

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: _____

(Isotope & Radiation Safety Committee)		15. GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL (Check One)	
7. MEDICAL ISOTOPES COMMITTEE		X	Appendix G Rules Followed; or Attachment 15.A
X	Names and Specialties Attached; and Attachment 7.A		Equivalent Rules Attached
	Duties as in Appendix B; or _____ (Check One)		
X	Equivalent Duties Attached Attachment 7.B	16. EMERGENCY PROCEDURES (Check One)	
8. TRAINING AND EXPERIENCE			Appendix H Procedures Followed; or
	Supplements A & B Attached for Each Individual User; and Attachment 8.A	X	Equivalent Procedures Attached Attachment 16.A Also see page 3 - Rad. Safety Plan
	Supplement A Attached for RSO. Attachment 8.A	17. AREA SURVEY PROCEDURES (Check One)	
9. INSTRUMENTATION (Check One)		X	Appendix I Procedures Followed; or Attachment 17.A
	Appendix C Form Attached; or		Equivalent Procedures Attached
X	List by Name and Model Number Attachment 9.A	18. WASTE DISPOSAL (Check One)	
10. CALIBRATION OF INSTRUMENTS			Appendix J Form Attached; or
X	Appendix D Procedures Followed for Survey Instruments; or Attachment 10.A & B (Check One)	X	Equivalent Information Attached Attachment 18.A
	Equivalent Procedures Attached; and	19. THERAPEUTIC USE OF RADIOPHARMACEUTICALS (Check One)	
X	Appendix D Procedures Followed for Dose Calibrator; or Attachment 10.A & C (Check One)	X	Appendix K Procedures Followed; or
	Equivalent Procedures Attached		Equivalent Procedures Attached Attachment 19.A
11. FACILITIES AND EQUIPMENT		20. THERAPEUTIC USE OF SEALED SOURCES	
X	Description and Diagram Attached Attachment 11.A	X	Detailed Information Attached; and Attachment 20.A
12. PERSONNEL TRAINING PROGRAM		X	Appendix L Procedures Followed; or _____ (Check One)
X	Description of Training Attached Attachment 12.A		Equivalent Procedures Attached
13. PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL		21. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE GASES (e.g., Xenon - 133)	
X	Detailed Information Attached Attachment 13.A	X	Detailed Information Attached Attachment 21.A
14. PROCEDURES FOR SAFELY OPENING PACKAGES CONTAINING RADIOACTIVE MATERIALS (Check One)		22. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL IN ANIMALS	
	Appendix F Procedures Followed; or	X	Detailed Information Attached Attachment 22.A
X	Equivalent Procedures Attached Attachment 13.A & 14.A	23. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL SPECIFIED IN ITEM 6.b	
		X	Detailed Information Attached Attachment 23.A

24. PERSONNEL MONITORING DEVICES				
TYPE <i>(Check appropriate box)</i>		SUPPLIER		EXCHANGE FREQUENCY
a. WHOLE BODY	<input checked="" type="checkbox"/>	FILM	R. S. Landauer	monthly
	<input type="checkbox"/>	TLD		
	<input type="checkbox"/>	OTHER <i>(Specify)</i>		
b. FINGER	<input type="checkbox"/>	FILM		
	<input checked="" type="checkbox"/>	TLD	R. S. Landauer	monthly
	<input type="checkbox"/>	OTHER <i>(Specify)</i>		
c. WRIST	<input type="checkbox"/>	FILM		
	<input type="checkbox"/>	TLD		
	<input type="checkbox"/>	OTHER <i>(Specify)</i>		

d. OTHER *(Specify)*

Victoreen VIP pocket monitor Model 1550
Prima IIa, Nuclear Associates Model 05-204

25. FOR PRIVATE PRACTICE APPLICANTS ONLY				
a. HOSPITAL AGREEING TO ACCEPT PATIENTS CONTAINING RADIOACTIVE MATERIAL				
NAME OF HOSPITAL			b. ATTACH A COPY OF THE AGREEMENT LETTER SIGNED BY THE HOSPITAL ADMINISTRATOR.	
MAILING ADDRESS			c. WHEN REQUESTING THERAPY PROCEDURES, ATTACH A COPY OF RADIATION SAFETY PRECAUTIONS TO BE TAKEN AND LIST AVAILABLE RADIATION DETECTION INSTRUMENTS.	
CITY	STATE	ZIP CODE		

26. CERTIFICATE <i>(This item must be completed by applicant)</i>	
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 <i>(See Section 170.31, 10 CFR 170)</i>	b. APPLICANT OR CERTIFYING OFFICIAL <i>(Signature)</i>
(1) LICENSE FEE CATEGORY:	(1) NAME <i>(Type of Print)</i> CHARLES C. FREEMAN
N/A	(2) TITLE Center Director
(2) LICENSE FEE ENCLOSED: \$	c. DATE

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 Form NRC-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.

RADIOACTIVE MATERIAL FOR MEDICAL USE

1. Sources in Groups VI that are used include:

- a. Iodine 125 - Sealed source (Norland Model 178 Bone Mineral Analyzer) 400mCi (maximum limit), used for bone mineral analysis
- b. Strontium 90 - Sealed source (Atlantic Research Corp, Model B-1 Beta Applicator) 120mCi for treatment of superficial eye disease
- c. Cesium 137 - needles and tubes (3M Medical Products Div.) for topical, interstitial and intracavitary treatment of cancer. See Table 6A

TABLE 6A

Description of Source	Number of <u>Sources</u>	Millicuries per <u>Source (nominal)</u>	Total Millicuries <u>(nominal)</u>
<u>Needles</u>			
0.5mg Ra Equiv. Gold	10	1.36	13.6
0.75mg Ra Equiv. Gold	10	2	20.0
1.0mg Ra Equiv. Gold	15	2.72	40.8
1.5mg Ra Equiv. Gold	5	4.1	20.5
1.0mg Ra Equiv. Silver	10	2.72	27.2
1.5mg Ra Equiv. Silver	10	4.1	41.0
2mg Ra Equiv. Silver	15	5.5	82.5
3mg Ra Equiv. Silver	4	8.2	32.8
<u>Tubes</u>			
5mg Ra Eq.	4	13.6	54.4
10mg Ra Eq.	10	27.2	272.0
Total: 604.8 millicuries of Cesium 137 (nominal)			

RADIOACTIVE MATERIAL FOR USES NOT LISTED IN ITEM 6.A

<u>Element/Mass No.</u>	<u>Chemical Form</u>	<u>Max. Number of Millicuries of Each</u>	<u>Purpose of Use</u>
Carbon 14	Carbon labelled compounds like: Palmitic acid, ^{14}C Paraminohippurate, and other non-gaseous forms	1 mCi	These nuclides would be used for laboratory research, tracer studies, including animal studies authorized by the Isotope & Rad. Safety Committee
Hydrogen 3	Tritium labelled compounds like Ouabain, inulin and other non gaseous forms	3 mCi	
Iodine 125	Any labelled chemical compound	2 mCi	
Iodine 131	Any labelled chemical compound	2 mCi	
Rubidium 86	Adenosine Triphosphate	1 mCi	
Cerium 141	Any labelled chemical form	3 mCi	
Chromium 51	Any labelled chemical form	3 mCi	
Strontium 85	Any labelled chemical form	3 mCi	
Carbon 14	^{14}C Arachidonic acid and other carbon labelled compounds and other non gaseous forms	5 mCi	In vitro studies
Calcium 45	$^{45}\text{CaCl}_2$	3 mCi	
Phosphorus 32	Adenosine triphosphate	1 mCi	
Hydrogen 3	Tritium labelled compounds like Ouabain, inulin and other non gaseous forms	10 mCi	

CHANGE NO. 1
ATTACHMENT A
CENTER MEMORANDUM 11-83-3
March 8, 1983

ISOTOPE AND RADIATION SAFETY COMMITTEE

The following are designated members of the Isotope and Radiation Safety Committee:

Dr. Julio V. Rivera Chief, Nuclear Medicine Service	Chairman
Dr. Juan M. Aranda Chief, Cardiology Section	Member
Ms. Heidi Pabón Radiation Safety Officer	Member
Mrs. Myrna O'Neill Administrative Assistant/Chief of Staff	Member
Mrs. Yolanda Ortiz Mr. Rafael Bernabe Prida (Alternate) AFGE Local 2408 Representative	Member
Mrs. M. Palacios de Lozano Physicist, Radiology Service	Member
Dr. Elsie Cintrón Chief, Radiology Service	Member
Dr. Lucy Toro Chief, Radiotherapy Section	Member
Mr. Tomás Rivera, RN Nursing Service	Member

ITEM 7

ISOTOPE AND RADIATION SAFETY COMMITTEE

I. PURPOSE: To establish in this Center an Isotope and Radiation Safety Committee.

II. POLICY: Procedures established at this Center will insure the safety of patients and employees in the performance of diagnostic, therapeutic and research procedures involving the use of ionizing radiation.

III. RESPONSIBILITIES:

a. The Isotope and Radiation Safety Committee will be responsible for the establishment of policies on the use of radioactive isotopes and radiation in medical diagnosis, treatment and research. It will review all proposals submitted by the medical staff for these purposes.

b. It will be responsible to the Chief of Staff for the safe use of radiation and radioisotopes within the Center.

c. It will be responsible for assuring compliance with the Institution's Radiological Safety Plan and requirements published in most recent guides described therein.

IV. PROCEDURES:

a. The Isotope and Radiation Safety Committee will be appointed by the Chief of Staff and will consist of the Chief of Nuclear Medicine, Chief of Radiology and Radiation Safety Officer or their representatives, one representative from Engineering Service, one from Nursing Service, and other members at large.

b. The Isotope and Radiation Safety Committee will meet at least quarterly and at the call of the Chairman.

c. The Committee will review and grant permission to individuals for the use of byproduct material for diagnosis and treatment in humans and for experimentation in animals and humans. It will be concerned with radiological health and safety of patients, personnel and environment.

d. The Committee will prescribe conditions required during the use or proposed use of byproduct material and radiation, and minimum level and experience of users.

e. The Committee will review records and reports from the Radiation Safety Officer and from other individuals delegated responsibilities for health safety practices.

f. The Committee will recommend remedial actions to the Chief of Staff to correct safety infractions.

ATTACHMENT 7B

ITEM 7

g. The Committee will formulate and review the institutional training programs for the safe use of radioisotopes and radiation emitting equipment - both diagnostic and therapeutic.

h. Copy of minutes of Committee meetings will be distributed to all members of the Committee, Chief of Staff and Center Director. These will include recommendations on reports from the Radiation Safety Officer and from other individuals concerned with radiation health safety practices.

V. REFERENCES: VA Manual M2, Part XX

VI. RESCISSIONS: Center Memorandum No. 00-78-6, Attachment D of May 16, 1977.

VII. EXPIRATION DATE: March 8, 1986


CHARLES C. FREEMAN
Center Director

TRAINING AND EXPERIENCE

1. Training and experience of users are reviewed by the Isotope and Radiation Safety Committee.
2. Medical users are physicians who are required to comply with training and experience criteria in Appendix A of the Guide 10.8 as a minimum.
3. Users other than physicians:
 - a. Qualifications are also reviewed by the Isotope and Radiation Safety Committee;
 - b. The Committee ensures that these users have sufficient training and experience with the type of materials, quantities involved, instrumentation to be used and radiation safety procedures involved in the type of work they will be doing.

4. Radiation Safety Officer

Heidi Pabón-Pérez

Qualifications submitted in letter dated June 15, 1984 and her name was included in the License Amendment No. 25.

INSTRUMENTATION

1. Survey Meters (one of each)

- a. Supplier: Nuclear Associates
 Model: PUG-1 (GM survey meter)
 Minimum range: 0 to 500 cpm or 0 to 0.2 mR/hr
 Maximum range: 0 to 50,000 cpm or 0 to 20 mR/hr
 Probe: GM "pancake" tube 1 3/4" diameter
 1.5mg/cm²
- b. Manufacturer: Victoreen
 Model: 470A - Panoramic (Ion chamber survey meter)
 Minimum range: 0 to 3 mR/hr (mR/hr range)
 Maximum range: (mR) 0 to 1000 mR/hr (mR/hr range)
 Maximum range: (R) 0 to 1000 R/hr (R/hr range)
 Also may be used as integrator

Other survey meters in the premises (one of each):

- a. Manufacturer: Victoreen
 Model: 491
 Minimum range: 0 to 0.1 mR/hr
 Maximum range: 0 to 100 mR/hr
- b. Manufacturer: Victoreen
 Model: 440
 Minimum range: 0 to 1 mR/hr
 Maximum range: 0 to 300 mR/hr

2. Dose calibrator (one of each):

- a. Manufacturer: Capintec
 Model: CRC-10
- b. Manufacturer: Capintec
 Model: CRC-5

3. Instruments used for diagnostic procedures:

- a. Gamma Camera (one of each):
 - 1. Manufacturer: Technicare
 Model: Sigma 410
 - 2. Manufacturer: Technicare
 Model: Sigma 420
 - 3. Manufacturer: Technicare
 Model: Omega 500

INSTRUMENTATION (cont'd.)

b. Scanner (one):

Manufacturer: Ohio Nuclear
Model: 84FD

c. Thyroid Probe (one):

Manufacturer: Picker
Model: Spectroscaler 4R

d. Nuclear Stethoscope:

Manufacturer: BIOS, Inc.
Model: 3000

e. Computer (Dedicated systems in Nuclear Medicine Service for imaging analysis) (two systems):

1. Manufacturer: Medical Data Systems
Model: Spectra A² System

2. Manufacturer: Medical Data Systems
Model: A² Mobile System

4. Gamma Scintillation Counters (one of each):

a. Manufacturer: Tractor Northern
Type of instrument: multichannel pulse height analyzer
Model: TN1705

Scintillation detector type: NaI(Tl) Well
Manufacturer: Bicron Model 2MW
(with preamplifier Tennelec Model 155 and
Power Supply Bertran Model 215)

Lower limit of detection for Cesium 137 is about 19.8
± 12 net for a 95% confidence level for 10 min counts.
Minimum sensitivity is about 2.5×10^{-5} uCi

b. Manufacturer: Beckman
Type of instrument: NaI(Tl) Well Scintillation detector,
automatic sample changer with printer,
76mm diameter - microprocessor controlled
Model: 8000

c. Manufacturer: Beckman
Type of instrument: NaI(Tl) Well Scintillation detector,
76mm diameter, automatic sample changer with
printer - microprocessor controlled
Model: 7000

Lower limit of detection for the Beckman Gamma systems is about
19.2 ± 12 cpm for Cs137 for a 95% confidence level for a 10min count.
Minimum sensitivity is about 2.4×10^{-5} uCi.

INSTRUMENTATION (cont'd.)

d. Liquid Scintillation Counter:

Manufacturer: Beckman

Type of instrument: Liquid scintillation counter, automatic
sample changer - microprocessor controlled

Model: LS 3150 T

5. Area monitors (one of each):

a. Supplier: Nuclear Associates Inc.

Model: 05-425 0.1mR/hr - 100mR/hr

b. Supplier: Nuclear Associates Inc.

Model: Primalert 50 0.2mR/hr - 25mR/hr

CALIBRATION OF INSTRUMENTS

1. Appendix D Procedures will be followed for the calibration of:
 - a. Survey instruments (the calibration form used is similar to the one in Appendix D of Regulatory Guide 10.8)
 - b. Dose calibrators
2. Instrument used for Diagnostic Purposes.
 - a. Gamma Cameras
 1. Daily and weekly quality control procedures are performed in accordance with manufacturer's recommendations.
 2. For other instruments, including counting equipment, quality control procedures are performed daily or when the instruments are used.

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 used for radiation protection purposes, i.e., at least up to 1 R/hr.

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 percent of the calculated or known values for each point checked. Readings within ± 20 percent are considered acceptable if a calibration chart, graph, or response factor is prepared, attached to the instrument, and used to interpret readings to within ± 10 percent. Also, when higher scales are not checked or calibrated, an appropriate precautionary note will be posted on the instrument.

3. Survey instruments will be calibrated

- a. By the manufacturer
- X b. ~~At the licensee's facility~~ At nearby facility; Medical Sciences Campus,
University of Puerto Rico

(1) Calibration source

Manufacturer's name Tech/Ops

Model no. 773

Activity in millicuries 0.159 C1 Cs 137 on June 29, 1983

or

Exposure rate at a specified distance

Accuracy $\pm 3\%$

Traceability to primary standard yes

- X (2) The calibration procedures in Section I of Appendix D will be used
or
- (3) The step-by-step procedures, including radiation safety procedures, are attached.

 c. By a consultant or outside firm

- (1) Name
- (2) Location
- (3) Procedures and sources

 have been approved by NRC and are on file in License No.

 have been approved by an Agreement State; a copy of the Agreement State license, the procedures, and a description of the sources are attached, and the consultant's report will contain the information on

 the attached "Certificate of Instrument Calibration."
 the consultant's reporting form as attached.

 are described in the attachment, and the consultant's report will contain the information on

 the attached "Certificate of Instrument Calibration."
 the consultant's reporting form as attached.

Item 10

CERTIFICATE OF INSTRUMENT CALIBRATION

For:

Instrument:

Manufacturer _____

Type _____

Model No. _____

Serial No. _____

Calibration Data:

Scale	Exposure rate (mR/hr)	Instrument reading (mR/hr)	Exposure rate (mR/hr)	Instrument reading (mR/hr)	Exposure rate (mR/hr)	Instrument reading (mR/hr)

Comments:

	Activity or	
<u>Nuclide</u>	<u>Exposure Rate at Specified Distance</u>	<u>Calibration Accuracy</u>
Calibration Source		

Calibrated by _____ Date _____

CALIBRATION OF DOSE CALIBRATOR

A. Sources Used for Linearity Test

(Check as appropriate)

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

or

☒ Other* (specify) Calicheck system*

B. Sources Used for Instrument Accuracy and Constancy Tests

<u>Radionuclide</u>	<u>Suggested Activity (mCi)</u>	<u>Activity (mCi)</u>	<u>Accuracy</u>
Co-57	3-5	<u>4.8</u>	<u>± 3%</u>
Ba-133	0.1-0.5	<u>0.210</u>	<u>± 3%</u>
Cs-137	0.1-0.2	<u>0.108</u>	<u>± 3%</u>
Ra-226	1-2	_____	_____
_____		_____	_____

C. ☒ The procedures described in Section 2 of Appendix D will be used for calibration of the dose calibrator

or

_____ Equivalent procedures are attached.

*For licensees who are not authorized for Mo-99/Tc-99m generators, activity must be equivalent to the highest activity used.

*A device called Calicheck from Calcorp Inc. is used to check for linearity. The manufacturer's instructions for use as revised on March 2, 1982 are followed.

ITEM 10

The activity levels of the reference sources used should approximate those levels normally encountered in clinical use (e.g., Co-57, 3-5 millicuries) giving adequate attention to source configuration. Identify in your application the three sources that you will use. State nuclide, activity, and calibration accuracy. The lower-energy reference standards (Tc-99m, Xe-133, I-125) must be in vials with the same thickness of glass as the actual samples to be measured for best accuracy.

1. Assay the reference standard in the dose calibrator at the appropriate setting, and subtract the background level to obtain the net activity.
2. Repeat step 1 for a total of 3 determinations, and average results.
3. The average activity determined in step 2 should agree with the certified activity of the reference source within ± 5 percent after decay corrections.
4. Repeat the above steps for other commonly used radionuclides for which adequate reference standards are available.
5. Keep a log of these calibration checks.
6. Calibration checks that do not agree within ± 5 percent indicate that the instrument should be repaired or adjusted. If this is not possible, a calibration factor should be calculated for use during routine assays of radionuclides.
7. At the same time the instrument is being initially calibrated at the licensee's facility with the reference standards, place a long-lived source in the calibrator, set the instrument, in turn, at the various radionuclide settings used (Cs-137, I-131, Tc-99m, I-125, etc.), and record the readings. These values may later be used to check instrument calibration at each setting (after correcting for decay of the long-lived source) without requiring more reference standards. Keep a log of these initial and subsequent readings.

FACILITIES AND EQUIPMENT

1. Nuclear Medicine Area:

The Nuclear Medicine Service is located at the basement in the hospital building. Diagram 1 shows the location of the different areas of the nuclear medicine service relative to the other areas in the basement. Above the nuclear medicine area is the entrance corridor, administrative services, bathrooms, clinical services and clinical laboratories.

Diagram 2 indicates the location of the equipment in the Preparation Room. This facility is used to receive, store and to prepare pharmaceuticals.

a. Tc99m Generators

Generator in use is stored inside a secondary shield. This shield is located on the bench, at Room A-3, (Diagram 2). Additional lead blocks 8x4x2 inches are used around the secondary shield (front and sides), lead plates about 1 inch thick (total) are placed at the back.

b. Storage of radiopharmaceuticals

Most radiopharmaceuticals are stored and handled at the shielded area, at Room A-3. An "L" shield with lead glass, (Diagram 2) is used. Lead blocks 8x4x2 inches are located around the sources.

Iodine and Xenon are stored in the hood (Room A-3) in lead containers. Lead blocks are used to provide additional shielding, configuration and size of shielding inside the hood may vary in accordance with the materials stored and used.

Refrigerated radiopharmaceuticals (kits) may be stored in the refrigerator at Room A-3 (Diagram 2) or Cold Room at Room A-11 (Diagram 3).

c. Storage of radioactive waste

Syringes, and other small contaminated objects are collected in a box inside a shield (lead bricks 8x4x2 inches) in Room A-3, (Diagram 2), then transferred to a box in Room A-2 (Diagram 4), for decay before final disposal. The area is surveyed weekly. Used generators are stored in this area too.

d. Preparation and dispensing of Group III kit radiopharmaceuticals

This is done in the shielded area at Room A-3 where the "L" shield with the lead glass is. At adjacent areas in Room A-14, where patients' records are kept, there are large files; access to this files is limited to Nuclear Medicine personnel.

Facilities and Equipment
Page 2

e. Imaging rooms

See Diagrams 4 and 5. Technologists may stand 8 or more feet from the patient in Rooms A-1 and A-12. Scanner and thyroid uptake probe are in Room A-11b, (Diagram 6).

f. Xenon 133 facilities

Room A-1 is used for ventilation studies using Xenon 133. A Xenon trap is used to collect the gas. For more details, see Attachment 21.A.

2. Clinical laboratory

Most radioassays are performed at Room A-11, (Diagram 3), but some are performed in the Clinical Laboratory Service located in the first floor. (Kits with small quantities of Iodine 125 and Cobalt 57 are used there) and some are performed in the research laboratories or the animal research facility in their laboratories, next to the Nuclear Medicine Service. Hoods are available in these other facilities.

LABORATORIES (RESEARCH)

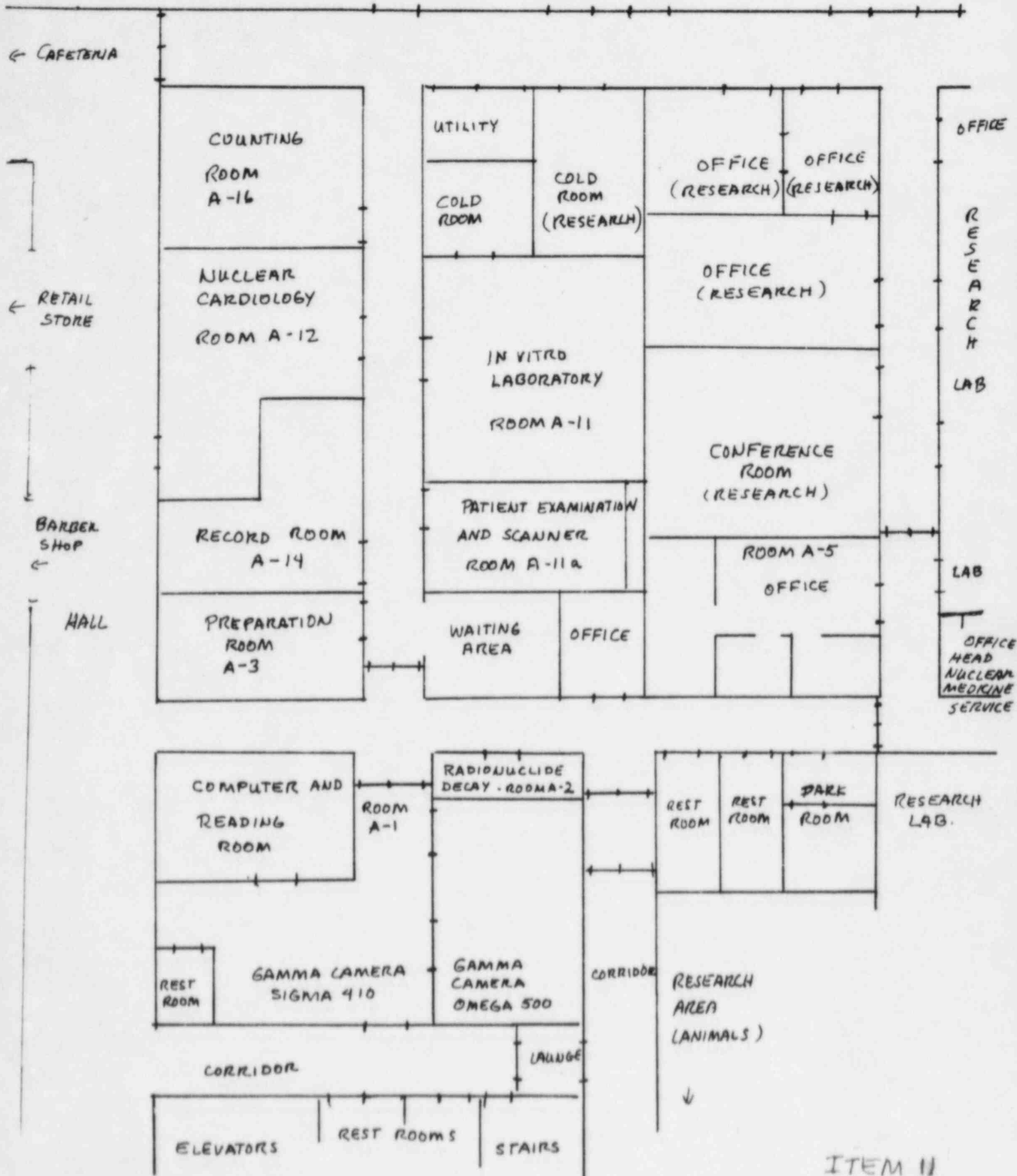
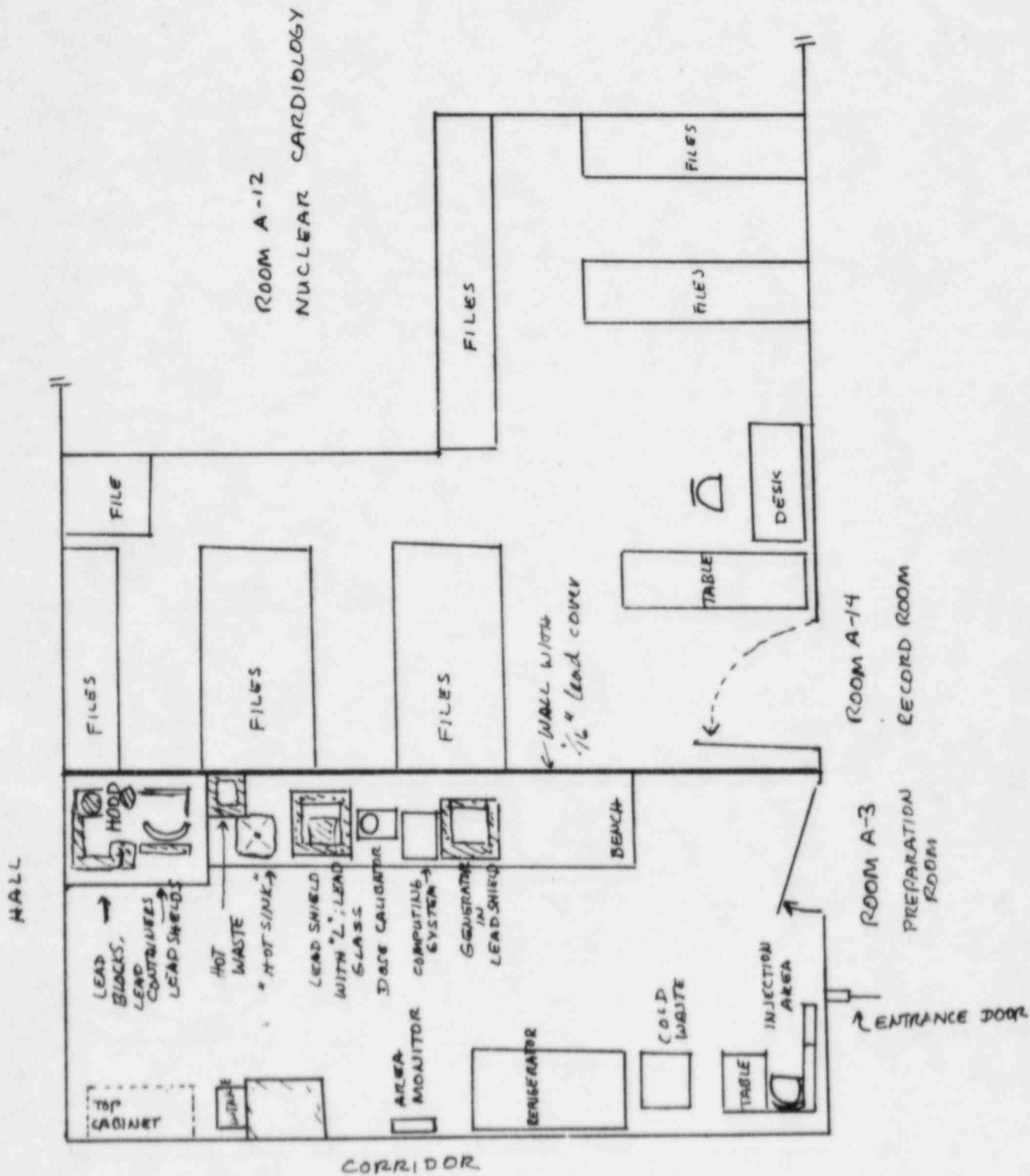


DIAGRAM 1

ITEM 11



SCALE 1/4" = 1'
0 1' 2' 3'

DIAGRAM 2

ITEM 11

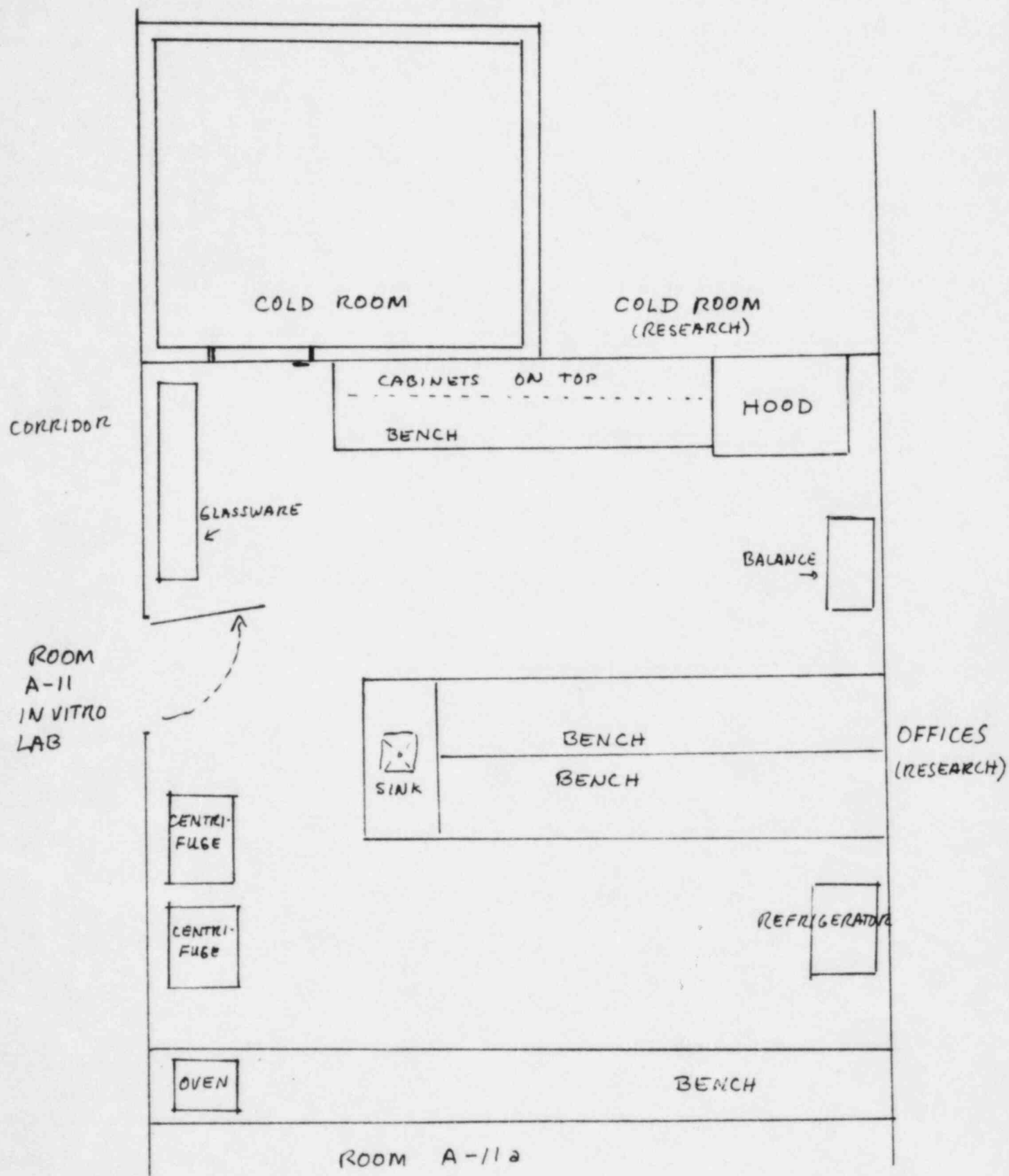


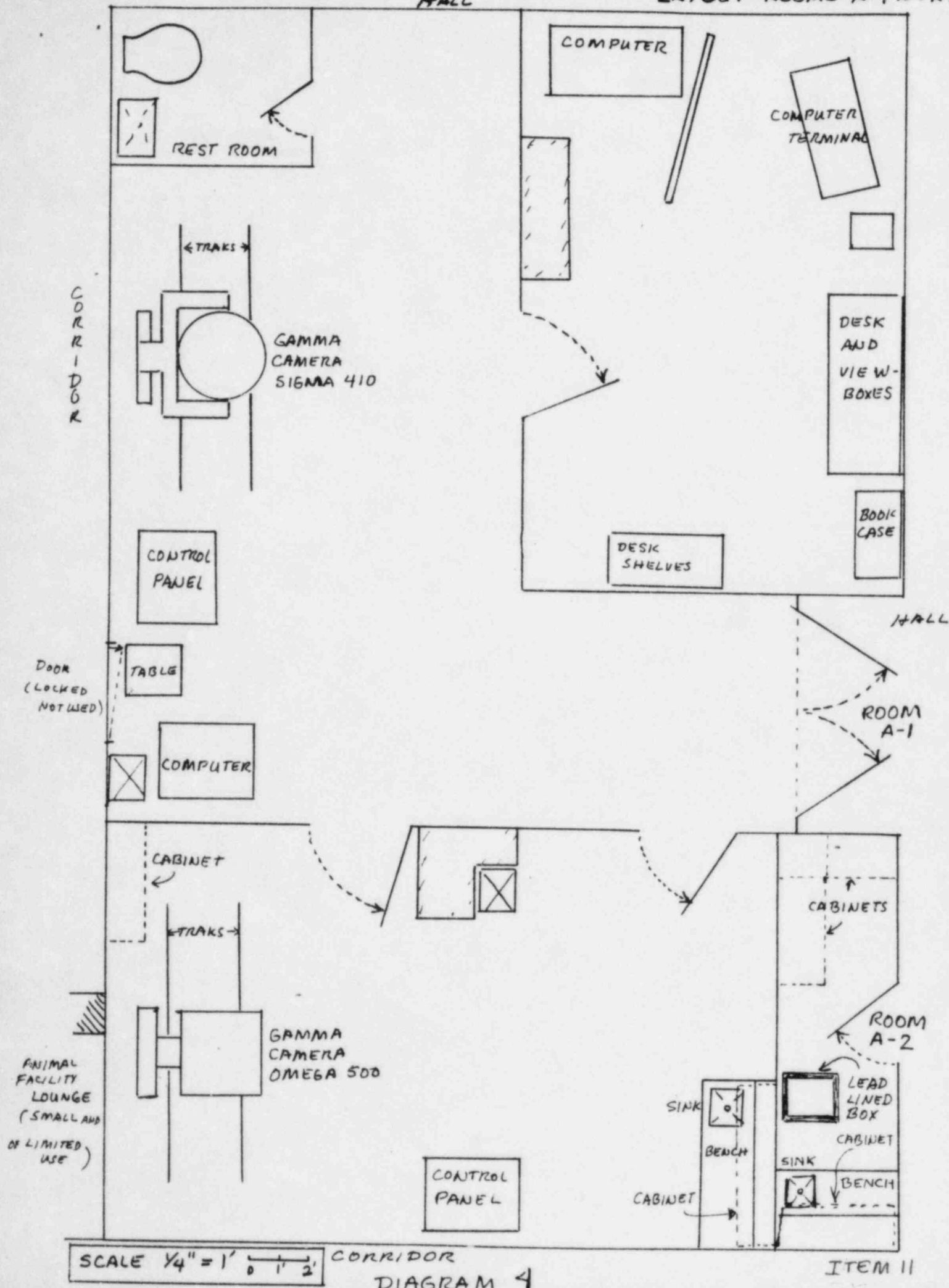
DIAGRAM 3

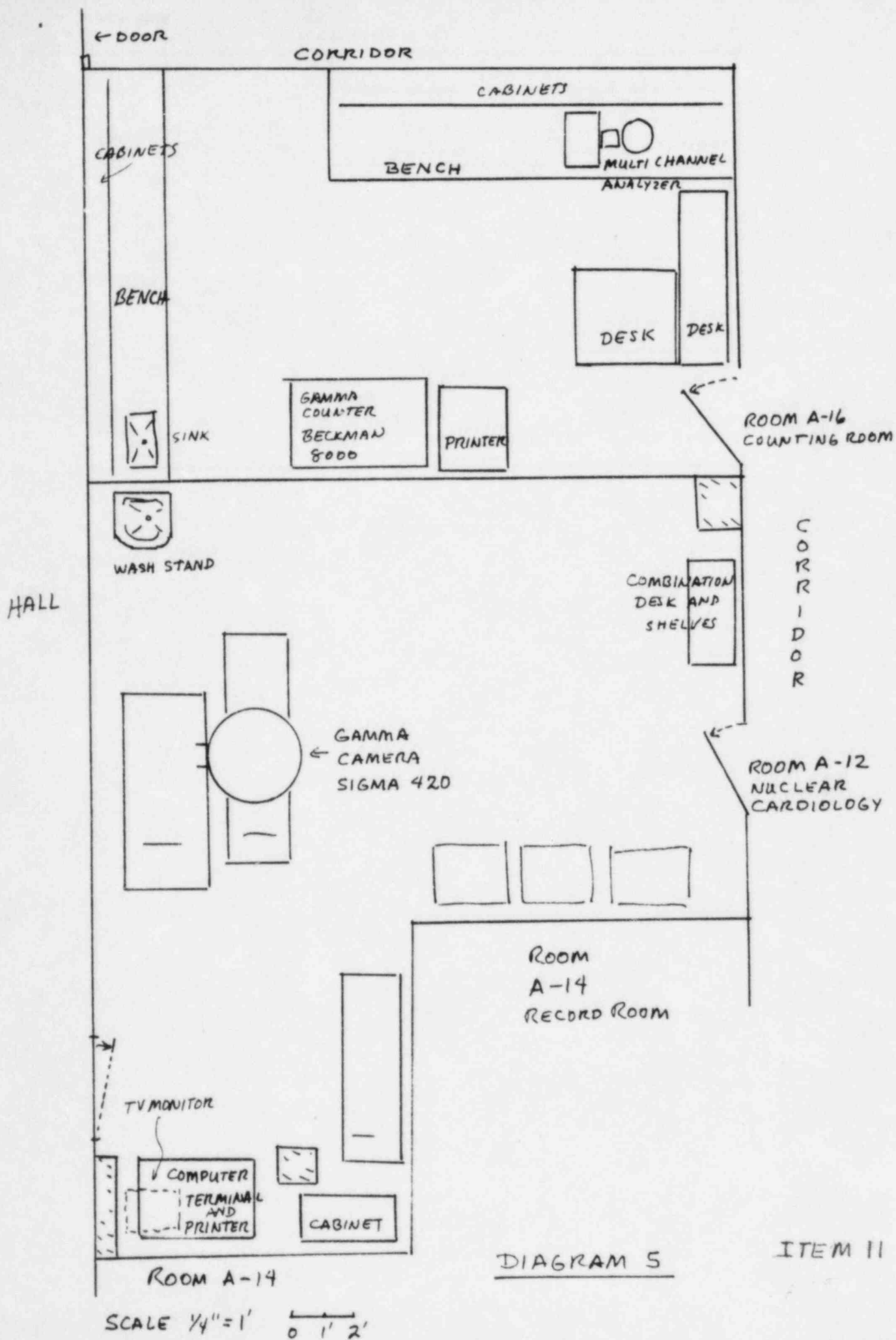
ITEM 11

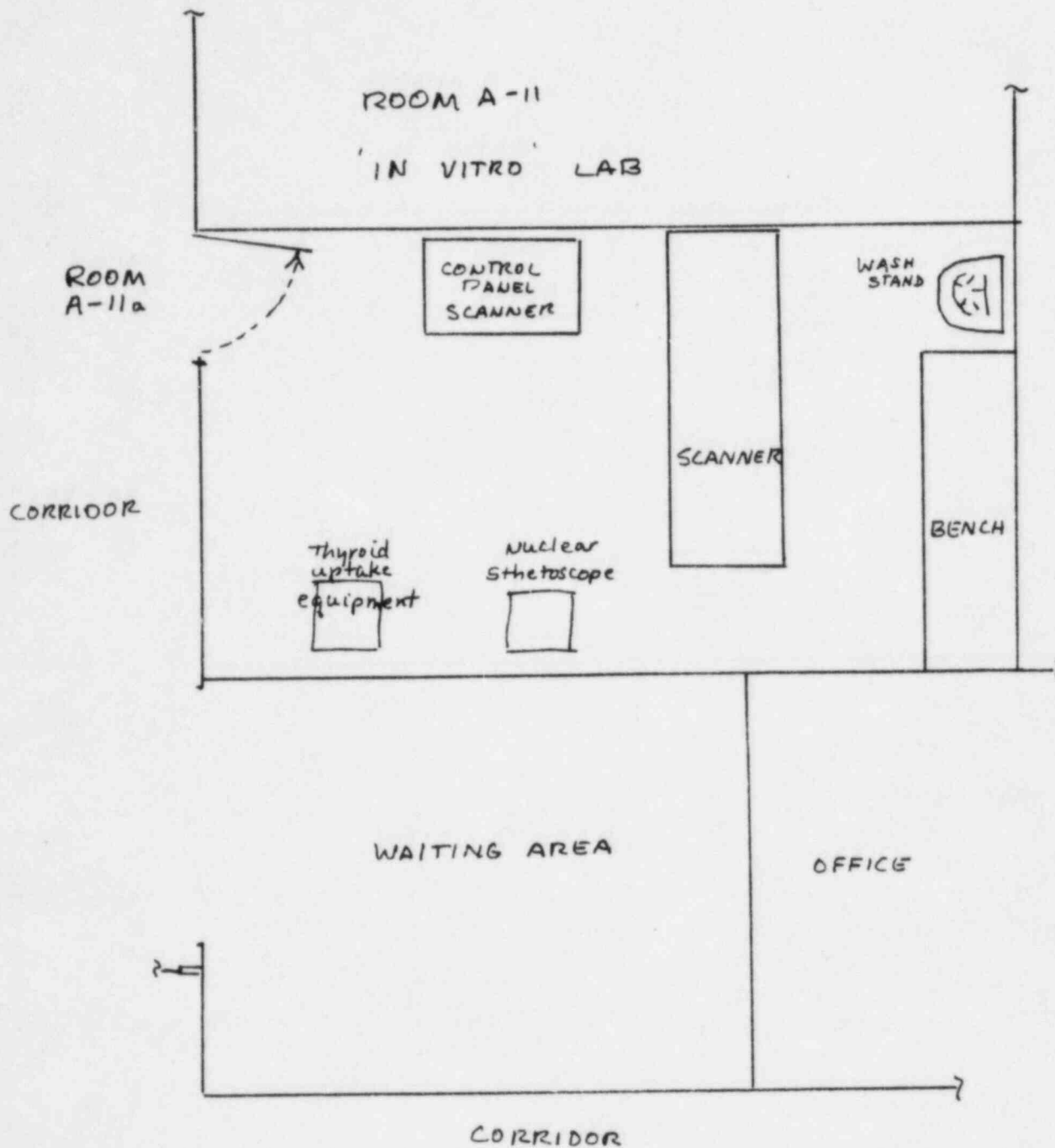
SCALE $\frac{1}{4}'' = 1'$ 0 1' 2'

HALL

LAYOUT ROOMS A-1 AND A-2







SCALE $\frac{1}{4}" = 1'$

0 1' 2'

DIAGRAM 6

ITEM 11

PERSONNEL TRAINING PROGRAM

1. The Radiation Safety Officer or his/her designee will provide instructions to radiation workers and other personnel as required by 10CFR, Part 19.12 and our ALARA Program. This training is provided to:

- a. radiation workers, including medical, technological, diagnostic radiology personnel and residents;
- b. nurses;
- c. security personnel;
- d. maintenance personnel;
- e. animal caretakers;
- f. secretarial and clerical personnel

2. Training will be provided:

- a. before assuming duties related to radiation;
- b. as annual refresher training;
- c. wherever significant changes in duties occur.
Personnel is informed of changes in regulations or terms of license.

3. Outlines of the (draft) Regulatory Guide "Radiation Protection Training for Personnel Employed in Medical Facilities" is being used as a guideline, with adaptations to our particular case.

Subjects included in the outlines of the draft are included in the lectures as necessary.

4. Lectures are of one hour duration for refresher training. (May extend to more than one hour lectures if considered necessary by the Radiation Safety Officer or Service Chief.) Sets of slides are available and used.

PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIALS

1. Procedures for procurement of radioactive material are specified in page 3 of the Radiological Safety Plan, Section B-3. These include receipt during off duty hours.
2. Specific procedures for opening the packages are detailed in Attachment II at the end of the Radiological Safety Plan.
3. Nuclear Medicine Service has contracts to receive specific materials at specific dates, usually during the weekend, every week. In this case, on Monday morning, the packages received are checked and surveyed before commencing work for the day and a form similar to the form enclosed is used (Attachment 14.A), which enables us to correlate easily the material received with the material expected. (The nuclides included may vary.) For other cases, a form which contains the same information as that in Appendix F of Regulatory Guide 10.8 is used.

RADIOACTIVE SHIPMENT RECEIPT REPORT
NUCLEAR MEDICINE SERVICE STANDING ORDERS

DATE: _____

[illegible]

Discrepancies: No _____ If yes, notify the RSO.
Yes _____

Survey of Packing Materials and Cartons

Surveyor:

GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIALS

See the Radiological Safety Plan, page 4, Section 5.

1. All users are required to follow procedures in page 4 of the Radiological Safety Plan.
2. These procedures are the ones listed in Appendix 6 of the Regulatory Guide 10.8.

EMERGENCY PROCEDURE FOR RADIOACTIVE SPILLS

Unsealed radioactive liquids are handled routinely in the Nuclear Medicine Laboratory. The potential for spillage is always present. It is imperative that individuals handling radioactive materials respond properly to these spills so as to limit their radiation exposure and prevent the spread of contamination.

MINOR SPILLS (tracer activities)

1. NOTIFY persons in the area that a spill has occurred.
2. PREVENT THE SPREAD, cover the spill with absorbent paper.
3. LIMIT ACCESS to the area to only those dealing with the spill.
4. CLEAN UP using disposable gloves, tongs. Insert all contaminated materials in plastic bags and dispose in radioactive waste containers.
5. SURVEY (use a GM survey meter) potentially contaminated areas, hands, clothing, shoes of potentially contaminated persons, decontaminate as necessary.
6. REPORT incident to the Radiation Safety Officer and submit a brief written report.

MAJOR SPILLS (therapy activities)

1. CLEAR THE AREA, notify all persons not involved in the spill to vacate the room at once.
2. PREVENT THE SPREAD. Cover spill with absorbent paper, confine the movement of all personnel potentially contaminated to prevent the spread.
3. CLOSE THE ROOM, lock doors to prevent entry.
4. CALL FOR HELP, notify the Radiation Safety Officer immediately.
5. PERSONNEL DECONTAMINATION
 - a. If the spill is on the skin, flush thoroughly and then wash with mild soap and lukewarm water.
 - b. Contaminated clothes should be removed and stored for further evaluation by the Radiation Safety Officer.
 - c. Survey (GM Survey Meter) personnel involved. Immediately initiate decontamination of personnel as necessary.

PERSONS TO NOTIFY:

Radiation Safety Officer - Heidi Pabón
BC-9 Yagrumo St.
Valle Arriba Heights
Carolina, P. R.
768-3904 (home)
758-7575 ext. 3372/5021/3254

Chief, Nuclear Medicine Service - Julio V. Rivera, MD
1515 Rhin St.
El Paraiso
Rio Piedras, P. R.
767-1377 (home)
758-7575 ext. 3372/3254

May 1984

*Reviewed
March 7, 1985
H. Pabón*

ITEM 16

AREA SURVEY PROCEDURES

1. Procedures and frequencies in Appendix I of Regulatory Guide 10.8 are followed.
2. Action levels for removable surface contamination in Medical Institutions in Table 2, page 8.23-8 of Regulatory Guide 8.23 (Jan. 1981) are used.
3. The Radiation Safety Officer will set a schedule for periodic radiation surveys of laboratories that may take in consideration:
 - a. the type of materials and amount used;
 - b. the frequency with which an area is used to work with radioactive materials
4. Individual users may perform radiation surveys in their own work areas.
5. For additional information, see pages 5 and 9 of the Radiological Safety Plan.

WASTE DISPOSAL (See Section B-4 of the Radiological Safety Plan)

1. Liquid waste will be disposed of in the sanitary sewer system in accordance with Section 20.303 of 10CFR, Part 20.

2. Mo-99/Tc 99m Generators:

Generators supplied by Medi Physics Inc. are returned to the manufacturer for disposal. Others are held for decay; columns are segregated and monitored separately to ensure decay to background levels prior to disposal.

3. Other solid waste is held for decay, except certain waste containing ^3H and ^{14}C . Mo-99/Tc 99m generators and any other waste held for decay are held until radiation levels, as measured in a low background area 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.

4. Other waste containing ^3H and ^{14}C :

These nuclides are used in very low concentration in radioassay procedures and tracer studies, so that it is possible to dispose of certain wastes as is indicated in Section 20.306 of 10CFR, Part 20.

THERAPEUTIC USE OF RADIOPHARMACEUTICALS

1. Appendix K procedures followed.
2. Attachment B and C are formats used in the case of therapeutic administration of Iodine 131.
3. See page 5 of Radiation Safety Plan.
4. Procedures described in Attachment 19.D are followed.

I M P O R T A N TRADIATION SAFETY PRECAUTIONS FOR PATIENTS CONTAINING THERAPEUTIC DOSES OF ^{131}I

1. Visitors will stay _____ minutes long at _____ meter away from patient.
2. No nurse who is pregnant will attend the patient. Likewise, visits of pregnant women and children are prohibited.
3. The patient shall use disposable items and utensils whenever possible.
4. Nursing personnel will wear personal radiation monitors. Nuclear Medicine Service will furnish this equipment only to the personnel that is in direct contact with the patient. Use gloves while attending the patient.
5. Patient's clothing and bed linens should be stored in a plastic bag inside the patient's room for surveying by the Radiation Safety Personnel before they are sent to the laundry.
6. Bed mattresses and pillow must be covered by a plastic bag. Also, bathroom's floor and toilet should be covered by absorbing pads to avoid any possible contamination.
7. Urine of incontinent patients should be disposed in the toilet, flushing it three or more times.
8. Patient will remain hospitalized until the Radiation Safety Officer or his designee certifies that the remaining dose in patient is less than 30mCi.
9. The room must be surveyed before it is reassigned to another patient. Ward's Supervisor should inform to Nuclear Medicine Service about the date and hour when the patient will be discharged.
10. For any radiation safety emergency, contact HEIDI PABON, Radiation Safety Officer on extensions 5021, 3254, 3372.

May 1984
Nuclear Medicine Service
VA Medical & Regional Office Center
San Juan, Puerto Rico

Off Duty Telephone Numbers

Heidi Pabón 768-3904
Radiation Safety Officer

Julio V. Rivera, MD 767-1377
Chief, Nuclear Medicine Service

VA MEDICAL & REGIONAL OFFICE CENTER
SAN JUAN, PUERTO RICO
NUCLEAR MEDICINE SERVICE

ATTACHMENT 19.C

131

I THERAPY ADMINISTRATION AND SURVEY RECORD

Patient _____ Date _____ Time _____
Social Security Number _____ Age _____
Dose (mCi) total: _____ residual: _____ net: _____ Diagnosis _____
Supervising Physician (sign) _____ ☐ Inpatient ☐ Outpatient
Dose Administered by (sign) _____ Ward _____ Room _____

SURVEY DATA

<u>Points of Survey</u>	<u>After Dose Administration</u>	<u>At Patient Discharge</u>	<u>After Discharge</u>
DATE:	_____	_____	_____
TIME:	_____	_____	_____
NET EXPOSURE RATES: (mR/hr.)			
One meter away from patient	_____	_____	_____
Two meters away from patient	_____	_____	_____
Bedside of patient	_____	_____	_____
Adjacent Room (wall contact)	_____	_____	_____
Adjacent Bed (patient's level)	_____	_____	_____
Corridor	_____	_____	_____
Washstand	_____	_____	_____
Floor	_____	_____	_____
Bathroom	_____	_____	_____
Other (specify)	_____	_____	_____
Person performing Survey	_____	_____	_____

NUCLEAR MEDICINE SERVICE

PROCEDURE FOR HANDLING OF RADIOIODINATED SOLUTIONS

General

Iodide ion in solution is subject to oxidation to iodine. This reaction is catalyzed by lights and is favored by an acid medium as results from solution of atmospheric carbon dioxide. Iodine thus formed is liberated from solution. Thus, iodinated solutions represent a special radiation hazard. The following procedure concerning special precautions shall be followed:

Procedure

1. Place shipments containing therapeutic amounts of radioiodine solutions behind lead shield at the fume hood in Room A3. This material shall be opened and handled only within the hood.
2. Wear gloves all the time while handling this material.
3. Use tongs whenever removing bottles from their shield.
4. Cover the surfaces of the hood and cover the floor in front of the hood with absorbent paper.
5. Administration of therapeutic doses:
 - a. The physician in charge is responsible for the administration of therapeutic doses to the patient. This should be done at the hood.
 - b. Radiation Safety personnel shall be present to maintain proper radiation safety precautions and survey the area after the dose administration.
 - c. Monitor hands and clothing before leaving the area.
6. Perform decontamination procedures if required.
7. All persons handling more than 1mCi of radioiodine should have a measurement of thyroid uptake the following day. Uptake will be calculated by comparison with the standard used in patient's uptake studies.
8. A record of results is maintained in the Radiation Safety Office.

March 1985

THERAPEUTIC USE OF SEALED SOURCES

A. Brachithery Sources:

1. Area where the sealed sources are stored:
 - a. Sources are located in a corner of the Cobalt 60 teletherapy room.
 - b. Diagram 7 shows the location of the shielded safe with the sources.
 - c. Shielding:
 - 1) Shielded storage safe (Radium Chemical), steel and shielded with 3 1/2 inches of lead, key lock door, four drawers. Drawers have a hole for each source. Outside dimensions of the safe: 11 1/2 x 11 1/2 x 12 1/2 inches.
 - 2) Additional shielding: lead bricks, 2 inches thick, stacked to a height of about 12 inches; an "L" lead shield, solid, 2 inches thick, 13 1/2 inches wide and 18 1/2 inches high. On top there is a lead glass 9 x 6 inches, about 1 1/2 inches thick. Diagram 7 shows the location of the lead bricks and the "L" lead shield.
 - 3) Radiation levels around the safe (closed); the maximum observed is 2.2mR/hr at the surface of the back of the safe. Levels are less than 0.2mR/hr to the sides and front.
2. Special precautions indicated in pages 6 and 7 of the Radiological Safety Plan are followed.
3. In addition to film monitor for whole body, ring TLD monitors are available for the personnel handling the sources.
4. Equipment and shielding available for transporting sources from storage to the place of use: A cart is used to transport the sources with a shielded box (shielding thickness is one inch of lead).
5. For methods of handling and accountability of the sources, see page 6 of the Radiation Safety Plan. An inventory is carried out every three months and a record is kept using form in Attachment 20.B. A form, Attachment 20.C, is included in the patient's record.
6. A survey of the room is performed as soon as possible after the patient is transferred to the room and also after the sources have been removed. The form, Attachment 20.D, is used to record the data of survey at the patient's room.

D. Leak Testing of Cesium 137 Sealed Sources:

Leak testing is performed at least every six months and recorded in a format such as Attachment 20.E. Instruments used are the scintillation (well) counters in the Nuclear Medicine Service. Procedure followed is to wipe the surface of the drawers (around the sources) where the sources are stored and the sources. If any test reveals a possible leak, that is, more than 0.005 microcuries present in a sample, the source will be withdrawn from use. Procedure indicated in Condition 13.C of the license will be followed.

ITEM 20

SCALE $\sim \frac{1}{4}$ inch = 1 foot

INVENTORY

ATTACHMENT 20.B

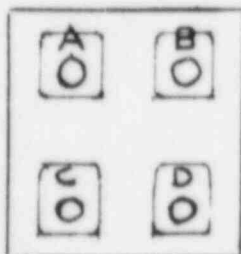
CESIUM-137 NEEDLES AND TUBES

Date: _____

	SOURCE TYPE	NO. IN STOCK	NO. IN USE AS PER ACTUAL COUNT	NO. OUT OF USE (DAMAGED) AS PER ACTUAL COUNT	COMMENTS
Drawer A	0.5mg gold	10			
	0.75mg gold	10			
	1.0mg gold	15			
	1.5mg gold	5			
Drawer B	1.0 mg silver	10			
	1.5 mg silver	10			
	2.0 mg silver	15			
	3.0 mg silver	4			
Drawer C	5.0 mg tubes	4			
	10.0mg tubes	10			
	TOTAL	93			

Remarks: _____

Carried out by: _____



ITEM 20

Patient's Name: _____ Soc. Sec. No. _____

TEMPORARY IMPLANT

Radionuclide: _____

Needle Implant:

_____ needles having _____ mg Ra eq. each

_____ needles having _____ mg Ra eq. each

_____ needles having _____ mg Ra eq. each

Total activity _____ mg Ra eq.

Applicator with tubes:

Type of applicator _____

Tubes inside applicator:

_____ tubes containing _____ mg Ra eq. each

_____ tubes containing _____ mg Ra eq. each

Total activity _____ mg Ra eq.

Insertion carried out on _____
(Date)

Initial radiation exposure rate at 1 meter _____ mR/hr.

(Signature) _____

To be removed on _____
(Date)

Instructions:

The patient is to remain hospitalized, restricted to his or her room, until the implant or applicator has been entirely removed.

Patients with needle implants may use the bathroom, under nursing supervision.

Patients with applicators, cannot use the toilet. Nursing personnel

are to provide the urinal whenever the patient requires it.

The urinal cannot be emptied until absolutely certain that it contains no radioactive source.

Once implant has been removed, all radiation signs are to be removed also.

For additional information, you may contact Radiology Service, Radiotherapy Section with any of the following persons:

Dr. Luz Toro de Berrios

Mrs. M. M. Palacios de Lozano, Radiological Physicist

Mrs. Irene Velazquez Graduate Nurse and Radiotherapeutic Technician

In case of an emergency, off working hours, check with the nursing station for telephone numbers.

REMOVAL OF RADIOACTIVE SOURCES

Removed by: _____

Radiation Survey carried out by: _____
(Signature)

Result: _____

Date: _____ Time: _____

SOURCE EXAMINATION AND COUNTING

Carried out by: _____
(signature)

Result: _____

Date: _____ Time: _____

Comments: _____

CESIUM-137 NEEDLES AND TUBES LEAK TESTInspection of sealed radioactive sourcesSwab Test

Date: _____

Location of sources: _____
_____Instrument used to count swabs: _____

Operating voltage: _____

Standard used: _____

Present activity of standard: _____

Standard Count rate: _____

Background: _____

cpm which would correspond to 0.005 microcurie: _____

$$X = \frac{(0.005 \text{ uCi})(\text{cpm}) \text{ std.}}{(\text{Activity}) \text{ Std.}}$$

COUNTING DATA ON SWABS

<u>Swab Sample</u>	<u>Group</u>	<u>Individual Source</u> <u>(Mg-Ra-equiv.)</u>	<u>Gross</u> <u>cpm</u>	<u>Net</u> <u>cpm</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

[illegible]

Result: _____

Evidence of Leak: _____

Surveyor: _____
(Signature)

Sr-90 Beta Eye Applicator Exposure Rate Measurement and Leak Test

General:

The Sr-90 Beta eye applicator is a source manufactured by Atlantic Research Corporation, Model B-1, serial no. 187. It is stored in its shielded container, in an appropriately safe storage area (Room B-128) under the immediate supervision of Surgical Service Supervisor or his designee.

Safety Precautions:

To prevent undue exposure to radiation:

1. The applicator should not be removed from its shielded container until the surgeon is ready for its use.
2. Prior to application to the patient's eye, the applicator tip should be wiped with alcohol-soaked pad. Do not touch the tip.
3. Immediately after use, wipe again the tip with alcohol and return the source to its container.
4. At no time, during its handling, the applicator tip must be in direct visual line with the operator's eyes, the intervening plastic shield shall be placed on the applicator's stem.

Exposure rate measurements:

A radiation safety survey should be conducted at least every six months by the Radiation Safety Officer or his designee using a recently calibrated survey instrument capable of detecting the hard Beta energies from the applicator.

1. Measure background exposure rate in corridor.
2. Measure the exposure rate in mR/hr at the front surface of the source container and at one foot from the container.
3. Record the data and fill out the respective form for further reference.

Leak Test:

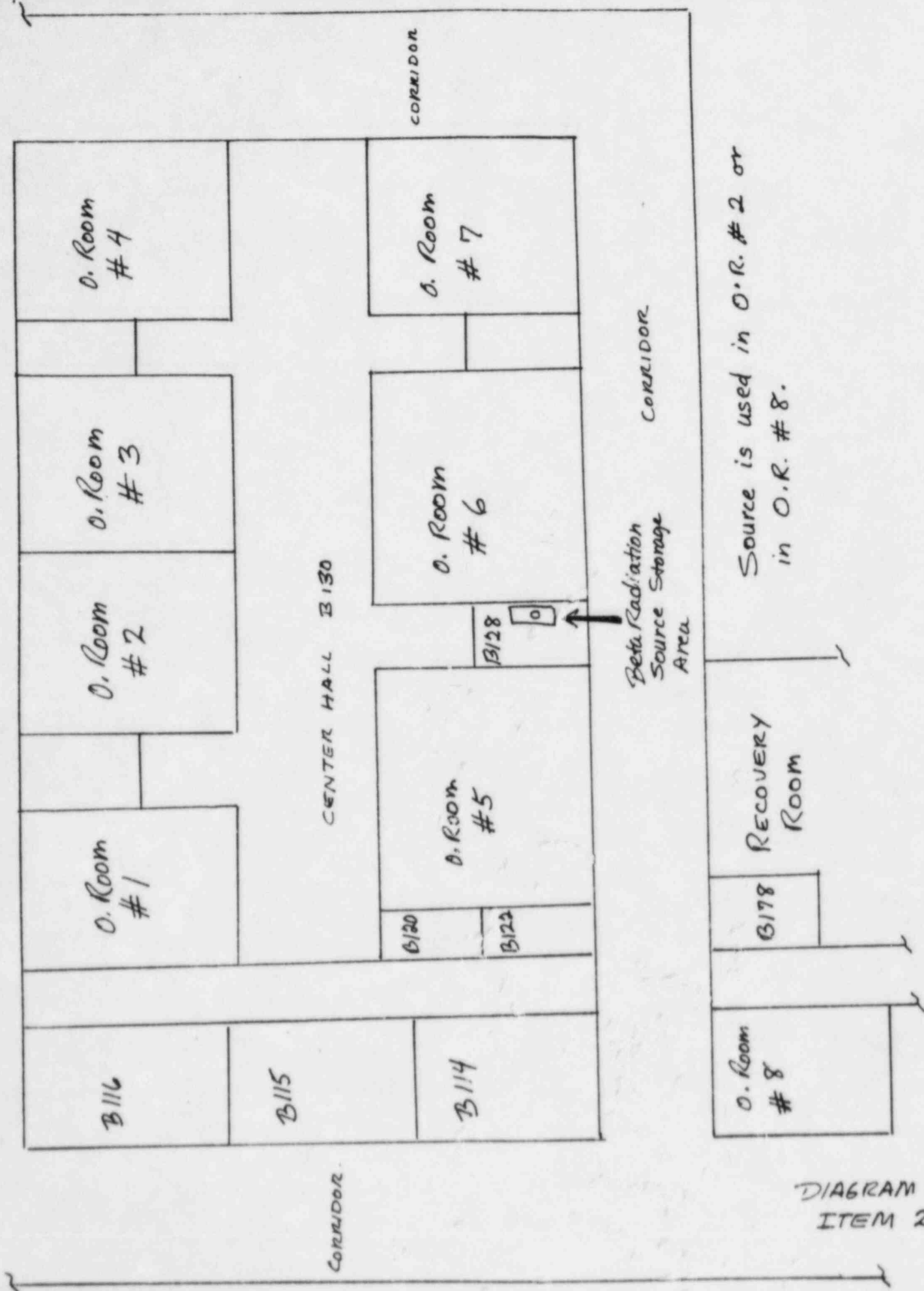
A semiannual leak test shall be performed to indicate the presence of removable contamination. License condition specify that the test is positive if 0.005uCi or more are detected in the samples.

1. With a wet Q-tip, (or filter paper), moisture with radiacwash,alconox or any other detergent solution, thoroughly rub it over the flat end of the applicator.

Sr-90 Beta Eye Applicator Exposure Rate Measurement and Leak Test (cont'd.)
Page 2

2. Repeat step 1 but around the plastic shield and inside the shielded container.
3. Allow the samples to dry and then, using the appropriate counting instrument, determine the maximum removable contamination, (in uCi).
4. If the test reveals the presence of 0.005 uCi or more, of removable contamination, VA Center shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with regulations. A report shall be filed within 5 days of the test with the NRC-Region II-describing the equipment involved, the test results and the corrective action taken.
5. Record data and results for further references.

March 1985



Source is used in O.R. #2 or in O.R. #8.

DIAGRAM 8
ITEM 20

PROCEDURES AND PRECAUTIONS FOR THE USE OF RADIOACTIVE
GASSES AND AEROSOLS

1. Quantities to be used
 - a. Patient information
 - (1) Number of studies expected per week; usually one (1) per week; not more than three (3) in any week
 - (2) Average activity per patient is 8mCi
 - b. Possession limit desired is 50mCi
2. Use and Storage Areas
 - a. The area where the material is to be used is Room A-1 in the basement, where the gamma cameras Sigma 410 and Omega 500 are located. See Diagram 9 and Attachment 21.C.
 - b. The air flow rates measured are indicated in Diagram 9.
 - c. The flow rates will be measured semiannually.
3. Procedure for routine use
 - a. Lung ventilation studies are performed by inhalation of gaseous Xenon 133. This is procured as individual patient doses. For administration and collection of Xenon 133, RADX equipment is used. The dispenser is supplied by vendor of the gas. Delivery system used is RADX Ventil-Con System, Model 2000A with trap model 120.
 - b. Radiological safety features include the following:
 - (1) Spirometer is totally enclosed with lead sheet and delivery arm is completely lead shielded (1.56mm Pb thick).
 - (2) A one way valve opens the room air intake port only during inhalation and insures no radioactive gas escapes to the atmosphere during workout.
 - (3) There is one way safety valve mounted inside the tubing in-line with the gas inlet valve. This safety valve prevents gas/air mixture from leaking out of the gas inlet valve if it is accidentally left open.
 - (4) The mouth piece is used with a nose clamp to insure against any radioactive gas entering the atmosphere.
 - (5) The exhausted radioactive gas is trapped in an activated charcoal trapping device (RADX Xenon trap).

Procedures and Precautions for the Use of Radioactive
Gases and Aerosols
Page 2

- c. The clinical procedure in Attachment 21.B is followed.
- d. There is an area monitor in the vicinity of gamma camera Sigma 410 (See Diagram 9) (Primalert 50).

4. Emergency Procedure

In case of accidental release of Xenon 133, temporary evacuation of the area will be effected immediately. The Radiation Safety Officer will be notified and no person will be allowed to enter the area without permission from the Radiation Safety Officer.

5. Air Concentrations of Xenon 133 in Restricted Areas

- a. Maximum amount of activity to be used per week:

$$A = 10\text{mCi(max)}/\text{patient} \times 3 \text{ patients/week} = 30\text{mCi/week} = 3 \times 10^4 \text{uCi/week}$$

- b. Loss rate $f = 25\%$ (assumed)

- c. Air flow rate in the areas of interest: (net)

$$\text{Storage area - Room A-3} \quad 420\text{f}^3/\text{min}$$

$$\text{Patient study area - Room A-1} \quad 105\text{f}^3/\text{min}$$

- d. Required ventilation rate:

$$\frac{A}{V} \times f \leq 1 \times 10^{-5} \text{uCi/ml}$$

$$V = \frac{A \times f}{1 \times 10^{-5} \text{uCi/ml}}$$

$$V = \frac{3 \times 10^4 \text{uCi/week} \times 0.25}{1 \times 10^{-5} \text{uCi/ml}}$$

$$V = 7.5 \times 10^8 \text{ml/week}$$

Required ventilation rate R:

$$R = \frac{7.5 \times 10^8 \text{ml/week}}{40\text{hr/week}} = 1.9 \times 10^7 \text{ml/hr}$$

$$R = 1.9 \times 10^7 \text{ml/hr} + \frac{1.7 \times 10^6 \text{ml/hr}}{\text{ft}^3/\text{min}} = 12\text{f}^3/\text{min}$$

Procedures and Precautions for the Use of Radioactive
Gasses and Aerosols
Page 3

- e. Required ventilation rates are less than measured rates in restricted areas.
6. Disposal of Xenon 133
- a. Xenon 133 is absorbed into a charcoal trap.
 - b. A portable GM survey meter is used to insure that the collection and trapping device is working properly. There is an area monitor in the room nearby the gamma camera.
 - c. In case of leakage from the trap the exhaust system will vent the gas.
 - d. The trap has an audio-visual alarm that is activated when the cartridge pack is saturated.
 - e. Saturated cartridge is stored for decay in Room A-2. The volume of the room is about 462 cubic feet (13'9" long, 4'3" wide, 8' floor to ceiling). It is supplied with an air condition outlet through a fluorescent fixture. The air is exhausted through the door, no air is recirculated. Lead bricks (2 inches thick) are used as shielding.
- Air flow is $30\text{f}^3/\text{min}$.

NUCLEAR MEDICINE SERVICE

XENON - VENTILATION PERFUSION STUDY

(E-410 Ohio Nuclear Camera)

Collimator:	GAP	Radioisotope:	^{133}Xe
Dose:	5 - 10 mCi	Intensity:	Max LCS
Orientation:	x inv	Auto exposure:	600 LCS

1. Turn ON the instrument 2 hours before starting the study.
2. Adjust energy peak for ^{133}Xe .
3. Connect the oxygen to the instrument and with the Oxygen Replenish Mode at manual, turn the spirometer to 5. Change the O₂ Replenish Mode to AUTO.
4. With the volume pos. knob, turn the stylus of the graph to 5. Turn the speed knob (of the graph) to 25mm/min.
5. Sit the patient with his back facing the detector. You can make a transmission scan for a better location of the patient. Instruct the patient carefully about the details of the procedure.
6. Using a nose clip, let the patient practice with the valve at Stabilization position.
7. Inject the Xenon into the system (turning the valve to Xenon Rebreathing position), and at the same time, ask the patient to take a deep breath. The system must be at Operate.
8. Ask the patient to hold his breath as long as he can. This phase is called Single Breath. Take a picture of 100k at this phase. If computer acquisition is desired, dynamic acquisition should be done acquiring 60 images, 10 seconds per image.
9. Now the patient may breath normally for at least three minutes. This phase is called Equilibrium. Take a picture of 100k at 1 minute equilibrium. Take another picture at 3 minute equilibrium while holding his breath inspiration and note the time that takes this picture.
10. Turn ON the Xenon trap and the valve to Xenon Washout Position. Turn on the system to Evacuate. Each picture of the following phase must be done with the time determined at the 3 minute equilibrium view. After 3 minutes of washout, if there is no evidence of gas retention on any lung area, inject 4mCi of $^{99\text{m}}\text{Tc}$ MAA. If retention is observed, continue taking images until the maximum clearance of it is observed. The computer settings must be altered for further acquisition time if needed. Turn energy to MAN (for $^{99\text{m}}\text{Tc}$), turn off LCS, adjust intensity to the current settings and take a picture of 500k with the patient at the same position. Take an AP view of 500k, also LL, RL, LPO and RPO. Both laterals and obliques must be set at the same counting time.

11. Sterilize the mouthpiece and noseclip after each study, the filter sterilization must be done weekly.

March 1985



**Veterans
Administration**

ATTACHMENT 21.C

Memorandum

Date: March 13, 1985

To: Radiation Safety Officer (115)
Thru: Chief, Engineering Service (138) *[Signature]*

From: Chief, M&R

Subj: Air Conditioning and Ventilating Systems
Nuclear Medicine Facility-Rms. A1 and A3

1. Room A-3 (Xenon 133 Storage Area)

A. Conditioned air supplied to Room = 180CFM

B. Air Exhausted = 600CFM (Through Hood or Bottom Wall Exhaust Grille)

Pressure is negative

2. Room A-1 (Xenon 133 in use)

A. Total conditioned air supplied in area = 495CFM

B. Air Exhausted = 600CFM

Pressure is negative

3. Room A-2

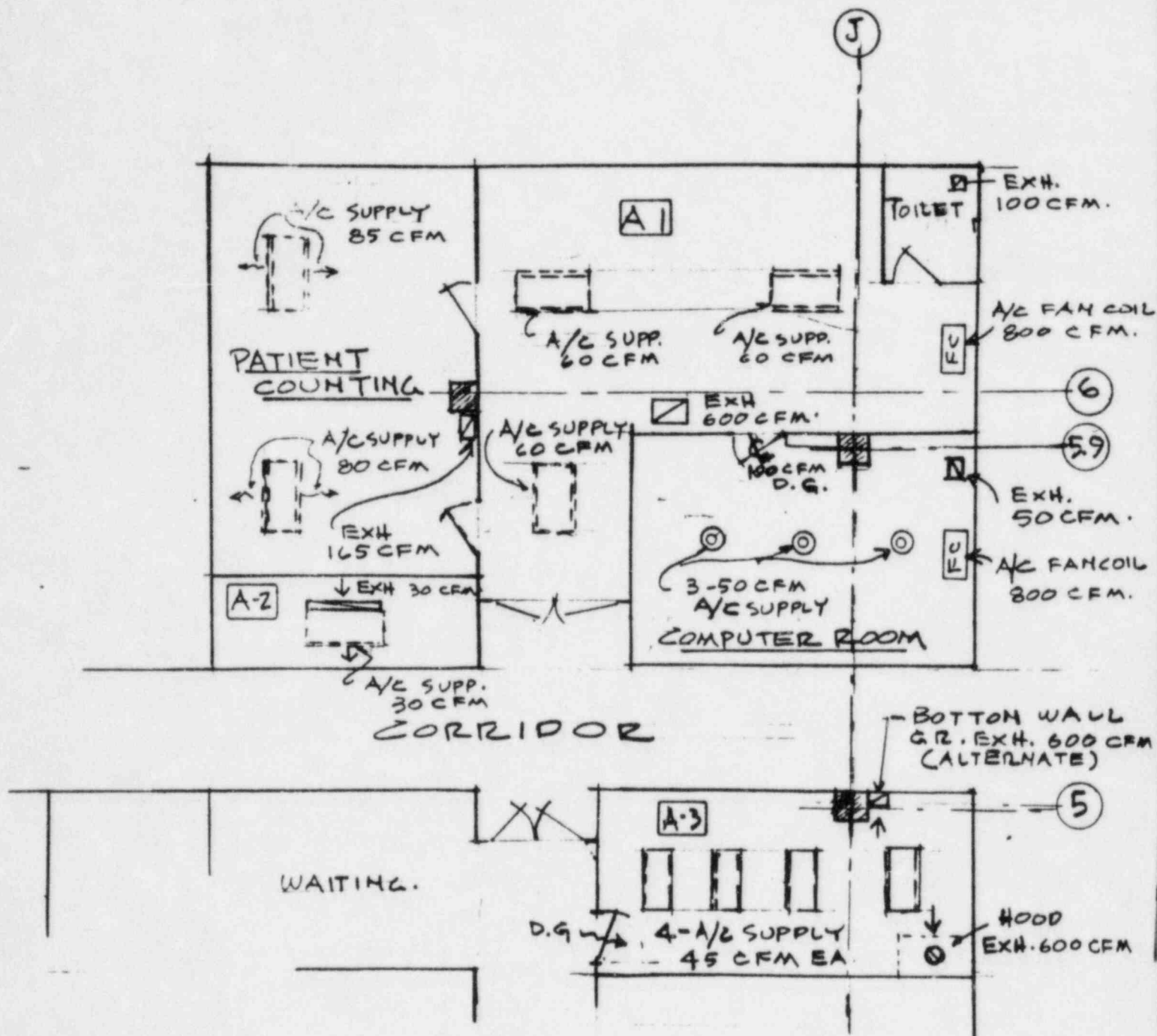
A. Conditioned air supplied to Room = 30CFM

B. Air Exhausted = 30CFM

Pressure is Neutral

[Signature]
HECTOR F. SANCHEZ

ITEM 21



PART BSMT. PLAN AREA "A"

AIR COND. & VENT. SYSTEMS
NUCLEAR MED. FAC.

V.A.M.R.O.C.

SAN JUAN, P.R.

ITEM 21

H.F.S.
3/12/85

PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIALS
IN ANIMALS

1. Animal housing facilities and laboratories are located near the Nuclear Medicine area, adjacent to the Medical Research Service. Location and type of facilities are indicated in Diagram 10. The area is of 3261 net square feet. Animal rooms are equipped with cages, timed lightning devices to insure light/dark cycles of 12 hours. Ambient temperature in these rooms are maintained at 18-29°C (65-84°F).
2. Attachment 22.B is a copy of the instructions provided to animal caretakers, researchers, technologists and related individuals for the handling of animals, animal waste and carcasses. This include handling of the animals, animal waste and carcasses, cleaning of cages and disposal of carcasses.
3. Research projects involving radioactive materials in animals must be approved by the Isotope and Radiation Safety Committee, the Research and Development Committee and Animal Studies Sub-Committee. Researchers are requested to submit for approval the protocol for the research, quantities and radionuclides to be used. The training of the personnel involved in the research project, the number and kind of animals to be used and the disposition waste and carcasses must be submitted.
4. Whenever tracer amounts of tritium and carbon 14 are used, animal carcasses and tissue are disposed in accordance with 10CFR Part 20, 20.306. This waste is incinerated (form in Attachment 22.C will be used to keep record of such disposal). Other waste will be handled as stated in Item 18.

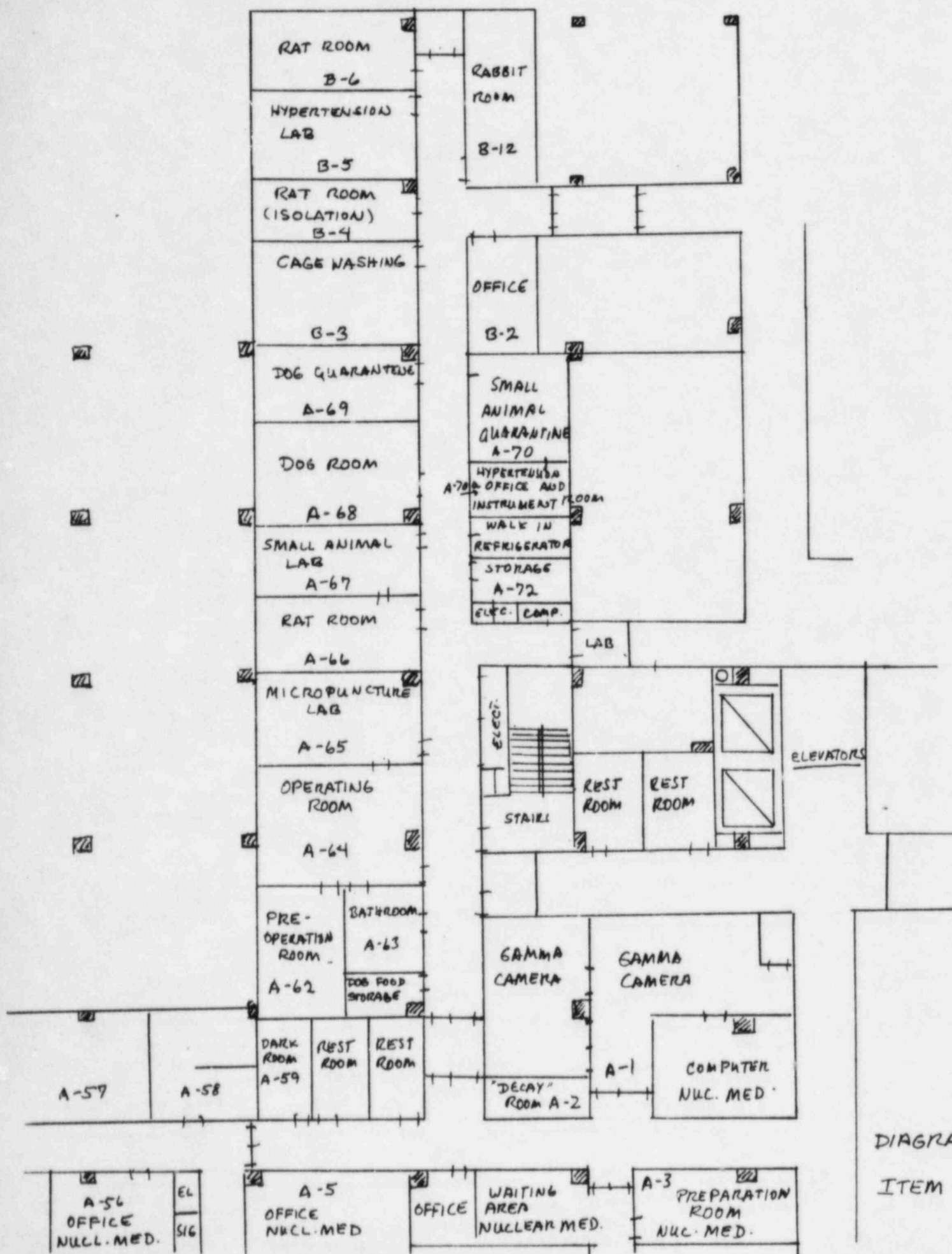


DIAGRAM 10

ITEM 22

NUCLEAR MEDICINE SERVICE

Procedure for Radioactive Contaminated Animal Carcasses, Handling, Disposal and
Incineration

General

Beta emitter radionuclides such as H-3 and C-14 and other beta and gamma emitters may be used in research activities with animals (rats, mice, dogs, hamsters, etc.). The following is a procedure to be followed by the personnel involved in such activities (researchers, technologists, animal keepers, etc.).

A. Handling of animals

1. Mark clearly the cages containing radioactive animals with the distinctive purple and yellow label indicating radioactivity.
2. Wear disposable plastic gloves while handling radioactive animals or when cleaning cages.
3. Put radioactive cage bedding, animal waste and animal carcasses into plastic bags, labeled as to the isotope and approximate amount of radioactivity and store in a cold room. Check with the Radiation Safety Officer for proper disposal.
4. Personnel radiation monitors must be worn at all times by personnel working in areas where radioactive materials are used.

B. Cleaning of cages

1. Radioactive cages shall be maintained separate and cleaned separately.
2. Wear plastic gloves and rubber apron when cleaning the cages.
3. The cages should be worked with soap or radiacwash (or similar product) and flushed with a large volume of water.

C. Lock the rooms where animals containing radioactivity are housed.

D. Disposal

1. Wear disposable gloves.
2. A heavy gauge polyethylene bag should be prepared to place the animal inside.
3. Fold the bag in a double cuff, fold outwards, to protect surface to be sealed off from contamination.
4. Place the dead animal on a disposable plastic sheet big enough so that no part of the animal projects itself outside the plastic.

5. Bind the feet of the carcasses with adhesive tape or bandages to avoid the risk of the bag being punctured by the claws of the animal.
6. Split the carcass centrally along the midline.
7. If the carcass is soiled with tissue fluid or blood, it should be powdered with Vermiculite (a commercial expanded mica) which would absorb the fluid.
8. Put the carcass into the bag with the plastic sheet.
9. Remove gloves and place them in the bag.
10. Use new gloves to continue the procedure.
11. Unfold the bag and seal or knot it.
12. Mark on the outside of the bag, the date, isotope, and activity of such isotope, using a standard radioactivity label.
13. Contact the Radiation Safety Officer or his designee (exts. 3255/3254) for information regarding proper disposal.
14. Lock the room during non-working hours.
15. If incineration is authorized by the Radiation Safety Officer, fill out for "Contaminated Animal Carcasses-Incineration Report" with the proper information and submit it to RSO office.

For questions or emergencies call Heidi Pabón, ext. 3255/3254.

ATTACHMENT 22.C

Contaminated Animal Carcasses Incineration Report

Reported by: _____ Title: _____

[illegible]

Notes: 1. Ashes should be collected and disposed properly by the Incinerator's housekeeping personnel. - (see procedure).

ITEM 22

PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIALS
SPECIFIED IN ITEM 6.5

1. Personnel using any of the radioactive materials listed in Item 6.b shall comply with the requirements stated in the Radiological Safety Plan.
2. Users shall submit research projects for the consideration and approval of the Isotope and Radiation Safety Committee, the Research and Development Committee and as appropriate, to the Subcommittee on Human Studies or the Animal Studies Subcommittee.
3. Materials specified in Item 6.b (unsealed sources) are used in tracer quantities (microcurie levels) and no specific bioassay procedures had been implemented. In the case of a future request to handle millicurie quantities of tritium, Iodine 125 or other nuclide in research studies, bioassay will be required. Bioassay for Iodine 125 or 131 will be performed in accordance with the NRC Regulatory Guide 8.20. An evaluation will be done on the type of bioassay necessary in the case of other radionuclides. The radionuclide used, quantities and how it will be handled (bench top, hood, other safety measures) and the frequency of handling such material (sporadic, continuous, or at specific frequencies) will be factors to consider. Equipment and facilities to perform urine assays using liquid scintillation techniques, in vivo gamma counting and whole body scans are available. The Radiation Safety Officer may require any individual user to perform bioassays and special surveys as deemed necessary.
4. Area surveys schedule will be set by the Radiation Safety Officer, using the following criteria:
 - a. Laboratory areas where only small quantities of radionuclides are used (less than 200uCi) will be surveyed monthly.
 - b. All other areas will be surveyed weekly, in accordance with Appendix I, NRC Regulatory Guide 10.8.