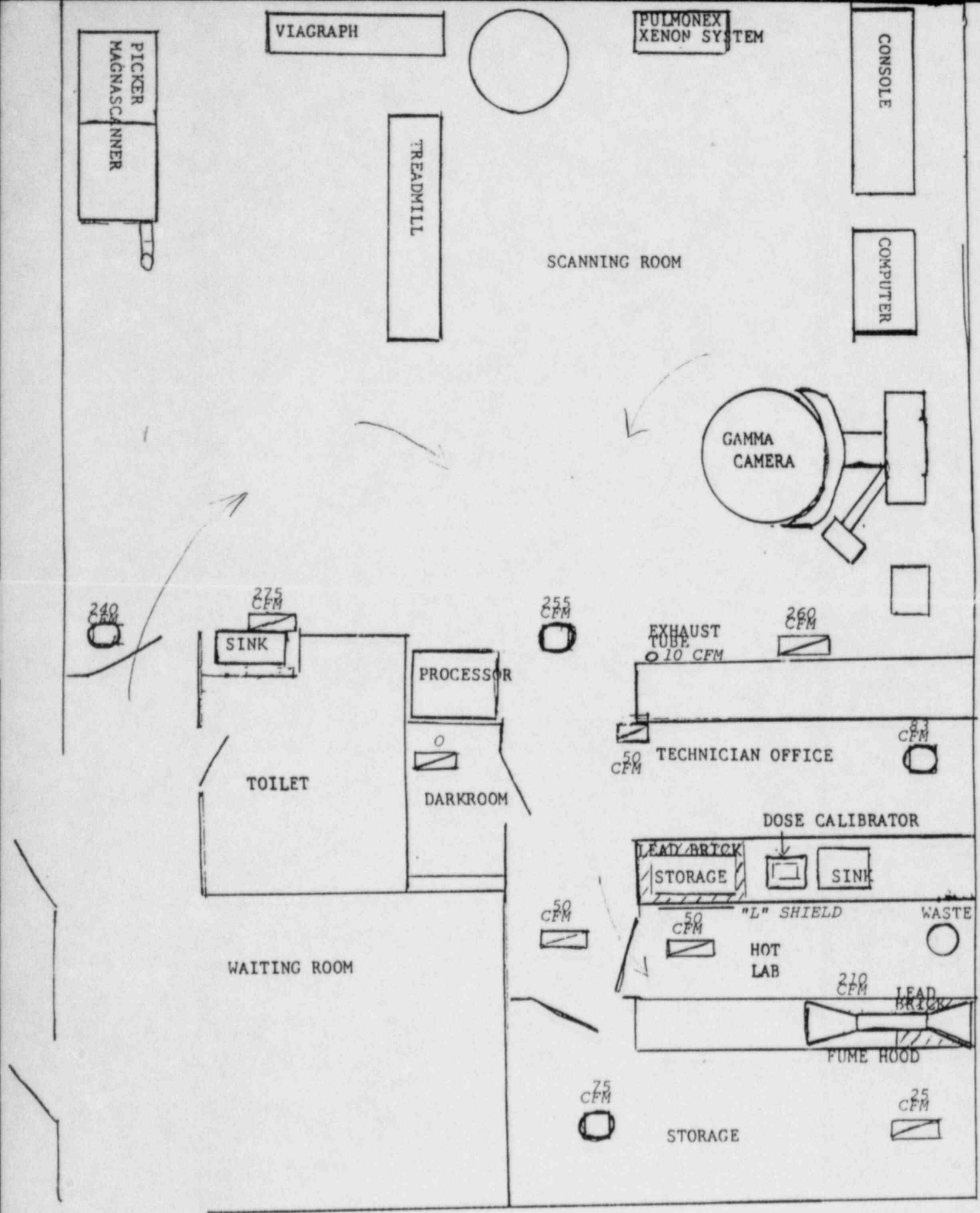
3. Release through scanning room (f=.2)

$$A \times F = 20 \times 10^{3} \times 52 \times .2 = 2.1 \times 10^{5}\ uCi/yr$$

$$V = 495 \times 1.48 \times 10^{10} = 7.3 \times 10^{12}\ ml/yr$$

$$C = 2.1 \times 10^{5} / 7.3 \times 10^{12} = 2.9 \times 10^{-8}\ uCi/ml$$

This is below the limit of 20.106 of 10 CFR Part 20 of 3×10^{-7} uCi/ml for release to unrestricted areas.



FORKOSH MEMORIAL HOSPITAL NUC. MED. DEPT.

SUPPLY VENT

Exhuast Vent

SCALE 1" - 4'

Item 21

E. Method of Xenon 133 Disposal

1. Dilution through exhaust systems:

The exhaust on the roof is normally restricted to the engineering staff and the roof itself can be considered unoccupied. The nearest unrestricted point is the air inlet which is on the side of the same building at least 20 feet away. Using Sutton's equation for a height of 1 meter, a discharge of 20 mCi/wk, a distance of 6 meters and a wind speed of 10 m.p.h. (slightly below the Chicago average according to the National Weather Service) the concentration is very close to $1x10^{-9}$ uCi/ml. While Sutton's equation is less than perfect in application here, the more than two orders of magnitude (not to mention variation in wind direction, further dilution in the ventilating system and other factors which would reduce the average concentration) indicate that this discharge will be well below the maximum set by Section 20.106 of 10 CFR part 20.

To thoroughly familiarize yourself with the equipment and methodology, it is suggested that you run through the procedure several times; first without any patient, then with a colleague as a "patient" without actually using xenon. When you are completely familiar with the routine, you can start doing xenon studies on a patient with confidence.

FOLLOW THESE SIMPLE STEPS CAREFULLY:

A. Setting Up Your Pulmonex

1. Open the top rear door. Inspect the interior. All hoses should be connected to their respective ports. Bags should be lying flat. The elbows on the bags should be in their wall brackets. Hoses should not be kinked.
2. Open the lower front door. All hoses should be connected to their respective ports.
3. Remove the empty plastic cartridge that hangs in the lower compartment. Fill the cartridge about 1/4 to 1/3 full with the blue drierite (139-101) and return the cartridge. This serves as a moisture trap for the air going into the charcoal cartridge. Close the lower compartment. Replace the drierite when it changes color (from blue to pink). *Failure to change the drierite will significantly shorten the life of the charcoal cartridge.*
4. Remove the empty plastic cartridge that is within the top compartment. Fill 1/4 to 1/3 full with white granule soda-lime (Model #130-019). Reconnect to the hoses. This soda-lime serves as a carbon dioxide trap. Close the top rear door. Change the soda-lime between each patient. *Failure to change the soda-lime will cause the patient to rebreathe too much carbon dioxide thus causing hyperventilation.*
5. Bring the unit to the area of operation. Make sure the timer is on "0" and plug into a nearby electrical outlet.
6. At the rear of the unit, there are two white hose connections, side by side. Attach the breathing tubes/Y Fitting/bacteria filter/mouthpiece assembly to the hose connections. The plastic plug and warning label on the Y fitting must be facing up.

> **Note:** Keep the breathing tubes as short as possible. If a patient is supine bring the system to the bedside. Never add a length of tubing to the patient side of the Y fitting. If you need more tubing length replace both breathing tubes. The distance from the Y to the patient must be as short as possible.

It is advisable to use hose clamps to tightly fasten the breathing hoses to the hose connections. As a safety precaution you can connect a hose from your room vent to the exhaust port on the Pulmonex. This exhaust port is located on the patient side of the Pulmonex just below the overhang.

> **Caution:** Some patients are sensitive to oxygen. Consult a physician before using oxygen. If the physician prefers, substitute room air for oxygen.

7. To add oxygen connect and clamp a 1/4" oxygen hose from your oxygen supply to the oxygen inlet port on the Pulmonex front panel. Turn the oxygen valve to 5 psi or 6-8 liters/minute and leave it on. If possible, use a pediatric regulator on the oxygen tank.

> **Note:** Use a flow regulator, not a flow meter. Flow rates can be high (up to 50 liters/min.) but pressure must be low, 5 psi.

B. Performing a Study.

8. Using a source, position the patient in front of the scintillation camera. See that both the lungs are within the crystal area.
9. Set the camera for Xe-133. Record all data on tape.
10. Place the Pulmonex as close to the patient as possible and set the handle to the "Start" position. The number "1" will appear under the handle.
11. Set the "Air Flow" control to 30 (an arbitrary figure that can be changed to accommodate the patient's breathing pattern).
12. Press the button on the front panel to add oxygen to the "To Patient" bag. Only add a small amount of oxygen, about 1/4 full. (The bag will only move slightly, do not fill it up.) More oxygen can be added later if the patient requires. In many cases, it is possible not to add any oxygen and perform the entire study on ambient air. In all cases, the oxygen is only to enrich the air in the circuit.

    To do a study with ambient air, before connecting the patient to the system, turn the Pulmonex on and go to position #2. When the "To Patient" bag is 1/4 full, switch the handle back to position #1. Now the system is ready to use.
13. Set the timer to 9 minutes (an arbitrary figure that can be changed at any time depending on the study procedure you prefer).
14. Place the mouthpiece in the patient's mouth. Clamp the patient's nose closed. A face mask may be used, if preferred. Place a vertex cape (#055-101) on the patient.
15. Have the patient breathe briefly on "Start" to become accustomed to breathing with a mouthpiece. The "from patient" bag will move slightly as the patient exhales.
16. Switch the handle to "Single Breath, Equilibium, #2". With a NEN Gun or syringe filled with xenon, puncture the mouthpiece's rubber with the needle and add the xenon as you have the patient take a deep inspiration. Have the patient hold his breath for as long as possible and then continue to breathe normally. Increase the "Air Flow" control to about 70, (an arbitrary figure that can be changed to accommodate the patient's breathing pattern).

    Advise the patient to breathe slowly and normally. Observe both breathing bags moving through the front panel windows. Add oxygen if the patient requires it. An alternative to puncturing the mouthpiece is to use the luer adapter plug provided with the system.

A common problem is the xenon not getting into the patient for single breath. If this happens, try again with these changes:

A. Lower the "Air Flow" control to 20 or 10 five seconds before xenon administration.

B. Puncture the mouthpiece closer to the patient.

C. Have the patient take a deeper breath.

17. When the patient reaches equilibrium (1 or 2 minutes, the counting rate on the camera stabilizes), switch to "Washout, #3". Take washout data on the camera (typical framing: first picture, 15 seconds; second, 30 seconds; third, 60 seconds). Have the patient breathe normally slowly.

18. Carefully watch the "from patient" bag. If it starts blowing up, the patient is breathing too fast. Advise him to normalize his breathing and increase the "Air Flow" speed. If the bag continues to expand up towards the glass, the patient will feel back pressure and resistance. To relieve this effect, open the lower cabinet. In the center there is a motor control. Turn it clockwise until the breathing bag deflates. Return the control to about 1/2 of its range when the study is complete. The use of this motor control will be a rare occurence. Do not adjust it unless it is absolutely necessary. If it is used, be sure to return it to its original position. To be effective, the increase in motor speed must be done before the bag is full so watch the "From Patient" bag carefully during washout.

19. When the washout is complete, remove the patient and let the system run for a few more seconds or until both bags are empty.

To prolong the life expectancy of your charcoal cartridge, do the following:

1. When the patient has completed the washout, do not leave the system running for more than 10 seconds.
2. Check the lower blower motor. It should be set on 50-60 and not increased unless a specific patient needs the extra evacuation power.
3. Make sure the drierite is replaced before it changes color.
4. Do not leave the Pulmonex in Position #3 when not in use.
5. Monitor the trap effluent at regular intervals and keep a formal record.
6. Spread studies out. If you perform all your studies in one day, xenon may break through.

Additional routine for maintenance program:

1. Remove the two breathing tubes on the back of the unit. Take one short tube about 8" and connect the two ports on the back of the unit together so that there is a C configuration made by the single tube. Place the handle in position #2 and press the oxygen button filling the unit with oxygen. Both bags should be blown up tight against the glass windows. They should remain tight for about two minutes. If they do not blow up tight or sag, you may have a leak somewhere in the system. Call us if this happens.

TEST PROCEDURE FOR MONITORING TRAP EXHAUST

Trap exhaust is monitored by using the gamma camera without a collimator. The following simple technique is used:

1. Remove the collimator from the camera.
2. With a 5 percent window, calibrate for Xe-133.
3. Fill a large plastic bag with a known volume of air (typically, 50 liters).
4. Inject a known quantity of Xe-133 (such as 100uCi) into the bag. The concentration will be 2×10^{-3} uCi cm^3).
5. Place the bag in front of the crystal and count for a known period of time. The c/m obtained is a measure of the efficiency.
6. Collect the exhaust of a typical study in another bag of the same volume (50 liters) and count as defined in Step #5.
7. Ratio the count rates to the standard taken to determine exhaust concentration.

   For example:

   If 2×10^{-3} uCi/cm^3 yielded 600,000 c/m above background, and collected effluent from the patient study was 150 c/m above background, then:

$$\text{Ratio} = \frac{1.5 \times 10^2 \text{ c/m}}{6 \times 10^5} = 2.5 \times 10^{-4}$$

   Exhaust Concentration

$$= R\,(2 \times 10^{-3} \text{ uCi/cm}^3)$$
$$= (2.5 \times 10^{-4})\,(2 \times 10^{-3})$$
$$= 5 \times 10^{-7} \text{ uCi/cm}^3 *$$

*MPC Xe-133 controlled area should not exceed 1×10^{-5} uCi/cm^3.

> Only perform the trap test when a patient is being tested on the system.

PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL SPECIFIED IN ITEM 6.b

We have a Co-57 calibration sealed source dated 12/20/78. This is from New England Nuclear model # NES-206. We use this for a daily calibration of our dose calibrator as stated in item 11. A wipe test is done every six months on this sealed source.

PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL SPECIFIED IN ITEM 6.b

We have a Co-57 calibration sealed source dated 5/26/82. This is from New England Nuclear Serial #2060582B-15, 229uCi of $^{137}_{C}s$ - 2/22/79 - Serial #3560279B-32, and 276uCi of $^{133}_{B}a$ - 2/22/79 - Serial #3580279B-14. They are used for calibration of dose calibrator. These sources are leak wipe tested every six months. The sources are handled with caution and surveyed $^{137}_{C}s$ - daily and $^{57}_{C}o$ and $^{133}_{B}a$ weekly for dose calibrator for constancy and accuracy.

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