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 generic 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

Jerry L. Pettis Memorial V. A. Hospital
11201 Benton St. (115A)
Loma Linda, Ca. 92354
TELEPHONE NO.: AREA CODE(714) 795-7971

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

Same as mailing

2. PERSON TO CONTACT REGARDING THIS APPLICATION

Tom R. Bennett ext.
TELEPHONE NO.: AREA CODE(714) 825-7084 2701

3. THIS IS AN APPLICATION FOR: *(Check appropriate item)*
- a. ☐ NEW LICENSE
- b. ☐ AMENDMENT TO LICENSE NO. _____
- c. ☒ RENEWAL OF LICENSE NO. 04-17862-01

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

See Attached

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.)*

Tom R. Bennett

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	x	5mCi
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	x	400mCi each
10 CFR 35.100,SCHEDULE A, GROUP IV	x	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP V	x	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP VI	x	600mCi

ADDITIONAL ITEMS:	MARK ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS *(In millicuries)*
IODINE-131 AS IODIDE FOR TREATMENT OF HYPERTHYROIDISM	x	as needed
PHOSPHORUS-32 AS SOLUBLE PHOSPHATE FOR TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA AND BONE METASTASES	x	as needed
PHOSPHORUS-32 AS COLLOIDAL CHROMIC PHOSPHATE FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.	x	as needed
GOLD-198 AS COLLOID FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.	x	as needed
IODINE-131 AS IODIDE FOR TREATMENT OF THYROID CARCINOMA	x	as needed
XENON-133 AS GAS OR GAS IN SALINE FOR BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES.	x	500 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
See Attached			

INDIVIDUAL USERS

USERS:	GROUPS I, II, III, IV, AND V
W. Ross Adey, M.D.	^{99m}Tc, ^{45}Ca, ^{35}S, ^{3}H, ^{14}C; ^{140}La
David Baylink, M.D.	^{3}H, ^{14}C, ^{45}Ca, ^{47}Ca, ^{35}S, ^{125}I; ^{32}P for in vitro studies only
Tom R. Bennett, B.S., R.T.	^{99m}Tc, ^{14}C, ^{125}I, ^{45}Ca, ^{32}P, ^{35}S, ^{3}H, ^{140}La, ^{46}Sc, ^{141}Cer; ^{22}Na for in vitro studies
Anil Bhatne, M.D.	All
John R. Farley, Ph.D.	^{14}C, ^{3}H, ^{125}I, ^{32}P, ^{45}Ca; ^{35}S for in vitro studies
Samuel Ing, M.D.	All
John Jennings, M.D.	^{3}H, ^{14}C, ^{35}S; ^{125}I for in vitro studies
Weldon Jolley, Ph.D.	^{14}C, ^{3}H; ^{125}I for in vitro studies
Gerald Kirk, M.D.	All
Josep G. Llaurado, M.D.	All
Lee A. Murphy, Ph.D.	^{3}H, ^{14}C, ^{35}S; ^{125}I for in vitro studies
Ved Prakash, M.D.	All
Eloy Schulz, M.D.	All
Harold Tinberg, Ph.D.	^{3}H, ^{125}I; ^{35}S for in vitro studies
David Mantik, M.D., Ph.D.	Therapy uses of Group VI 10 CFR 35.100
James M. Slater, M.D.	Therapy uses of Group VI 10 CFR 35.100
William J. Sparos, Jr., M.D.	Therapy uses of Group VI 10 CFR 35.100
Orval J. Swarm, M.D.	Therapy uses of Group VI 10 CFR 35.100

RADIOACTIVE MATERIAL

FORM	PURPOSE OF USE
	^{14}C
Any	Studies on transplantation immunology.
Glutamic acid	To measure brain uptake before, during, and following exposure to non-ionizing electromagnetic fields.
Inulin	To measure brain uptake before, during, and following exposure to non-ionizing electromagnetic fields.
Amino acids	Test incorporation into macromolecules of cultured cells or tissue in vitro.
Sugar and sugar analogs	Test incorporation into macromolecules of cultured cells or tissue in vitro.
Proline	To follow incorporation of proline into bone cells.
	^{45}Ca
$CaCl_2$	To examine efflux of metallic cations from cerebral tissue before, during, and following exposure to non-ionizing electromagnetic fields.
$CaCl_2$	Anesthetic effects on membranes with altered lipids.
$CaCl_2$	To label embroyonic bones.
$CaCl_2$	To establish an in vitro bone resorption-assay.
$CaCl_2$	To determine the effect of acid phosphatase on bone resorption.
$CaCl_2$	To determine uptake and release of cells in tissue culture.
	^{47}Ca
Oral solution	Determine calcium uptake in human bone cells.
	^{141}Ce
Inert 15 micron microspheres in physiological saline	Determine the source of nutrient blood flow in tumors.

RADIOACTIVE MATERIAL
(Continued)

FORM	PURPOSE OF USE
	^{51}Cr
Chromium chloride	Studies on transplantation immunology.
Chromium chloride	Characterization of cellular immune reactivity in human T-cell subpopulation.
Sodium chromate	To label lymphocytes or tumor cells.
	^{68}Ge
Cl	Chromatography
	^{3}H
Thymidine	Test incorporation into macromolecules of cultured cells or tissue in vitro.
Proline	Test incorporation into macromolecules of cultured cells or tissue in vitro.
Leucine	Test incorporation into macromolecules of cultured cells or tissue in vitro.
Uridine	Test incorporation into macromolecules of cultured cells or tissue in vitro.
Adenosine	To measure endogenous biologically active parathyroid hormone.
N-Succinimidyl (2, 3-^{3}rl) proprionate	To label proteins with tritium.
2-deoxy-D-glucose	Determine osteoclast activity in ^{3}HDeoxyglucose uptake.
Naloxone	To bind opiate receptors in brain homogenates.
Thymidine	To determine the rate of DNA synthesis in chick calvarial cells.
Proline	To determine effects of bone acid phosphatase on bone formation
Thymidine	Studies on transplantation immunology.
Thymidine	Cellular immunity in URT and VAT cancers.

RADIOACTIVE MATERIAL
(Continued)

FORM	PURPOSE OF USE
	^{3}H
Proline	Resorption assay for bone in organ culture.
Proline	To test incorporation into cells in the presence and absence of mitrogens.
Thymidine	To test incorporation into cells in the presence and absence of mitrogens.
Thymidine	To follow incorporation of thymidine and proline into bone cells
Proline	To follow incorporation of thymidine and proline into bone cells.
Cholecalciferol	To study metabolism of cholecalciferol by cell cultures.
Amino acids	To determine level of protein synthesis.
Glutamic and GABA acid	To examine efflux of labeled amino acids from cerebral tissue before, during, and after exposure to non-ionizing electromagnetic fields.
Thymidine	Characterization of cellular immune reactivity.
Taurine	Measure brain uptake before, during, and after exposure to non-ionizing electromagnetic fields.
Proline	To label embryonic bones.
Thymidine	To estimate cell proliferation in monolayer culture for correlation with alkaline phosphatase activity in cells.
	^{123}I
Hexadecenoic acid	Quantitative myocardial imaging.
	^{125}I
NaI	To iodinate proteins for radioimmunoassay in determination of parathyroid hormone levels and characterization of protein isolated from adult human bones.
Tyrosin and albumin	Studies on transplantation immunology.

RADIOACTIVE MATERIAL
(Continued)

FORM	PURPOSE OF USE
	^{125}I
NaI	For radioimmunoassay, radioreceptor assay, and chromatography.
Labeled proteins	To assay receptors on cultured cells.
Labeled hormones	To assay receptors on cultured cells.
Uridine	For incorporation into cellular DNA.
NaI	To label tumor cells.
	^{131}I
Albumin, thyroxin, globulin	Studies on transplantation immunology.
	^{111}In
DTPA	Radioaerosol imaging.
	^{113m}In
Cl, DTPA, albumin	Cardiopulmonary investigations with radionuclides.
DTPA	Radioaerosol imaging.
	^{140}La
$LaCl_3$	To examine efflux of metallic cations from cerebral tissue before, during, and following exposure to non-ionizing electromagnetic fields.
	^{22}Na
NaCL	Effect of electromagnetic radionuclide on cell metabolism.
	^{95}NB
Inert microspheres in physiological saline	Determine the source of nutrient blood flow in tumors.

RADIOACTIVE MATERIAL
(Continued)

FORM	PURPOSE OF USE
	^{32}P
ATP	To examine physiological functions by acid phosphatase.
ATP	To measure endogenous biologically active parathyroid hormone.
ATP	Enzymatic phosphorylation of specific proteins.
Orthophosphate	To investigate activities in cells and extracts.
Orthophosporic acid	Treatment of tumors by vascular occlusion and Beta emitting radioisotope.
Nucleic acids	Studies on transplantation immunology.
	^{35}S
ATP	To determine level of protein synthesis.
Methionine	To label tumor cells.
$H_2{}^{35}SO_4$	Glycoprotein synthesis in cultured cells.
$H_2{}^{35}SO_4$	To test incorporation into macromolecules of cultured cells or tissue in vitro.
Methionine	Protein synthesis in cultured cells.
	^{46}SC
Inert 15 micron microspheres in physiological saline	Determine the source of nutrient blood flow in tumors.
	^{99m}Tc
HDP (oxidronate, sodium)	To determine bone uptake and retention in normal, Vitamin D deficient and calcium depleted-repleted rats.
Sulfur colloid	Control of gastric emptying in man.
DTPA	Radioaerosol imaging.
Sulfur colloid	Radioaerosol imaging.

RADIOACTIVE MATERIAL
(Continued)

FORM	PURPOSE OF USE
	^{127}Xe
Gas	Lung scanning agent.
	^{133}Xe
Liquid	Skin graft nutrient blood flow.

RADIONUCLIDES FOR ROUTINE HUMAN USE NOT LISTED IN GROUPS I THROUGH VI AND FOR NONHUMAN USE

NO.	NUCLIDE	FORM	LIMIT
1.	^{46}Sc	Any	15mCi
2.	^{141}Ce	Any	15mCi
3.	^{35}S	Any	50mCi
4.	^{133}Xe	Any	500mCi
5.	^{127}X	Gas	500mCi
6.	^{123}I	Fatty Acid	200mCi
7.	^{99}Mo	$^{99m}Tc/^{99}Mo$ Generator	4000mCi
8.	^{99m}Tc	Any	4000mCi
9.	^{3}H	Any	500mCi
10.	^{14}C	Any	25mCi
11.	^{140}La	Any	1mCi
12.	^{125}I	Any	200mCi
13.	^{51}Cr	Any	20mCi
14.	^{32}P	Any	75mCi
15.	^{47}Ca	Any	15mCi
16.	^{22}Na	Any	50mCi
17.	^{68}Ge	Any	20mCi
18.	^{153}Gd	Sealed Sources GL-1 Gulf Nuclear	2000mCi
19.	^{125}I	Norland Instrument Model # 178A591A	500mCi
20.	^{137}Ce	Needles/Tubes	1000mCi
21.	^{60}Co	Needles/Tubes	1000mCi
22.	^{198}Ag	Seeds	1000mCi
23.	^{192}Ir	Seeds in Ribbon	1000mCi
24.	^{226}Ra	Needles/Tubes	1000mCi
25.	^{222}Rn	Seeds	1000mCi
26.	^{90}Sr	Applicator	500mCi
27.	^{125}I	Seeds	1000mCi

Items 1-17 are to be used in medical research, diagnosis, and therapy in humans and tracer studies in animals.

Item # 18 is to be used in a bone mineral scanner.

Item # 19 is to be used in a bone mineral analyzer.

Items # 20-27 are to be used in medical research and therapy.

RADIATION SAFETY COMMITTEE MEMBERSHIP*

Josep G. Llaurado, M.D. — Chairman
Chief, Nuclear Medicine Service
Professor Radiology, Loma Linda University

Tom R. Bennett, B.S. — Alternate Chairman
Radiation Safety Officer

Anil Bharne, M.D. — Member
Assistant Chief, Nuclear Medicine Service

Vishvanath Date, M.D. — Member
ACOS/Ambulatory Care

Margaret Freeman, R.N. — Member
Critical Care Area Supervisor, Nursing Service

Albert E. Hirst, M.D. — Member
Chief, Laboratory Service
Professor Pathology, Loma Linda University

Gerald A. Kirk, M.D. — Member
Chief, Nuclear Medicine, Loma Linda University
Associate Professor Radiology, Loma Linda University

Irvin N. Kuhn, M.D. — Member
ACOS/Education
Associate Professor Medicine (Hematology
and Oncology) Loma Linda University

Edwin Scheeline, A.A. — Member
Administrative Assistant to Chief of Staff

Beatriz Vasquez, Ph.D. — Member
Research Chemist, Research Service
Associate Research Professor, Department
of Pharmacology, Loma Linda University

Florian W. Zielinski, Ph.D. — Member
Radiochemist/Radiopharmaceutical Scientist
Nuclear Medicine Service

*Unless otherwise indicated, appointment is with the Jerry L. Pettis Memorial Veterans' Hospital

TRAINING AND EXPERIENCE OF
AUTHORIZED USERS

AUTHORIZED USERS:		NRC LICENSE #
Josep G. Llaurado, M.D.	To be added from	48-02130-02
W. Ross Adey, M.D.		04-17862-01
Tom R. Bennett, B.S.		04-17862-01
Anil Bharne, M.D.		04-17862-01
John R. Farley, Ph.D.		04-17862-01
Samuel J. Ing, M.D.		04-17862-01
John Jennings, M.D.		04-17862-01
Weldon Jolley, Ph.D.		04-17862-01
Lee A. Murphy, Ph.D.		04-17862-01
Ved Prakash, M.D.		04-17862-01
Eloy Schulz, M.D.		04-17862-01
Harold Tinberg, Ph.D.		04-17862-01
David Baylink, M.D.	Training and Experience Enclosed	
Gerald Kirk, M.D.	Training and Experience Enclosed	
David Mantik, M.D., Ph.D.	Training and Experience Enclosed	
James M. Slater, M.D.	Training and Experience Enclosed	
William J. Sparos, Jr., M.D.	Training and Experience Enclosed	
Orval J. Swarm, M.D.	Training and Experience Enclosed	

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The American Board of Nuclear Medicine

A CONJOINT BOARD OF THE AMERICAN BOARDS OF INTERNAL MEDICINE, PATHOLOGY, AND RADIOLOGY, & SPONSORED BY THE SOCIETY OF NUCLEAR MEDICINE

475 Park Avenue South, New York, New York, 10016 Telephone 212-889-0717

January 4, 1979

Josep G. Llaurado, M.D.
V.A. Hospital
Wing D-12N
Wood, WI 53193

Dear Dr. Llaurado:

With great pleasure the Conjoint American Board of Nuclear Medicine informs you that you have passed its September 30, 1978 Certifying Examination in the broad field of Nuclear Medicine and now are recognized as a Certified Specialist with competence in all aspects of the diagnostic, therapeutic, and medical research uses of radioactive materials.

A certificate indicating this recognition will be sent to you in the near future.

The Conjoint American Board of Nuclear Medicine congratulates you upon your achievement and this recognition.

Sincerely,

Frederick J. Bonte, M.D.
Chairman

FJB:jc

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
JOSEP G. LLAURADO, M.D.,Ph.D.	WISCONSIN

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C
Nuclear Medicine, after 2 years full residency program at combined Medical College of Wisconsin - Wood VA program.		September 1978

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	HAMM. HOSP, LONDON 1952-54 M.D. AND.HOSP.HOUSTON 1957-58 Wood VA 1976-78	80 40 80	200 100 200
b. RADIATION PROTECTION	HAMM HOSP,LONDON 1952-54 WOOD VA 1976-78	20 40	40 80
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	DREXEL UNIV PHILA 1961-63 WOOD VA 1976-78	80 20	80 20
d. RADIATION BIOLOGY	HAMM HOSP LONDON 1952-54 M.D.AND. HOSP HOUSTON 1957-58 WOOD VA 1976-78	20 20 40	40 40 80
e. RADIOPHARMACEUTICAL CHEMISTRY	HAMM HOSP LONDON 1952-54 M.D.AND.HOSP HOUSTON 1957-58 WOOD VA 1976-78	10 10 40	20 20 80

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

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

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Medical License

Clinical Experience

J.G.LLAURADO,M.

Co^{58}	
Schilling Test	600
Fe^{59}	
Iron Metabolism	
Body distribution, external counts	40
Plasma Clearance	38
Iron Turnover	40
RBC Utilization	40
Iron Utilization	40
	40
Se^{75}	
Pancreas Scintigraph	12
I^{125}	
T-4 Test	3800
T-7 Free Thyroxine Index	2600
T-3	3800
Xe^{133}	
Pulmonary Studies	680
Indium^{111}	
Bone Marrow Scintigraph	8
Yb^{169}	
Cisternography	60
Tl^{201}	
Myocardial Perfusion	450

Clinical Experience

I^{131}

Thyroid Uptake	960
Thyroid Scintigraph	800
Renogram	420
Renal Blood Flow	400
Plasma Volume	50
Therapy	60

Tc^{99m}

Liver Scintigraph	3520
Brain Scintigraph	2240
Thyroid Scintigraph	210
Cerebral Blood Flow	2030
Spleen Scintigraph	3500
Bone Marrow Scintigraph	42
Heart Ventriculogram	920
Kidney Scintigraph with DTPA	80
Kidney Scintigraph with DMSA	60
Kidney Scintigraph with Glucoheptonate	30
Inferior Vena Cava Scintigraphy	3
Mediastinal Great Vessel Scintigraph	40
Aorta Scintigraph	30
Parotid Scintigraph (including rapid sequence)	60
Thyroid Uptake	10
Renal Blood Flow	150
Cardiac Blood Flow	900
Lung Scintigraph with M.A.A.	750
Transmission Lung	12
Lymphnode Scintigraph	3
Bone Scintigraph	1240
Whole Body Scintigraph	960
Liver Transmission	3
Hepatobiliary Excretion (Iprofenin)	150
Gastrointestinal Bleeding	10
Gastric Emptying	2

Cr^{51}

Blood Volume	80
Red Cell Survival	110
Red Cell Volume	78

P^{32}

P^{32} Therapies	20

Co^{57}

Schilling Test	700
Serum B_{12}	2400
Co excretion	6

Item 5. (FORM NRC-313M SUPPLEMENT A)

J.G.LLAURADO,M.D.,P

EXPERIENCE WITH RADIATION

Isotope	Maximum Amount	Where Experience Gained	Duration of Experience	Type of Use
^{131}I	300 mCi	MD Anderson Hosp, Houston, Tx. and Wood VA, WI	7 years	Research, Diagnosis and Therapy
^{125}I	100 mCi	" " " "	7 years	Research and Diagnos
^{123}I	600 mCi	Wood VA	5 years	Diagnosis
^{32}P	75 mCi	" "	6 years	Diagnosis and Therap
^{99}Mo	300 mCi	" "	6 years	Generator
^{99m}Tc	300 mCi	" "	6 years	Diagnostic & Researc
^{51}Cr	10 mCi	" "	6 years	Diagnostic & Researc
^{60}Co sealed	50 mCi	" "	6 years	Instrument Calibrati
$^{57,58,60}Co$	2 mCi	" "	6 years	Research
^{59}Fe	.250 mCi	" "	6 years	Diagnostic & Researc
^{14}C	2 mCi	Univ of Utah, Salt Lake City Univ of Penna., Philadelphia and Wood VA	12 years	Research
^{3}H	1000 mCi	" " " "	12 years	Diagnostic & Researc
^{113m}In	25 mCi	Wood VA	6 years	Diagnostic & Researc
^{133}Xe	1500 mCi	" "	6 years	Diagnostic
^{63}Ni	30 mCi	" "	6 years	Sealed Source
^{67}Ga	10 mCi	" "	6 years	Diagnostic
$^{43}K, ^{44}K$	5 mCi	Hamm Hosp, London Univ of Penna, Philadelphia and Wood VA	13 years	Research
$^{23}Na, ^{24}Na$	5 mCi	" " " "	13 years	Research
^{169}Yb	10 mCi	Wood VA	6 years	Diagnostic

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ATTACHMENT A

Form AEC-313a (2-73) 10 CFR 30 Page 1	UNITED STATES ATOMIC ENERGY COMMISSION **APPLICATION FOR BYPRODUCT MATERIAL LICENSE—MEDICAL** SUPPLEMENT A—HUMAN USE	Form approved. Budget Bureau No. 38-R0080

If byproduct material is for "human use" (internal administration of byproduct material, or the radiation therefrom to human beings), complete this supplement and attach to the application for byproduct material license.

1. (a) USING PHYSICIAN'S NAME
David J. Baylink

(b) NAME AND ADDRESS OF APPLICANT (If different from 1(a). Include ZIP Code.)
Chief, Mineral Metabolism (111)
Pettis Veterans Hospital
Loma Linda, CA 92357

2. THE USING PHYSICIAN INDICATED ABOVE IS LICENSED TO DISPENSE DRUGS IN THE PRACTICE OF MEDICINE BY A STATE OR TERRITORY OF THE UNITED STATES, THE DISTRICT OF COLUMBIA, OR THE COMMONWEALTH OF PUERTO RICO. CIRCLE ANSWER — (YES) NO

3. A STATEMENT OF USING PHYSICIAN'S CLINICAL RADIOISOTOPE EXPERIENCE (PAGE 3 OF THIS SUPPLEMENT) IS SUBMITTED IN SUPPORT OF THIS APPLICATION. IF ANSWER IS NO, USE PAGE 2 OF THIS SUPPLEMENT TO EXPLAIN OR REFER TO OTHER APPLICATION OR RELATED DOCUMENTS ON WHICH THIS INFORMATION APPEARS.
see page 2 for in vitro applications
CIRCLE ANSWER — (YES) NO

4. A DESCRIPTION OF THE USING PHYSICIAN'S TRAINING AND EXPERIENCE IN BASIC RADIOISOTOPE HANDLING TECHNIQUES AND/OR RADIOPHARMACEUTICAL PREPARATION IS APPENDED. CIRCLE ANSWER — (YES) NO

5. (a) DESCRIBE PURPOSE FOR WHICH MATERIAL WILL BE USED INCLUDING SPECIFIC CONDITIONS OR DISEASES TO BE DIAGNOSED OR TREATED (Use page 2 if necessary)

Determination of enteral calcium absorption by ^{45}Ca or ^{47}Ca

Determination of bone mass by ^{125}I absorptiometry for diagnosis of osteoporosis, osteomalacia, and other osteopenias; special application is determining bone mass of appendicular vs axial skeleton.

(b) CHEMICAL FORM ADMINISTERED

^{45}Ca and ^{47}Ca given either orally or parenterally.

^{125}I not administered to patient -- sealed source.

(c) DOSAGE SCHEDULE FOR EACH CONDITION TO BE DIAGNOSED OR TREATED

10 µc ^{45}Ca by mouth
10 µc ^{47}Ca by i.v.

not applicable for ^{125}I

6. INVESTIGATIVE PROPOSAL FOR EXPERIMENTAL OR NON-ROUTINE USE IS APPENDED. (See Appendix F of AEC Licensing Guide for items to be submitted)
routine procedures
CIRCLE ANSWER — YES (NO)

7. IF BYPRODUCT MATERIAL WILL NOT BE OBTAINED IN PRECALIBRATED FORM FOR ORAL ADMINISTRATION OR IN PRECALIBRATED FORM FOR PARENTERAL ADMINISTRATION, DESCRIBE IDENTIFICATION, PROCESSING, AND STANDARDIZATION PROCEDURES:

originally calibrated by manufacturer; recalibrated before administration to patients by Nuclear Medicine, in Nuclear Medicine

8. THE PROPOSED USE OF BYPRODUCT MATERIAL HAS BEEN, OR WILL BE, APPROVED BY THE MEDICAL ISOTOPE COMMITTEE. CIRCLE ANSWER — (YES) NO

HOSPITAL FACILITIES FOR INDIVIDUAL PRACTICE USE ONLY

9. (a) THE APPLICANT HAS COMPLETED ARRANGEMENTS FOR A HOSPITAL TO ADMIT RADIOACTIVE PATIENTS WHENEVER ADVISABLE. CIRCLE ANSWER — (YES) NO

(b) A COPY OF INSTRUCTIONS TO BE FURNISHED TO THE HOSPITAL AS TO RADIOLOGICAL SAFETY PRECAUTIONS TO BE TAKEN AND AVAILABLE RADIATION INSTRUMENTATION IS ATTACHED. CIRCLE ANSWER — (YES) NO

Form AEC-313a (2-73) Page 3	UNITED STATES ATOMIC ENERGY COMMISSION **APPLICATION FOR BYPRODUCT MATERIAL LICENSE—MEDICAL** SUPPLEMENT A—PRECEPTOR STATEMENT	

This page is to be completed by the applicant physician's preceptor. If more than one preceptor is necessary to document experience, obtain a separate statement from each. Page 2 may be used for comments and additional information.

10. NAME AND ADDRESS OF APPLICANT PHYSICIAN (Include ZIP Code.)

David J. Baylink, M.D.
1534 Fern Ave. West
Redlands, CA 92373

11. CLINICAL TRAINING AND EXPERIENCE OF PHYSICIAN NAMED IN ITEM 10 ABOVE

(A) ISOTOPE	(B) CONDITIONS DIAGNOSED OR TREATED	(C) No. Cases Observed (See 1 in key below)	(D) No. Cases Involving Personal Participation (See 2 in key below)
I-131 or I-125 both	Diagnosis of thyroid function		
	Determination of blood and blood plasma volume		
	Liver function studies		
	Fat absorption studies		
	Kidney function studies		
	In vitro studies		~~thousands of~~ radioimmunoassays
Cr-51	Gastrointestinal protein loss studies		
	Determination of red blood cell volume and studies of red blood cell survival		
Fe-59	Iron turn over studies		
Co-58or Co-60	Intestinal absorption studies		
K-42	Potassium space determinations		
I-131	Thyroid imaging		
	Brain tumor localization and cardiac imaging		
	Cisternography		
	Lung imaging		
	Liver imaging		
	Kidney imaging		
	Placenta localization		
Cr-51	Placenta localization		
	Spleen imaging		
Au-198	Liver imaging		
Hg-197	Brain imaging		
	Kidney imaging		
Hg-203	Brain imaging		
Sr-85	Bone imaging		
Tc-99m	Brain imaging		
	Thyroid imaging		
	Salivary gland imaging		
	Blood pool imaging		

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
David Baylink M.D	CA, WA, OR

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	NIH Postdoc Fellowship, Harvard Med. Sch, 1964-5 Nuc. Med. Univ. of Wash, 1966		6 mo 6 mo
b. RADIATION PROTECTION	same as above		same as above
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	LLU Med School, 1953-7 NIH Postdoc, Harvard, 1964-5 Nuc. Med., Univ. of Wash, 1966	3 hr x 1 yr	6 mo 6 mo
d. RADIATION BIOLOGY	LLU Med. Sch., 1953-57 Univ. of Wash, on job training, 1966-1971	twice a wk x 3 mo	5 yrs
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
^{45}Ca	4 mCi	Seattle VAH; American Lk VAH, Tacoma, WA	1966-76; 1976-81	personal use as investigator & director of lab
^{125}I	4 mCi (NaI)	same	same	same
^{3}H	40 mCi (*)	same	same	same
^{32}P	1 mCi	American Lk VAH, Tacoma	1976-81	director of lab
^{47}Ca	4 mCi	Seattle VAH	1966-76	invest & director
^{14}C	3 mCi	same	same	same
^{35}S	2 mCi	American Lk VAMC, Tacoma	1976-81	director of lab

(continued)

#8 p. 10 2-17-83

PAGE 4	APPLICATION FOR BYPRODUCT MATERIAL LICENSE—MEDICAL SUPPLEMENT A—HUMAN USE	

(A) ISOTOPE	(B) CONDITIONS DIAGNOSED OR TREATED	(C) No. Cases Observed (See 1 in key below)	(D) No. Cases Involving Personal Participation (See 2 in key below)
Tc-99m	Placenta localization		
	Liver and spleen imaging		
	Lung imaging		
	Bone imaging		
Xe-133	Blood flow studies and pulmonary function studies		
Se-75	Pancreas imaging		
P-32	Treatment of polycythemia, leukemia, and Bone metastases		
	Intracavitary treatment		
I-131	Treatment of thyroid carcinoma		
	Treatment of hyperthyroidism and cardiac condition		
Au-198	Intracavitary treatment		
Co-60 or CO-137	Interstitial treatment		
	Intracavitary treatment		
Ir-192	Interstitial treatment		
Co-60 CO-137	Teletherapy treatment		
Sr-90	Treatment of eye disease		

Key to Column (C) and (D) above

1. Observation should consist of observing radioisotope administration techniques and discussion with preceptor the case histories to establish most appropriate diagnostic and/or therapeutic procedure, limitation, contraindications, etc.

2. Personal participation should consist of (a) supervised examination of patients to determine the suitability for radioisotope diagnosis and/or treatment and recommendation on dosage to be prescribed, (b) collaboration in calibration of the dose and the actual administration of the dose to the patient, including calculation of the radiation dose, related measurements, and plotting of data; and (c) adequate period of training to enable the physician to manage radioactive patients and to follow patients through diagnosis and/or the course of treatment.

12. DATES AND TOTAL NUMBER OF HOURS OF CLINICAL RADIOISOTOPE TRAINING on the job training for ^{45}Ca and ^{47}Ca and bone mineral analyzer, 1966-1972, well over one hundred hours

13. THE TRAINING AND EXPERIENCE INDICATED ABOVE WAS OBTAINED UNDER THE SUPERVISION OF Dr. Clayton Rich
Chief, Nuclear Medicine
Seattle VAH, Seattle, WA

(not available for signature)

AT _____
(Institution) Name and Address

_____
(Byproduct Material License Number)

_____
(Signature of Preceptor)

APPLICATION FOR BYPRODUCT MATERIAL LICENSE—MEDICAL
SUPPLEMENT A—HUMAN USE

This page may be used for providing additional information. Please cross reference to specific items.

continuation of 5. experience with radiation

^{131}I	4 mCi	Seattle VAH; American Lk VAH, Tacoma, WA	1966-76; 1976-81 as investigator	personal use & director of lab
^{125}I	200 mCi (sealed source)	same	same	same

* ^{3}H in the form of:

^{3}H-TdR	same	same	same
^{3}H-Lys	"	"	"
^{3}H-Pro	"	"	"
^{3}H-Leu	"	"	"
^{3}H-Glu	"	"	"
^{3}H-vitamin D	"	"	"
^{3}H-2Dglu	"	"	"
^{3}H-Urid	"	"	"
^{3}H-N-succ-prop	"	"	"
^{3}H-cAMP	"	"	"
^{3}H-formaldahyde	"	"	"
^{3}H-24,25-vitamin D	"	"	"
^{3}H-1,25-vitamin D	"	"	"
^{3}H-25-OHD	"	"	"
^{3}H-Hypro	"	"	"

LOMA LINDA UNIVERSITY

Loma Linda Campus
LOMA LINDA, CALIFORNIA 92350
La Sierra Campus
RIVERSIDE, CALIFORNIA 92515

SCHOOL OF MEDICINE
DEPARTMENT OF RADIATION SCIENCES
SECTION OF NUCLEAR RADIOLOGY
LOMA LINDA CAMPUS
714/796-7311, EXT. 3283

July 29, 1982

Tom R. Bennett
Radiation Safety Officer 115-A
Veterans Administration Hospital
11201 Benton Street
Loma Linda, CA 92357

Dear Tom:

The information requested by NRC for Medical Radioisotope Committee members is as follows:

1. Gerald A. Kirk, M.D.

2. Specialty: Diagnostic Radiology
   Nuclear Medicine

3. Training and Experience:
   Radiology Residency , LLUMC, 1972-1975
   Nuclear Medicine Fellowship, LLUMC, 1975-1976
   Asst. Chief, Nuclear Medicine, LLUMC, 1975-1978
   Chief of Nuclear Radiology, LLUMC, 1978 to Present

Copies of Board Certifications are enclosed.

Sincerely,

Gerald A. Kirk

Gerald A. Kirk, M.D.
Director of Nuclear Radiology

GAK:ms

Enclosures

#8 p. 13 2-17-83

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America, the Section
on Radiology of the American Medical Association and the American Society of Therapeutic Radiologists
Hereby certifies that

Gerald A. Kirk, M.D.

Has pursued an accepted course of graduate study and clinical work, has met certain standards
and qualifications and has passed the examination conducted under the authority of

The American Board of Radiology

Thereby demonstrating to the satisfaction of the Board that he is qualified to practice the specialty of

Diagnostic Radiology

And, further, the American Board of Radiology, acting in conjunction and cooperation with

The American Board of Nuclear Medicine

A conjoint board formed with the sponsorship of the American Board of Internal Medicine, the American
Board of Pathology, The American Board of Radiology and the Society of Nuclear Medicine

On this the eighteenth day of June, 1976

acknowledges Special Competence in

#8 p. 14 2-17-83

American Roentgen Ray Society,

the American Radium Society, the Radiological Society of North America, the Section on Radiology of the American Medical Association and the American Society of Therapeutic Radiologists

Hereby certify that

Gerald A. Kirk, M.D.

Has pursued an accepted course of graduate study and clinical work, has met certain standards and qualifications and has passed the examination conducted under the authority of

The American Board of Radiology

Thereby demonstrating to the satisfaction of the Board that he is qualified to practice the specialty of

Diagnostic Radiology

And, further, the American Board of Radiology, acting in conjunction and cooperation with

The American Board of Nuclear Medicine

A conjoint board formed with the sponsorship of the American Board of Internal Medicine, the American Board of Pathology, The American Board of Radiology and the Society of Nuclear Medicine

On this the eighteenth day of June, 1976

acknowledges Special Competence in

Nuclear Radiology

Robert N. Cooley
President
American Board of Radiology

Joseph F. Ross
President
American Board of Nuclear Medicine

C. Allen Good
Secretary
American Board of Radiology

S. James Adelstein
Secretary
American Board of Nuclear Medicine

#8 p. 15 2-17-83

The American Board of Nuclear Medicine

Incorporated 1971

A consent Board organized with the sponsorship of the American Board of Internal Medicine, American Board of Pathology, American Board of Radiology and the Society of Nuclear Medicine

hereby certifies that

[illegible]

has met the requirements of this Board and is certified as qualified to practice as a specialist in all aspects of clinical and laboratory

Nuclear Medicine

including but not limited to Radioimmunoassay, Nuclear Imaging, In Vivo Measurements & Therapy with unsealed Radionuclides

[illegible]

#8 p. 16 2-17-83

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America,
the Section on Radiology of the American Medical Association
and the American Society of Therapeutic Radiologists
Hereby certifies that

Gerald A. Kirk, M.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this thirteenth day of December, 1975
Thereby demonstrating to the satisfaction of the Board
that he is qualified to practice the specialty of

Diagnostic Radiology

Robert N. Cooley
President

C. Allen Good
Secretary

#8 p. 17-2-17-83

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America,
the Section on Radiology of the American Medical Association
and the American Society of Therapeutic Radiologists
Hereby certifies that

Gerald A. Kirk, M.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this thirteenth day of December, 1975
Thereby demonstrating to the satisfaction of the Board

#8 p. 18 2-17-83

The American Board of Pathology, The American Board of Radiology and the Society of Nuclear Medicine

hereby certifies that

[illegible]

has met the requirements of this Board and is certified as qualified to practice as a specialist in all aspects of clinical and laboratory

Nuclear Medicine

including but not limited to Radioimmunoassay, Nuclear Imaging, in Vivo Measurements & Therapy with unsealed Radionuclides.

Joseph F Rowe M.D.

04059

S. J. Adelstein

10-27-76

#8 p. 19 2-17-83

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America
and the Section on Radiology of the American Medical Association
Hereby certifies that

James Munro Slater, M.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this thirteenth day of December, 1968
Thereby demonstrating to the satisfaction of the Board
that he is qualified to practice the specialty of

Therapeutic Radiology

John A. Evans
President

J. Vladimir Kerr
Secretary

THE AMERICAN BOARD OF RADIOLOGY
INCORPORATED IN THE DISTRICT OF COLUMBIA
1934

ADVISORY BOARD
FOR
MEDICAL SPECIALTIES

#8 p. 20 2-17-83

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America
and the Section on Radiology of the American Medical Association
Hereby certifies that

Orval Jay Swarm, M.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this fourteenth day of December, 1974
Thereby demonstrating to the satisfaction of the Board
that he is qualified to practice the specialty of

Therapeutic Radiology

AMERICAN BOARD OF RADIOLOGY
INCORPORATED
IN THE
DISTRICT
OF

Robert N. Cooley
President

C. Allen Good
Secretary

AMERICAN BOARD
OF
MEDICAL SPECIALTIES
EXCELLENCE

#8 p. 21 2-17-83

The American Board of Radiology

Organized through the corporation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America
and the Section on Radiology of the American Medical Association
Hereby certifies that

Orval Jay Swarm, M.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this ninth day of June, 1973
Thereby demonstrating to the satisfaction of the Board
that he is qualified to practice the specialty of

Radiology

Ralph G. Leddy
President

C. Allen Good
Secretary

#8 p. 22 2-17-83

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America,
the Section on Radiology of the American Medical Association
and the American Society of Therapeutic Radiologists
Hereby certifies that

David Wayne Mantik, M.D., Ph.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this seventh day of June, 1980
Thereby demonstrating to the satisfaction of the Board
that he is qualified to practice the specialty of

Therapeutic Radiology

THE AMERICAN BOARD OF RADIOLOGY
INCORPORATED IN THE DISTRICT OF COLUMBIA
7034

E. Richard King, President

C. Allen Good, Secretary

AMERICAN BOARD OF MEDICAL SPECIALTIES

#8 p. 23 2-17-83

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America,
the Section on Radiology of the American Medical Association
and the American Society of Therapeutic Radiologists
Hereby certifies that

William Joseph Spanos, Jr., M.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this eleventh day of June, 1977
Thereby demonstrating to the satisfaction of the Board
that he is qualified to practice the specialty of

Therapeutic Radiology

THE AMERICAN BOARD OF RADIOLOGY
INCORPORATED IN THE DISTRICT OF COLUMBIA
1934

Sidney W. Nelson
President

C. Allen Good
Secretary

#8 p. 24 2-17-83

NRC-313M SUPPLEMENT A
(8-78)
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
Tom R. Bennett	

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	Loma Linda University 1975-1977	72	36
	University of Virginia June-Aug. 1979	24	15
b. RADIATION PROTECTION	Loma Linda University 1975-1977	36	8
	University of Virginia June-Aug. 1979	19	16
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	Loma Linda University 1975-1977	108	72
	University of Virginia June-Aug. 1979	14	8
d. RADIATION BIOLOGY	Loma Linda University 1975-1977	24	
	University of Virginia June-Aug. 1979	13	
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
Mo-99	2.5 Curies	Jerry L. Pettis Memorial Veterans Hospital Loma Linda, Ca.	1978-Current	Supervise all use...Safety of both Medical and Research.
I-125	10 mci			
I-131	300 mci			
Calcium45	10mci			
H-3	20mci			
Carbon-14	2mci			
Cr-51	10mci	Isotope Cont.		
P-32	15 mci	Co-57 5 mci		
Tl-201	35 mci	Cs-137 200 mci		
		Co-60 95 mci		

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

CURRICULUM VITAE

Tom R. Bennett

Date of Birth: April 16, 1948 Birthplace: Las Vegas, Nevada

Marital Status: Married

Education:

High School: Western High School, Las Vegas, Nevada

College:

Pacific Union College, Angwin, California
B.S. Biology 1971

Loma Linda University, Loma Linda, California
B.S. Radiological Technologist 1976

University of Virginia, Charlottesville, Virginia
Radiation Safety Training 1979

Registrations and Certifications:

ARRT - American Registry of Radiological Technologists
X-Ray Technology

CRT - California State Department of Health
Certified Radiologic Technologist

Society Membership:

Health Physics Society

Work Experience:

Chief Research Associate, Perinatal Biology Research, Department of Medicine, Loma Linda University, Loma Linda, California 1972-1977

Chief Technologist (X-Ray), Yucaipa Valley Medical Center, Yucaipa, California 1977-1978

Health Physics Technologist, Office of Radiation Safety, VA Hospital, Loma Linda, California 1979-1981

Radiation Safety Officer, VA Hospital, Loma Linda, California 1981-current

RADIATION DETECTION INSTRUMENTS

DIAGNOSTIC INSTRUMENTS:

2 Scintillation Cameras, large field, GE Maxicamera II.

1 Norland Bone Mineral Analyzer.

1 Tomographic Scanner, Searle PhoCon.

1 Mobile Camera, Picker Dyna Mo.

1 Rectilinear Scanner, 5", Picker Magnascanner V.

1 Dual Probe Detector System, modular with 3" crystal detectors, Ortec.

1 Shielded Well Counting System, Ortec 4800 series.

1 Multichannel Analyzer, Tracor Northern TN-1706.

1 Gamma Automatic Counting System, Beckman Gamma 4000.

1 Thrombus Detector, Technical Associates FS-8M-SCAT.

1 Automatic Well Counter, Searle Model 1185.

1 Liquid Scintillation Counter, Searle Delta 3000.

CALIBRATION INSTRUMENTS (Clinical and Radiation Safety):

2 Dose Calibrators, Capintec CRC-10.

1 Dose Calibrator with Printer, Capintec CRC-20, used in patient dose area.

MONITORING AND SURVEY INSTRUMENTS (Clinic and Radiation Safety):

1 Ionization Chamber Detector (Cutie-Pie), Model 740F. Detection of alpha, beta, and gamma; window thickness under 500 ug/cm^2, dose range from 0-2.5 mr/hr to 250 R/hr.

1 Picker Model 655-186 GM Counter for low-level radiation detection.

2 Portable Monitors, Technical Associates PUG-1 series. Detection of beta and gamma, CPM ranges from 0 to 500-50,000. Assorted GM and gamma scintillation probes.

1 Liquid Scintillation Counter, Beckman LS-3150. Counting low-level, low-energy betas.

1 Multichannel Analyzer with Well, Tracor Northern TN-1706.

3 Room Monitors, Technical Associates SML-6 - 2AR, 0 to 500-50,000 cpm.

2 Room Monitors, Victoreen Vamp area monitors.

RADIATION DETECTION INSTRUMENTS
(Continued)

RESEARCH INSTRUMENTS:

1 Scintillation Camera, standard field, Searle.

3 Scintillation probes, 3" crystals, Technical Associates.

1 Scintillation probes, 2" crystals, Bicron.

3 Single Channel Spectrometers, ORTEC-550.

CALIBRATION OF INSTRUMENTS

1. DOSE CALIBRATORS:

   a. The CRC-20 used in assay of patient's doses is daily checked for constancy by a check with a known source of ^{57}Co, and a daily log is kept. Background radiation is checked before and after each constancy check and is also recorded.

   b. The CRC-10s are constancy checked before each use.

   c. Linearity is assertained with the use of a Calicheck Linearity Calibration kit produced by the Cal Corp., Inc., P.O. Box 25589, Cleveland, Ohio. The manufacturer's instructions for use as revised on March 2, 1982, will be followed. Test results will be recorded and retained for inspection. Instrument linearity is checked quarterly.

2. SCINTILLATION PROBES, WELLS, AND SCANNERS:

   a. These are peaked with either ^{123}I, ^{125}I, or ^{57}Co before each use, depending on the isotope in question.

   b. A constancy check is done by comparison with past calibration readings.

3. SCINTILLATION CAMERAS:

   a. A daily flood field check with flood source of ^{57}Co with the collimator on along with a high resolution bar phantom is done. Logs are kept.

   b. Daily checks are made of pulse height analyzer peaking of radionuclides used.

4. TEST FOR GEOMETRICAL VARIATION: This was tested at installation using ^{99m}Tc October 26, 1978, and will be repeated should any instrument be changed following instructions as stated in Regulatory Guide 10.8 Appendix D, Method of Calibration of Dose Calibrator.

5. INSTRUMENT ACCURACY: This is checked annually using Capintec CR-486E set ^{57}Co, ^{137}Cs, ^{60}Co, 99mTc 10 mCi ± 1 as prescribed in RG 10.8.

6. LIQUID SCINTILLATION COUNTERS: These are checked against ^{14}C and ^{3}H standards provided by manufacturers.

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

_____ b. At the licensee's facility

(1) Calibration source

Manufacturer's name _____
Model no. _____
Activity in millicuries _____
or
Exposure rate at a specified distance _____
Accuracy _____
Traceability to primary standard _____

_____ (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.

X c. By a consultant or outside firm

(1) Name Certified Radiation Instruments

(2) Location 12926 Saticay North Hollywood, Ca. 91605

(3) Procedures and sources

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

X 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

X 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.

CALIBRATION CERTIFICATE

To,

V. A. Loma Linda.

No: 9189

Date: 1-14-83

Instrument Model: VICT 740F Serial No: 2060

Range	Full Scale	Calib. at.	Exposure	Actual Reading	% Error	Exposure	Actual Reading	% Error	Source Used.
Rx1	25	15	5	5	±15	20	20	±15	Ram
Rx10	"	150	50	50	"	200	200	"	" Co 6a
Rx100	"	1500	500	500	"	2,000	2000	"	"
Rx1k	"	15,000	5,000	5,000	"	20,000	20,000	"	"
Rx10k									

Batteries:

Next Calibration Due:

All readings in mr/hr, including background of approximately 0.05 mr/hr.
Source used is traceable to National Bureau of Standards.

Comments:

The above instrument is calibrated by:

Certified Radiation Instruments Co
12926 SATICOY ST. UNIT # 5
NO. HOLLYWOOD CA 91605
PHONE 765-3757

1/18/79 R. CHU

DOSE CALIBRATOR

Instrument Accuracy:

Frequency: At installation and quarterly.

Manufacturer:_____ Model:_____ Serial #:_____

Location:_____

Premeasurement Procedure:

1. On programmable unit, use manual mode (e.g. use sample number 00 on CRC-20).

2. Push "ACT", then push "TEST" button. The meter display is _____.

(Should be a value between 130 to 155 volts. Should also be constant within 12 volts and never vary more than 15 volts from one day to the next).

3. Push "ZERO" and adjust the locked potentiometer until display is within ± 2 μCi of zero.

Display reading _____.

4. Make sure no strong sources nearby that may affect results. Effects of shielded sources can be determined by noting the difference in background reading when it is removed.

5. On CRC-20 push "BKG" to correct for background. Display should be with ± 0.5 μCi of zero after about 1 minute.

Display reading _____.

6. Contamination test:

(a) Push "ACT" button, "OTHER" and set "030" on the calibrator dial. Note display reading _____.

(b) Remove sample holder from the well and note display reading _____.

(c) Remove chamber well liner and note display reading _____.

(If values in (b) and (c) are less than that of (a), sample holder and well liner are contaminated).

(d) Put chamber well liner back into the well. Never use the calibrator without the liner.

Dose Calibrator Con't 1/18/79 R.CHU

Instrument Accuracy:

Use a certified reference source to perform the following measurements. Enter results in the table provided.

1. Calibration of activity measurement:

   Set the calibrator dial appropriately for the reference standard. Measure background level and then assay the standard. Repeat by using the appropriate push button. Dial & Push Button

2. Calibration for constancy check:

   Repeat the above for different push button settings and dial settings.

3. Compute correction factor after taking into account of decay. Compare measurements in step #2 with last quarters' if available.

Dose Calibrator Cont'd

4. Data and Results:

Date: _____ Inspector: _____

Isotope: _____ Calibrated Activity: _____

Date of Calibration: _____ Manufacturer: _____

Model & Serial #: _____ Volume: _____

Type of Vial: _____

Activity at time of measurement after correction: _____

1. Calibration of Activity Measurement:

(a) Dial/Button	(b) Background	(c) Assay Reading	(d) Measured Activity = (c) - (b)	(e) Correction Factor = Corrected Calibrated Activity/(d)

Dose Calibrator Cont'd

2. Calibration for constancy check:

(a) Button	(b) Background	(c) Assay Reading	(d) Net Reading (c) - (b)
Ga-67			
Tc-99m			
In-111			
In-113			
I-123			
I-131			
Xe-133			
Tl-201			
Dial			
50			
80 (Tc-99)			
91 (In-113m)			
94 (Ga-67)			
151 (I-131)			
188 (Xe-133)			
205 (Tl-201)			
277 (I-123)			
331 (In-111)			
550			
800			
990			

DOSE CALIBRATOR

Test for Geometrical Variation: to be done at installation

Frequency: At installation

Manufacturer:_____ Model:_____ Serial #:_____

Location:_____

Premeasurement Procedure:

1. On programmable unit, use manual mode (e.g. use sample number 00 on CRC-20).

2. Push "ACT", then push "TEST" button. The meter display is _____. #'s

(Should be a value between 130 to 155 volts. Should also be constant within 12 volts and never vary more than 15 volts from one day to the next).

3. Push "ZERO" and adjust the locked potentiometer until display is within ± 2 μCi of zero.

Display reading _____.

4. Make sure no strong sources nearby that may affect results. Effects of shielded sources can be determined by noting the difference in background reading when it is removed.

5. On CRC-20 push "BKG" to correct for background. Display should be with ± 0.5 μCi of zero after about 1 minute.

Display reading _____.

Premeasurement 6. Contamination test:

(a) Push "ACT" button, "OTHER" and set "030" on the calibrator dial. Note display reading _____.

(b) Remove sample holder from the well and note display reading _____.

(c) Remove chamber well liner and note display reading _____.

(If values in (b) and (c) are less than that of (a), sample holder and well liner are contaminated).

(d) Put chamber well liner back into the well. Never use the calibrator without the liner.

Dose Calibrator Con't

Geometrical Variation:

Choose a vial and isotope that are used clinically. Put about 2 mCi and 1 ml in the vial.

1. Setup the dose calibrator appropriately.

2. Note reading without and with vial in the dose calibrator. Note also time of reading.

3. Increase the volume of liquid in the vial in steps (e.g. to 2, 4, 8, 10, 20, 25 ml) by adding the appropriate amount of water or saline. After each addition, gently shake vial to mix contents and assay as in step #2. (Be sure to include a measurement that has a total volume as that of the chosen reference calibration source.

Dose Calibrator Con't

4. Enter and analyse results as in following table.

Date: _____ Inspector: _____

Results: Isotype _____ Pharmaceutical _____

Activity: _____ mCi Background: _____ mCi

Standard Volume _____ Specification of Vial _____

(a) Total Vol in ml	(b) Reading in mCi	(c) Time	(d) Net Results = Reading - Bckgrd in mCi	(e) Reading Corrected for Decay	(f) Correction Factor = Std Volume/(e)

Plot the correction factors against the volume on linear graph paper. Label the axes appropriately.

Dose Calibrator Con't

5. To determine geometrical and attenuation correction factor of syringe, perform the following measurement for different type of radioisotope and syringe. Measure total amount of activity in vial. Measure amount of activity drawn into the syringe. Measure amount of activity left in the vial. Record data in the following manner:

Date: Investigator _____

Radioisotope _____ Pharmaceutical _____

Type of Vial _____ Initial Volume in Vial _____

Total amount of activity measured in vial _____ at time _____

Type of Syringe _____ Volume drawn into Syringe _____

Amount of Activity measured in syringe _____

at time _____.

Amount of activity remained in vial as measured _____
at time _____.

Analysis: Correct data by volume variation and decay.

(a) Corrected initial cmount of activity in vial _____

(b) Corrected final amount of activity in vial _____

(c) Corrected amount of activity in syringe _____

(d) Correction factor = $\frac{(a) - (b)}{(c)}$ =

Dose Calibrator Con't

6. To determine correction factor for isotopes in capsule form. Obtain activity as determined by other means (manufacturer, well counter etc.) and compare with assay result. Record all pertinent data in the following form:

Date: _____ Inspector: _____

Radioisotope _____

Amount of activity calibrated _____mCi/uCi

by the means of _____ at date _____ time_____

Type of vial if used _____

Amount of activity measured by dose calibrator _____mCi/uCi

measured at time _____

Correction factor = $\frac{\text{amount of activity calibrated and corrected for decay}}{\text{Amount of activity measured}}$

=

FACILITIES AND EQUIPMENT

The following paragraphs list specific rooms in this facility in which isotope work is conducted with isotope storage locations and major equipment noted.

1B-43 Radioactive material receiving room and waste storage room. Equipment includes one refrigerator, one freezer, a chemical fume hood, 1" lead L-Block, remote handling instruments, lead aprons, and lead-lined storage cabinet.

1B-49 ^{45}Ca and ^{125}I isotopes used in radioisotope hood.

2C-24 ^{125}I and ^{35}S isotopes are stored in the refrigerator and freezer in their original shipping containers. Major equipment in this room includes automatic cell harvestor, vacuum pump, temperature control bath and circulator, and duovac oven. This lab also has a chemical fume hood, ultra centrifuge, work benches, refrigerator, freezer, CO_2 incubator, and PH meter.

2C-25 ^{3}H and ^{45}Ca isotopes are stored in this room in the refrigerator. This lab has a radioactive cell harvestor, microwave generator, refrigerator, spectro Ph, incubator oven, PH meter, chemical fume hood, shaker bath, automatic chromatopac chromatograph, and two temperature control water baths.

3C-06 This is a multi-user counting room. ^{3}H and ^{14}C isotopes are stored in the freezer. Major equipment includes an infrared spectrophotometer ultra low freezer, freeze drier, immunodiffusion camera, two liquid scintillation counters, infusion pump, cell harvestor, gamma counter, spectrophotometer, and an auto titer.

3C-07 There is no storage in this room. There is a chemical fume hood, laminar flow hood, incubation oven, and two microscopes.

3C-09 ^{125}I isotopes are stored in the refrigerator. There is a germ-free bio flow chamber, PH meter, centrifuge, steam sterilizer, chemical fume hood, glucose analyzer, microscope, duovac oven, and an incubator oven.

3C-26 ^{3}H isotope is stored in freezer. There are two refrigerators with freezer, two gas chromatograph systems, laminar flow hood, chemical fume hood, air driven ultra centrifuge, two incubation ovens, and a centrifuge.

4C-02 (Rooms 3C-02 through 4C-07 are research labs.) ^{125}I and ^{45}Ca are stored in this room. There is a fume hood, gamma counter, and isotopes are stored in the labeled refrigerator and freezer.

4C-03 ^{3}H is used in this room. There is a vacuum wash system for treated cells, and waste vials and liquid waste are accumulated here in appropriate containers for pick-up.

4C-04 ^{3}H and ^{45}Ca isotopes are used here. Scintillation fluid is added to vials in fume hood; there is a scintillation counter and a freezer for storage.

FACILITIES AND EQUIPMENT
(Continued)

4C-05 ^{3}H isotopes are stored here. Equipment includes refrigerator for storage and an isotope work bench.

4C-07 ^{45}Ca and ^{3}H isotopes are stored in labeled refrigerator. Fume hood work area and two laminar flow hoods.

4C-22 No storage in this room. Equipment includes Searle gamma camera, digital voltmeter, two 3x2 image sodium iodide crystal probes, lead-lined storage cabinet, lead-lined refrigerator, respirator pump, Picker survey meter, mini computer, multi-channel analyzer (well counter), annealing oven, TLD reader, infusion pump respirometer, dose calibrator, three electronic nebulizers, centrifuge, 20x20x20 inch Pb storage area, radioisotope fume hood, area monitor with alarm, vacuum pump, flammable liquid storage area, liquid scintillation counter, and an automated gamma counter. Isotopes that are used in this room, but are not stored here, include: ^{67}Ga, ^{201}Tl, ^{99m}Tc, ^{131}I, ^{57}Co, ^{127}Xe, ^{133}Xe, and ^{111}In.

4C-25 Major equipment in this room includes a chemical fume hood, laminar flow hood, two centrifuges, two microscopes, temperature control water bath, incubation oven, refrigerator, PH meter; spectrophotometer.

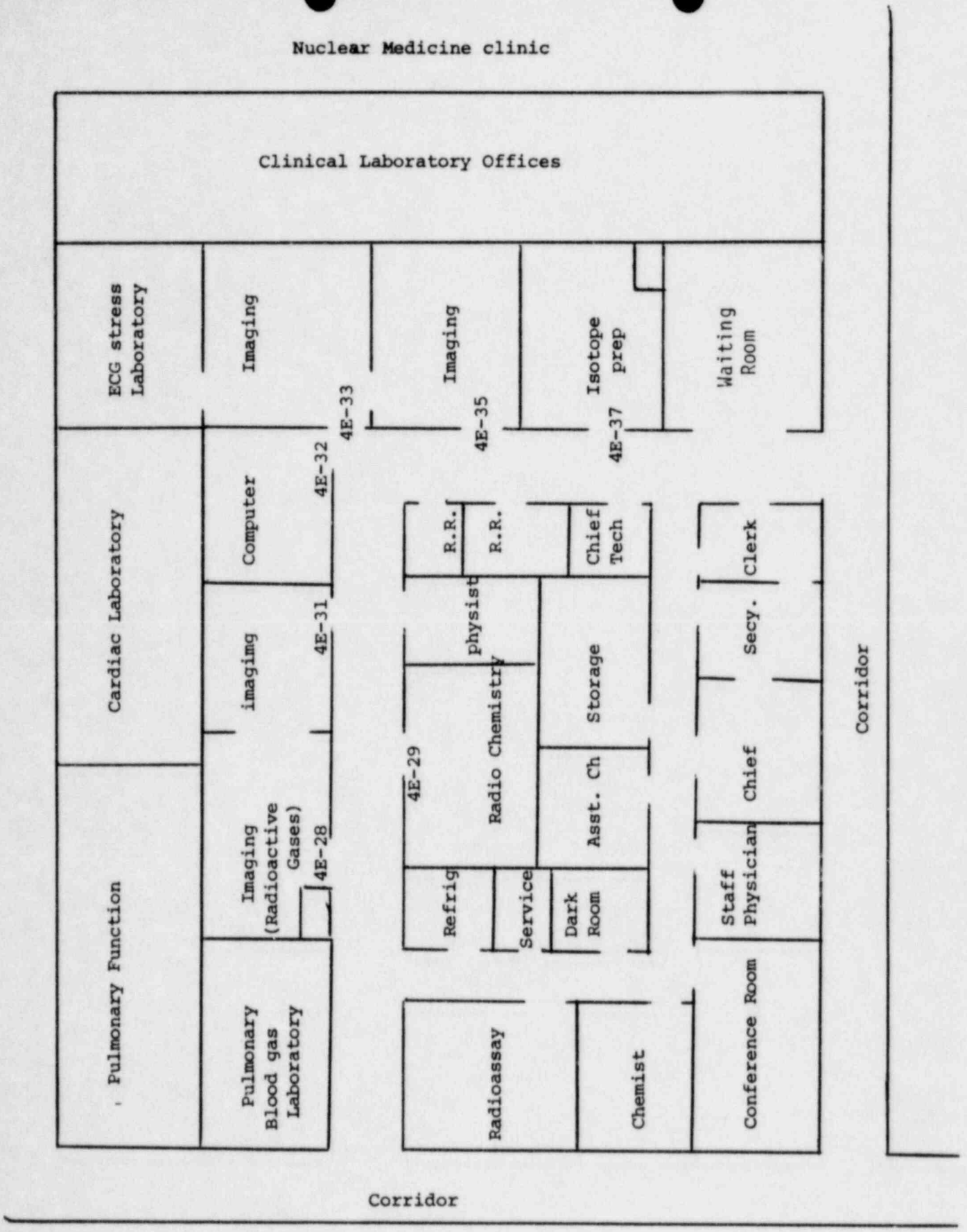
4C-28 ^{3}H and ^{51}Cr isotopes are stored in freezer. Major equipment includes freezer, incubation oven, liquid scintillation counter, radio cell harvestor, temperature control water bath, scanning lensitometer, centrifuge, two freezers, chemical fume hood, microscope, PH meter, and a vacuum pump.

4E-28 Nuclear Medicine ^{133}Xe and aerosol room. Major equipment includes a 800 cfm radioisotope hood; G.E. Maxi II Scintillator Camera. This room is under negative pressure.

4E-29 Radioisotope Chemistry Lab. Major equipment includes 1" lead block, PH meter, drying oven, freeze dryer, laminar flow hood, multi-channel analyzer, and G.M. type area monitor.

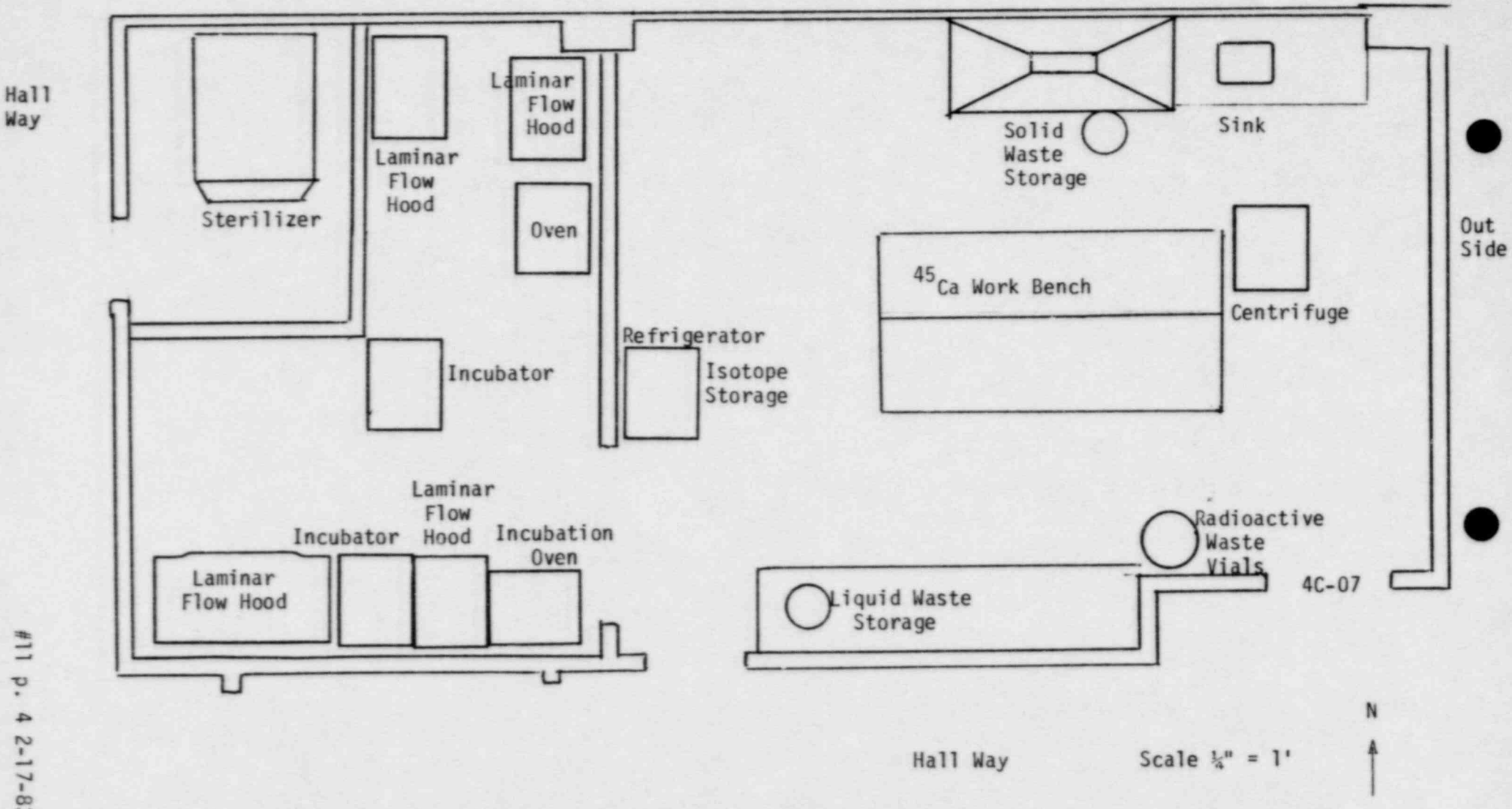
4E-37 Radioisotope Preparation Room. Radioactive materials for human use are stored and prepared in this room. Major equipment includes a 800 cfm radioisotope hood, a 1" lead L Block, several lead storage containers, two lead brick storage enclosures, a CRC-20 dose calibrator; a refrigerator for the storage of isotopes and kits.

Nuclear Medicine clinic

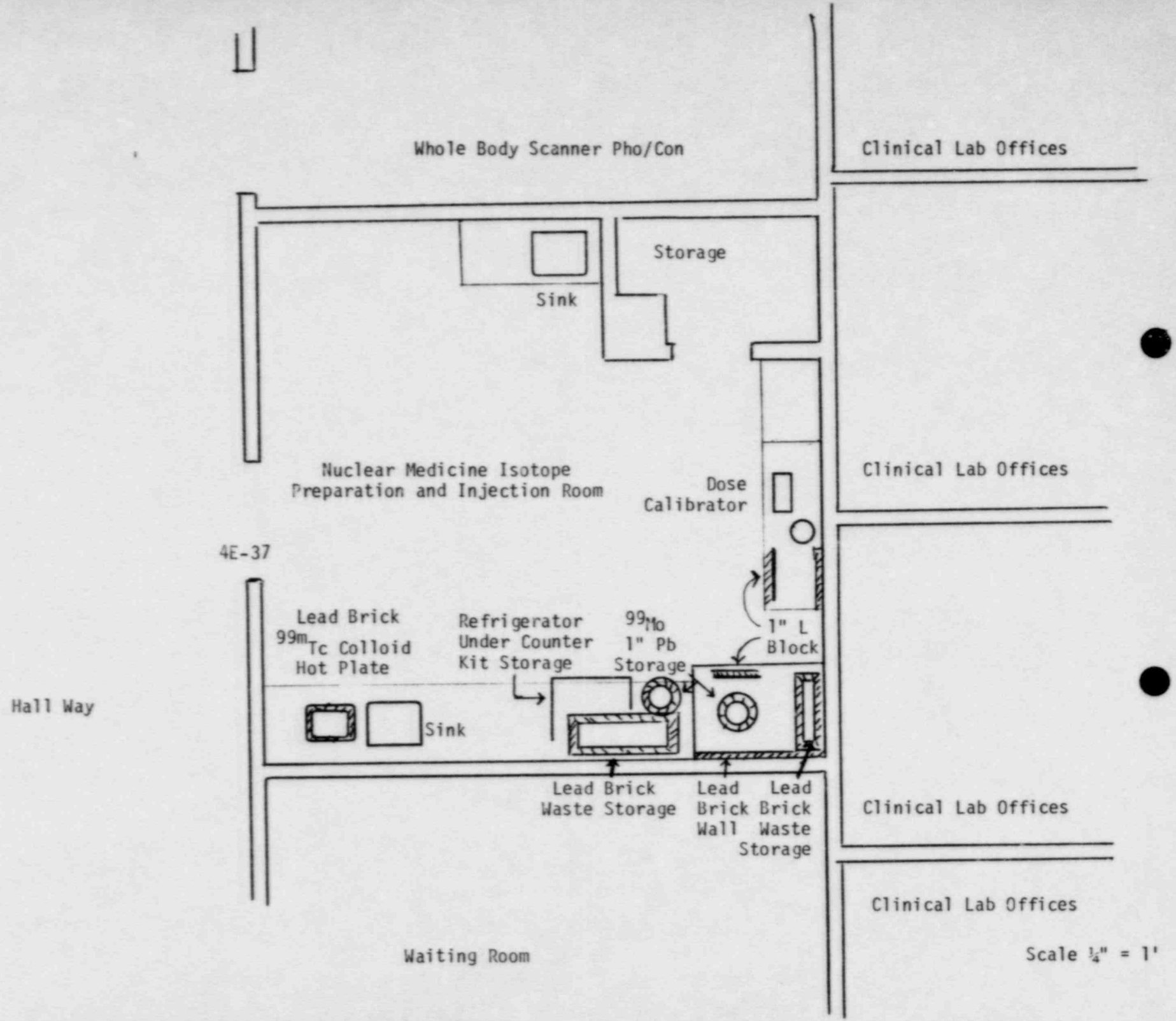


Scale 1"= 15'

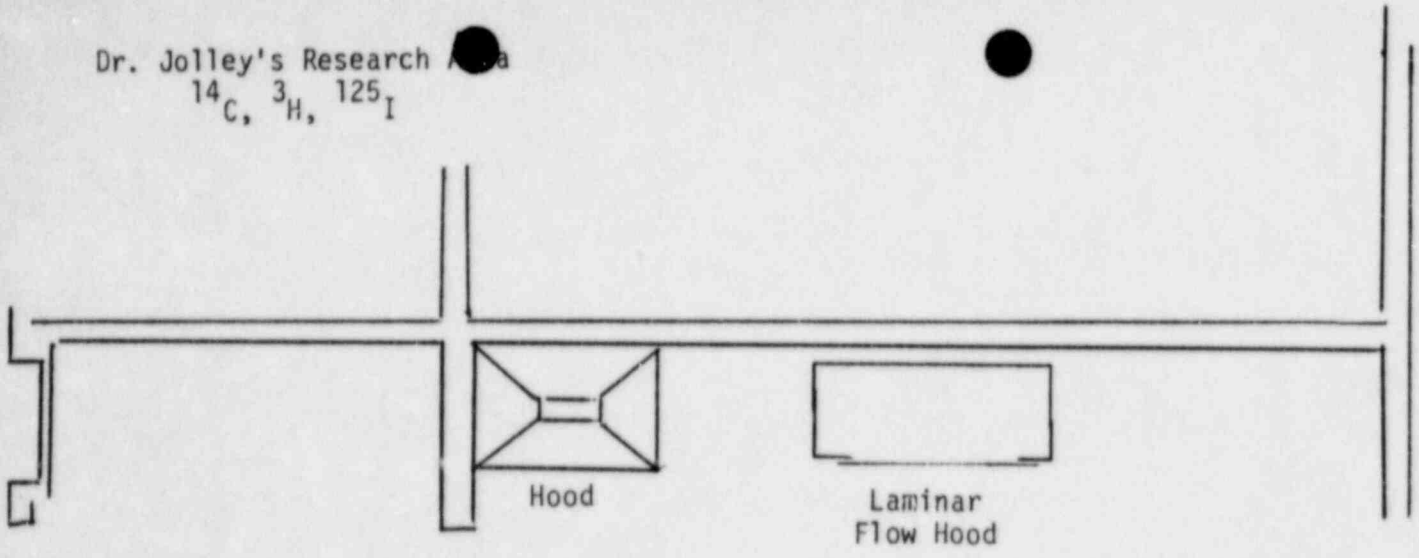
Dr. Adey/Dr. Baylink
^{3}H, ^{45}Ca



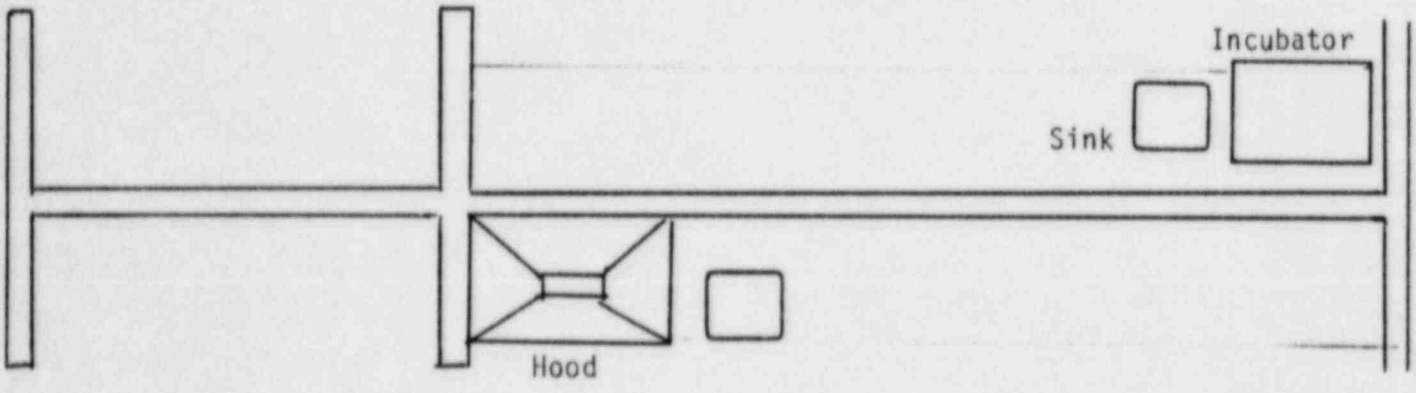
#11 p. 4 2-17-83


Whole Body Scanner Pho/Con
Clinical Lab Offices
Storage
Sink
Nuclear Medicine Isotope
Preparation and Injection Room
Dose
Calibrator
Clinical Lab Offices
4E-37
Lead Brick
99m Tc Colloid
Hot Plate
Refrigerator
Under Counter
Kit Storage
99 Mo
1" Pb
Storage
1" L
Block
Hall Way
Sink
Lead Brick
Waste Storage
Lead
Brick
Wall
Lead
Brick
Waste
Storage
Clinical Lab Offices
Clinical Lab Offices
Waiting Room
Scale ¼" = 1'

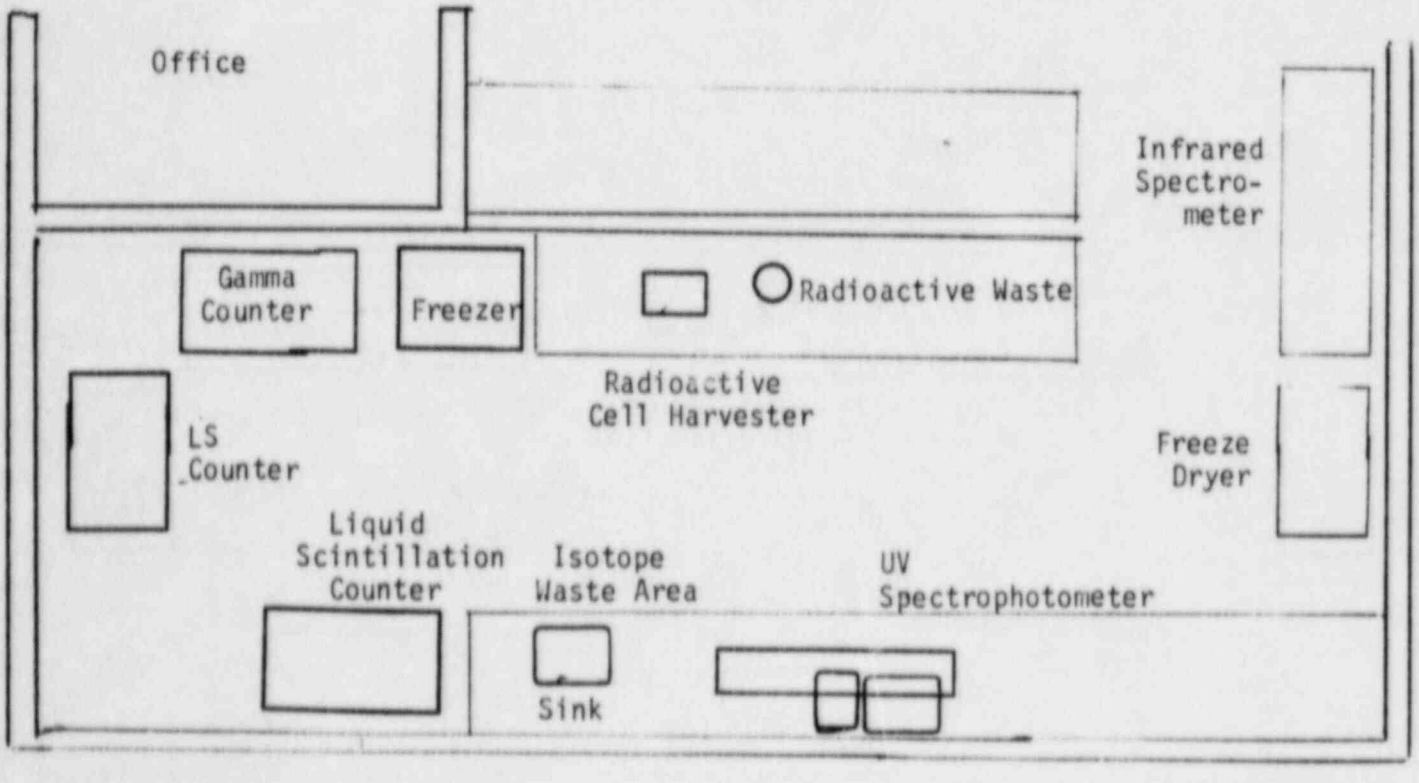
Dr. Jolley's Research Area
^{14}C, ^{3}H, ^{125}I



3C-07



3C-06

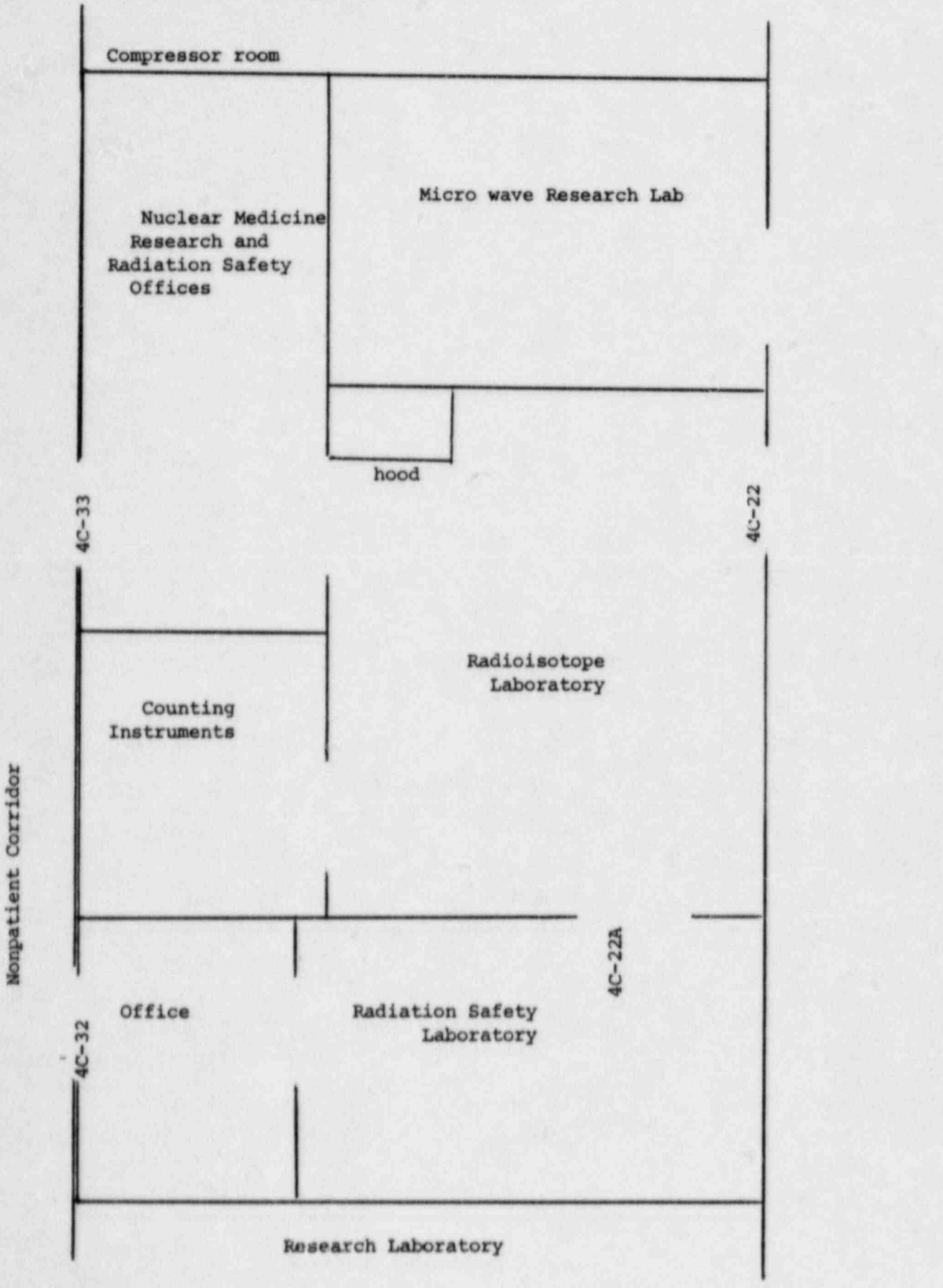


Scale ¼" = 1'

N

#11 p. 6 2-17-83

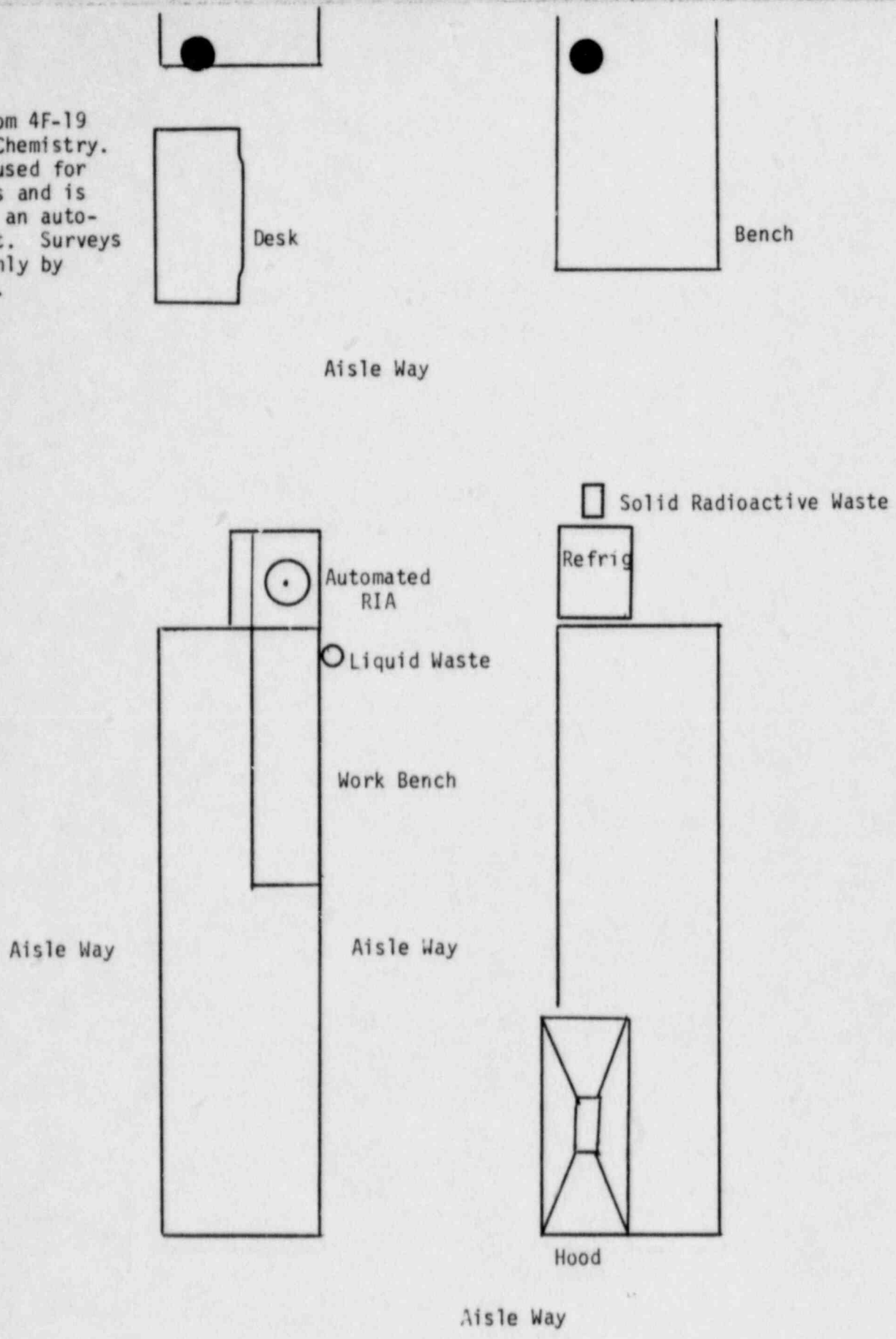
Nuclear Medicine Radioisotope Research Laboratories



Scale: 1"= 5'

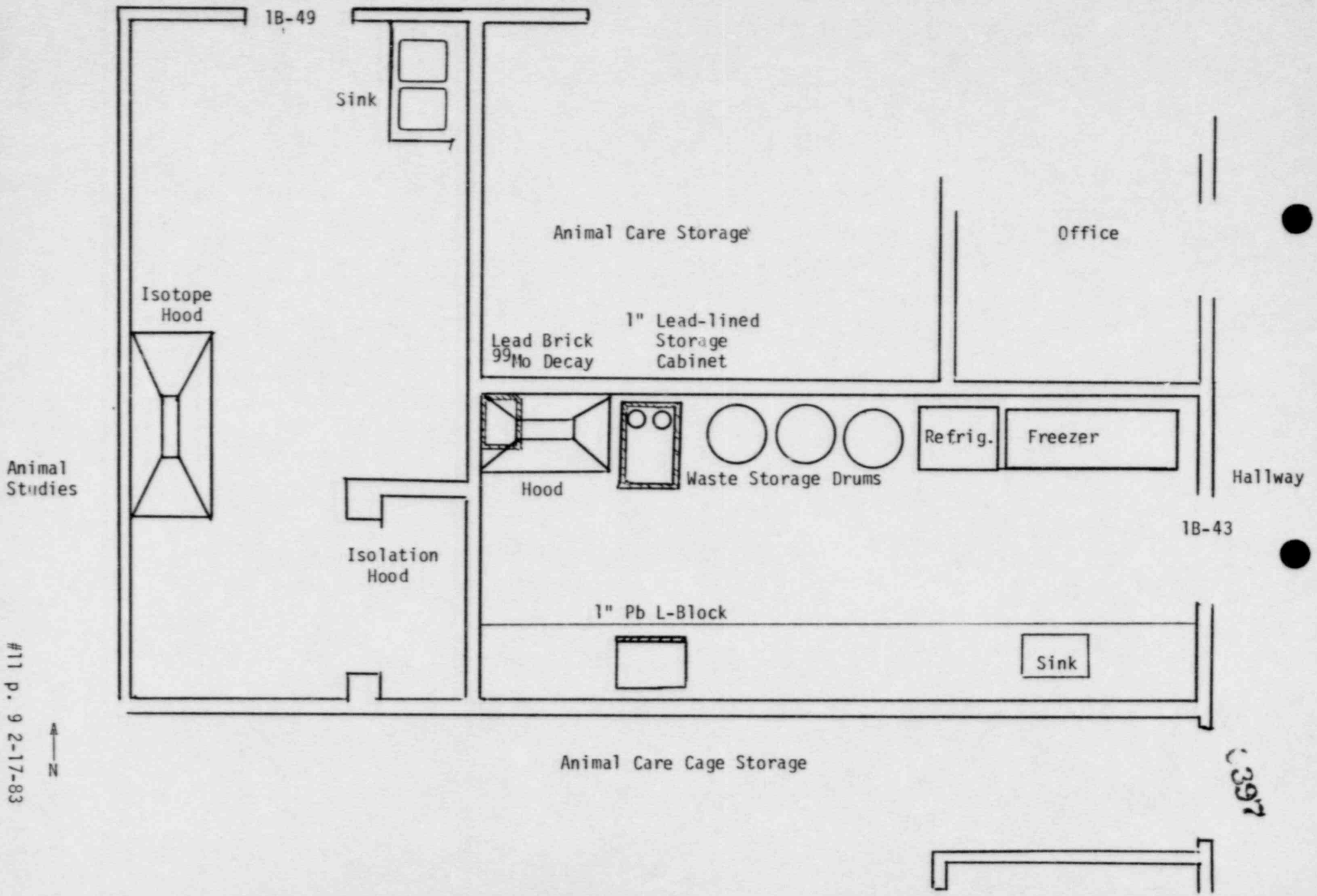
#11 p. 7 2-17-83

Details of Room 4F-19 Clinical Lab Chemistry. This area is used for RIA procedures and is equipped with an automated RIA unit. Surveys are done monthly by Lab personnel.



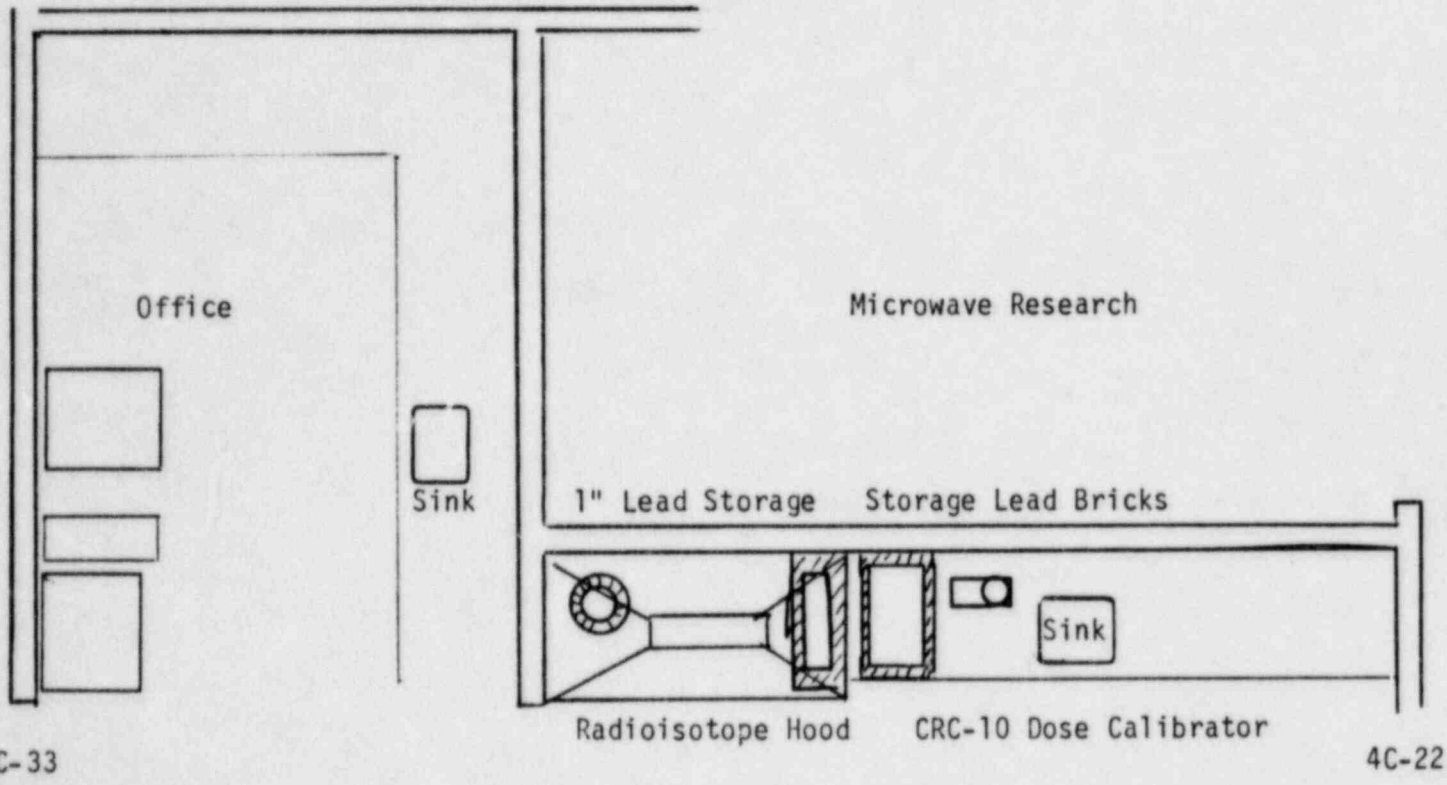
Scale ¼" = 1'

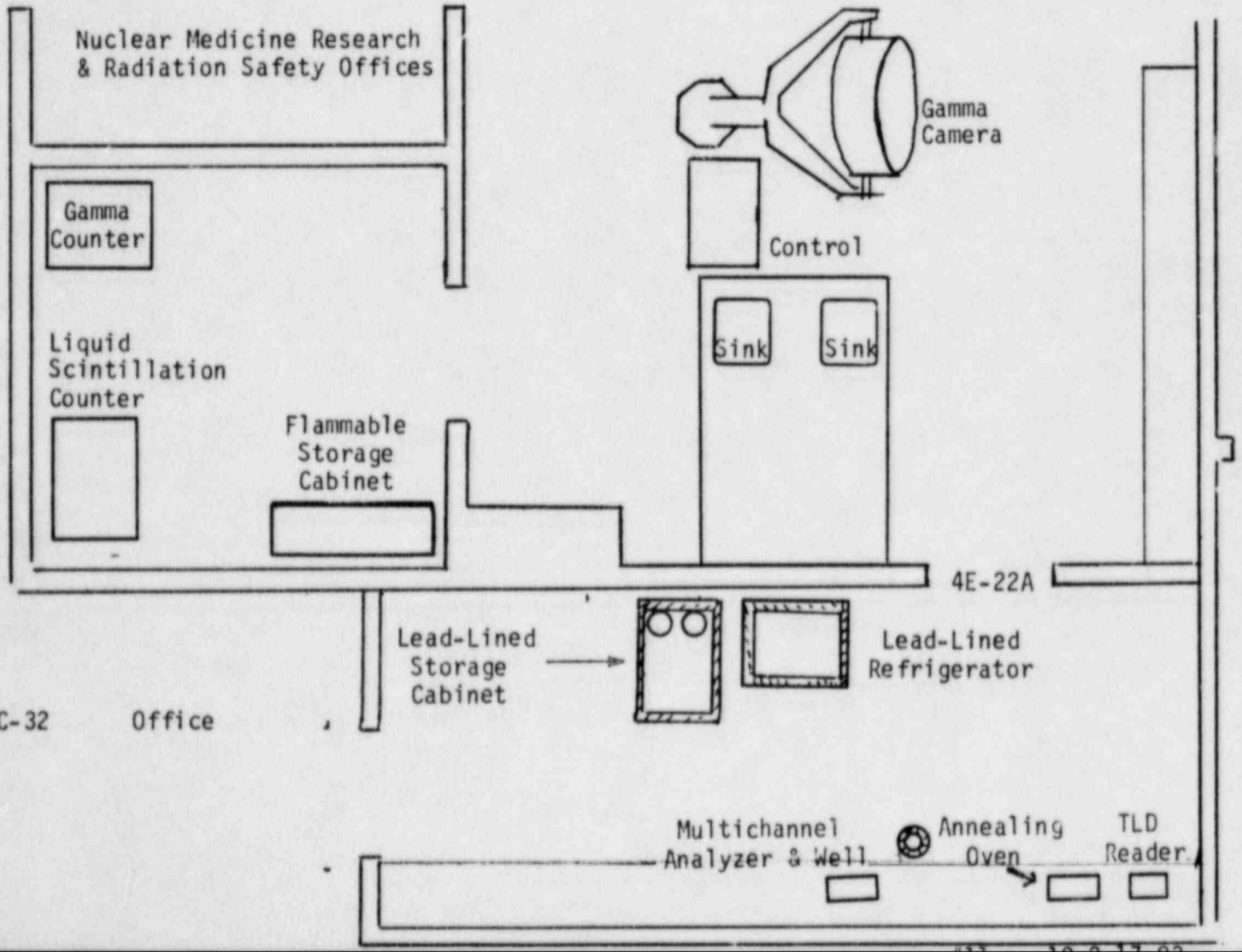
Scale ¼" = 1'

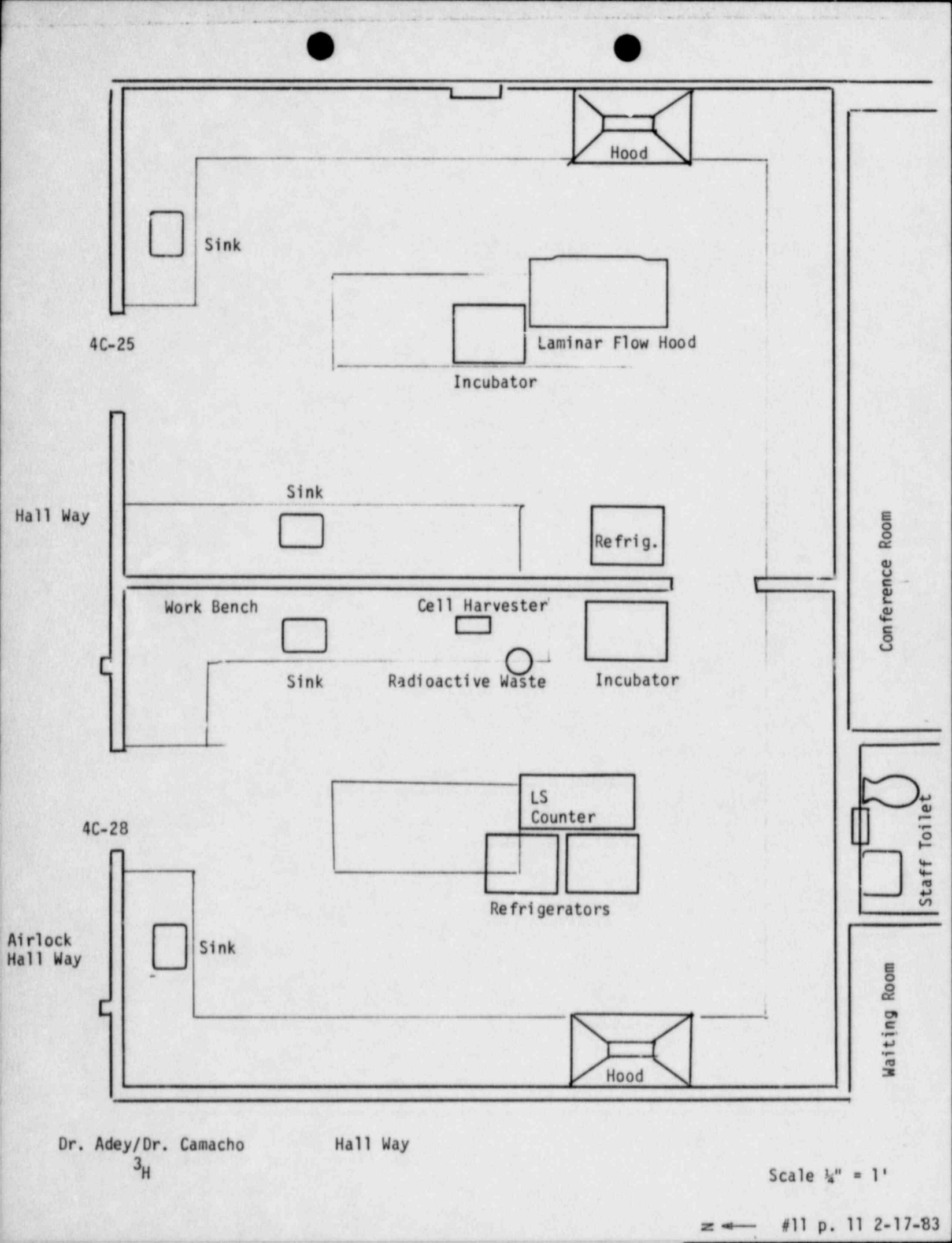


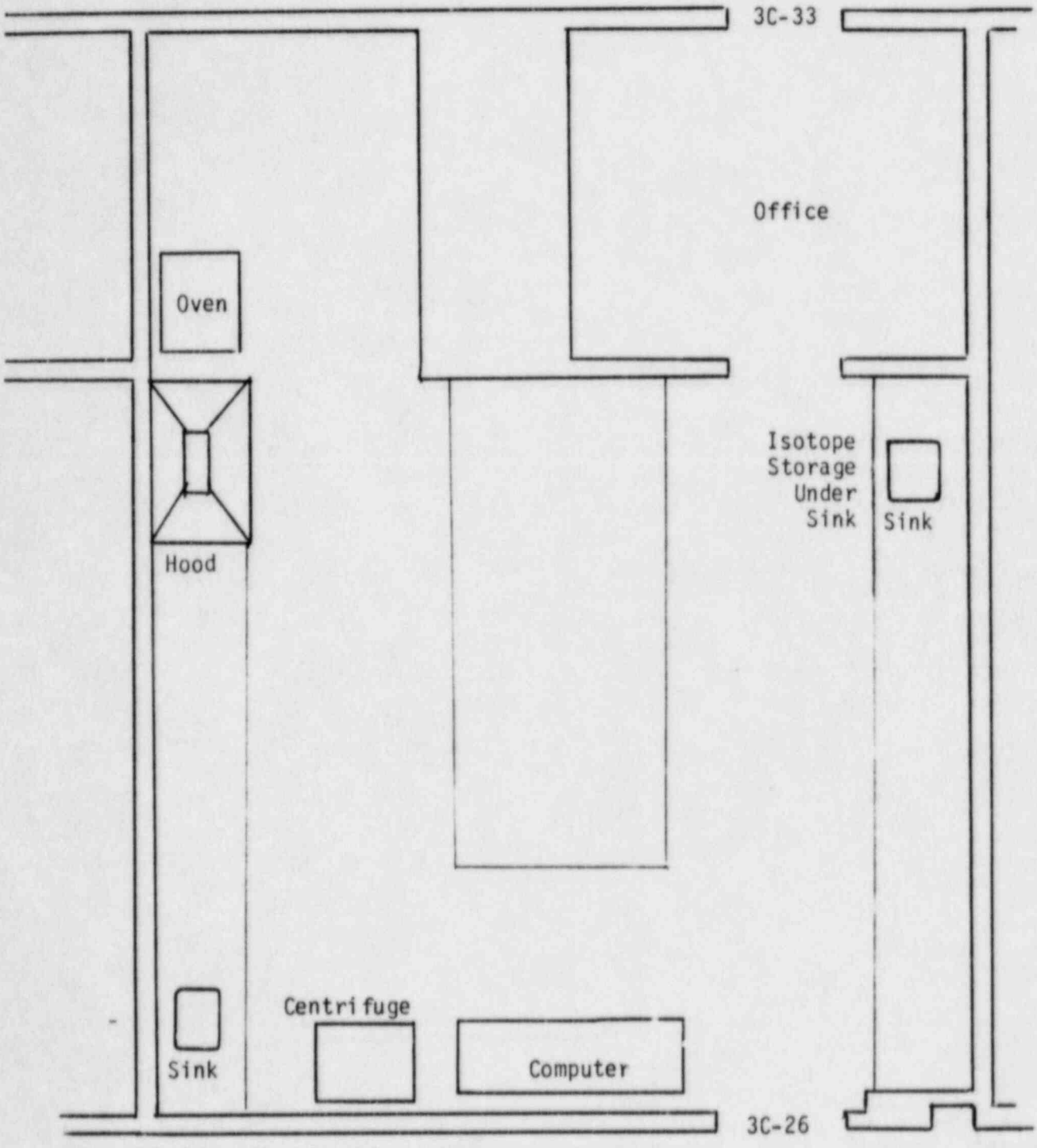
#11 p. 9 2-17-83

397


Office
Sink
Microwave Research
1" Lead Storage
Storage Lead Bricks
Sink
Radioisotope Hood
CRC-10 Dose Calibrator
4C-33
4C-22


Nuclear Medicine Research
& Radiation Safety Offices
Gamma
Camera
Gamma
Counter
Control
Sink
Sink
Liquid
Scintillation
Counter
Flammable
Storage
Cabinet
4E-22A
Lead-Lined
Storage
Cabinet
Lead-Lined
Refrigerator
4C-32
Office
Multichannel
Analyzer & Well
Annealing
Oven
TLD
Reader

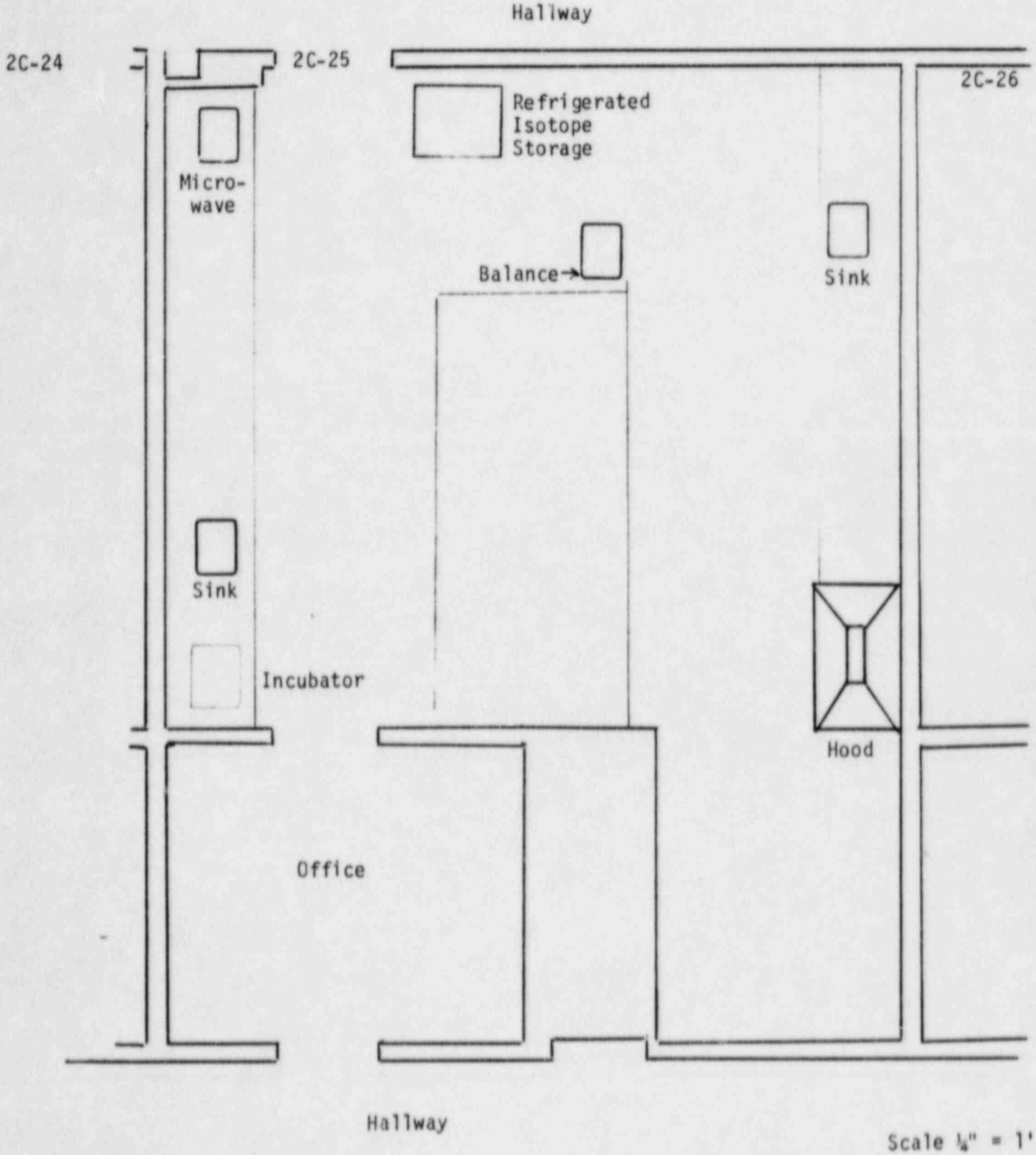

Hood
Sink
4C-25
Laminar Flow Hood
Incubator
Hall Way
Sink
Refrig.
Work Bench
Cell Harvester
Sink
Radioactive Waste
Incubator
Conference Room
LS
Counter
4C-28
Refrigerators
Staff Toilet
Airlock
Hall Way
Sink
Waiting Room
Hood
Dr. Adey/Dr. Camacho
^{3}H
Hall Way
Scale ¼" = 1'
N
#11 p. 11 2-17-83



Scale ¼" = 1'

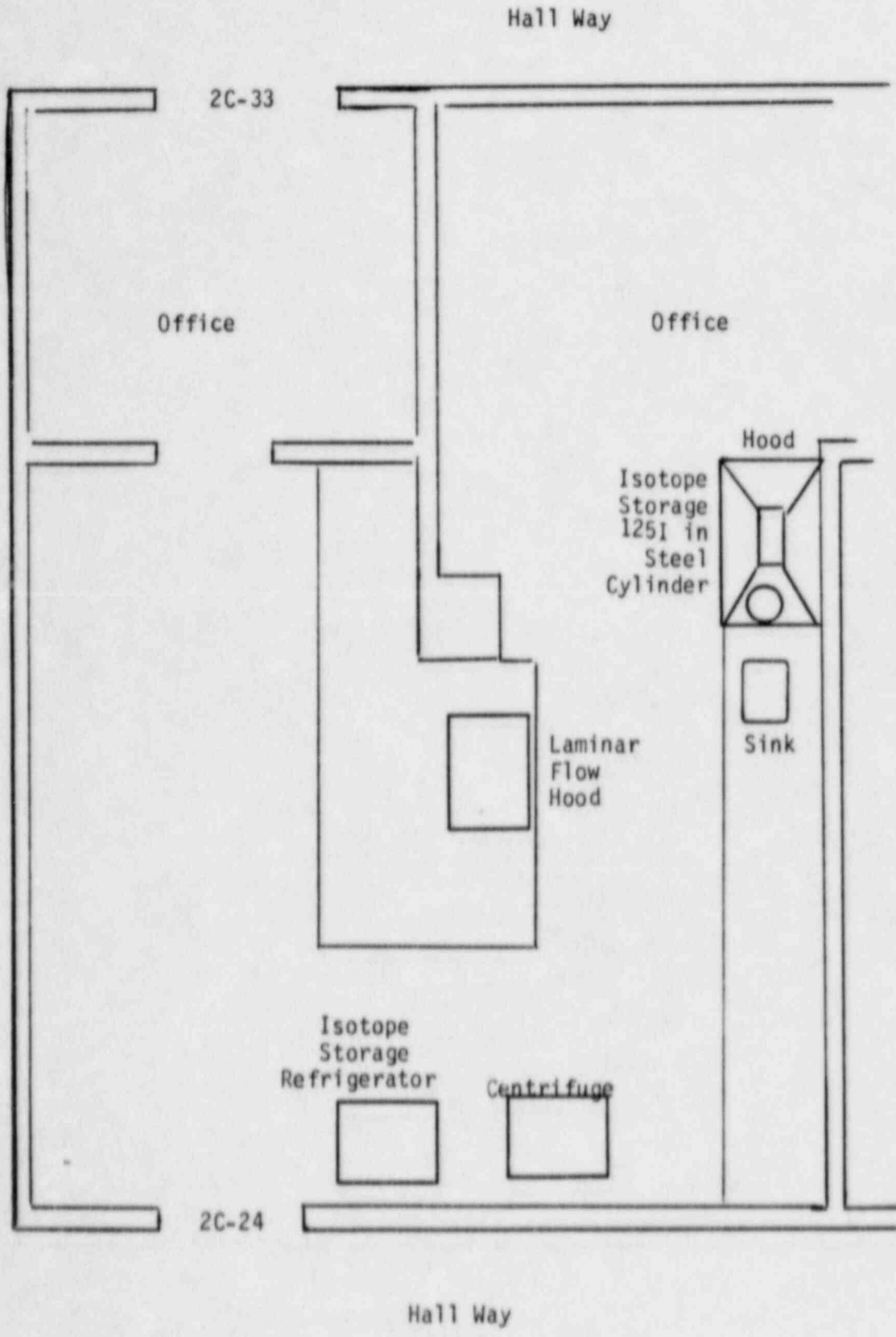
#11 p. 12 2-17-83

Dr. Adey's Research Area
using ^{45}Ca, ^{3}H



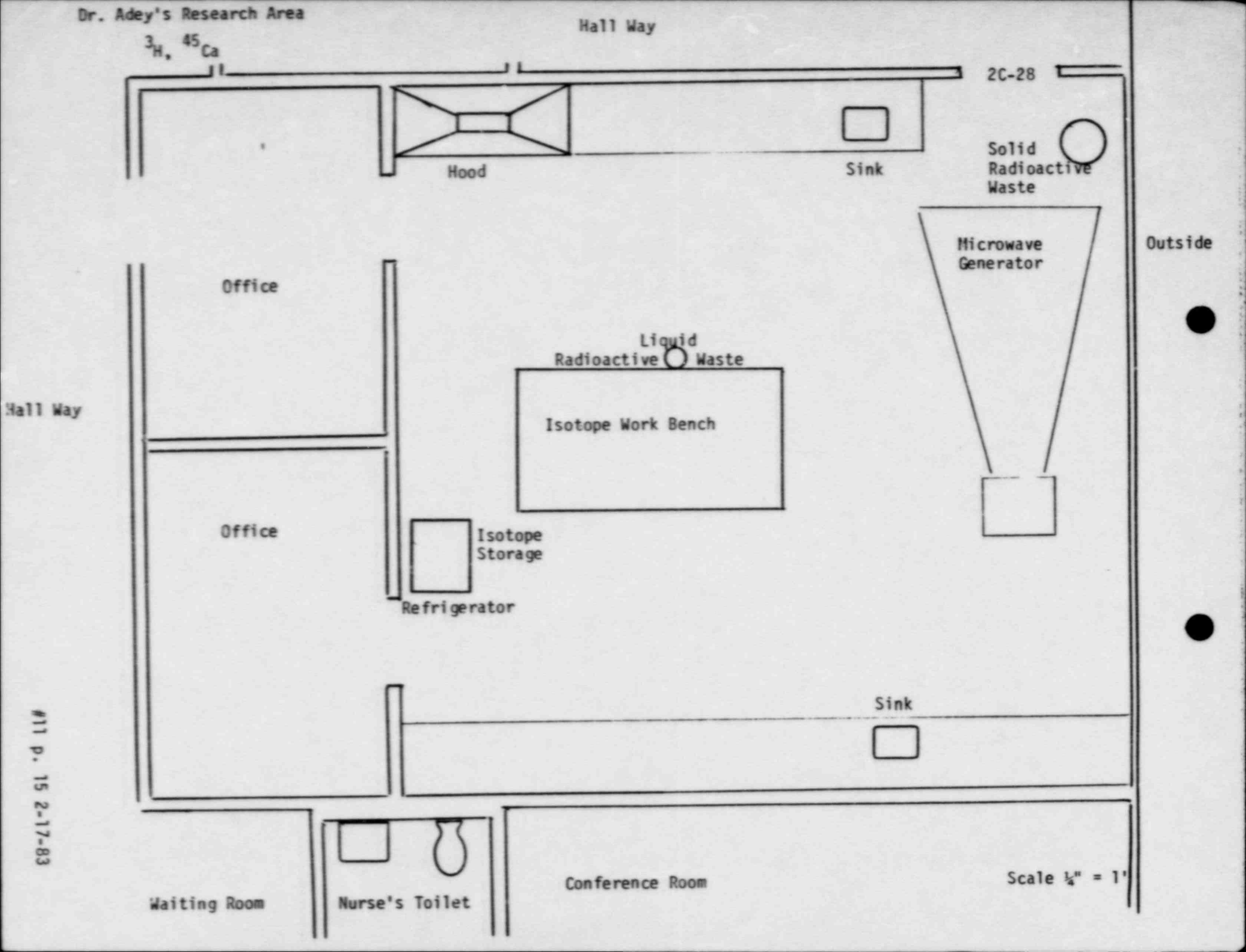
Scale ¼" = 1'

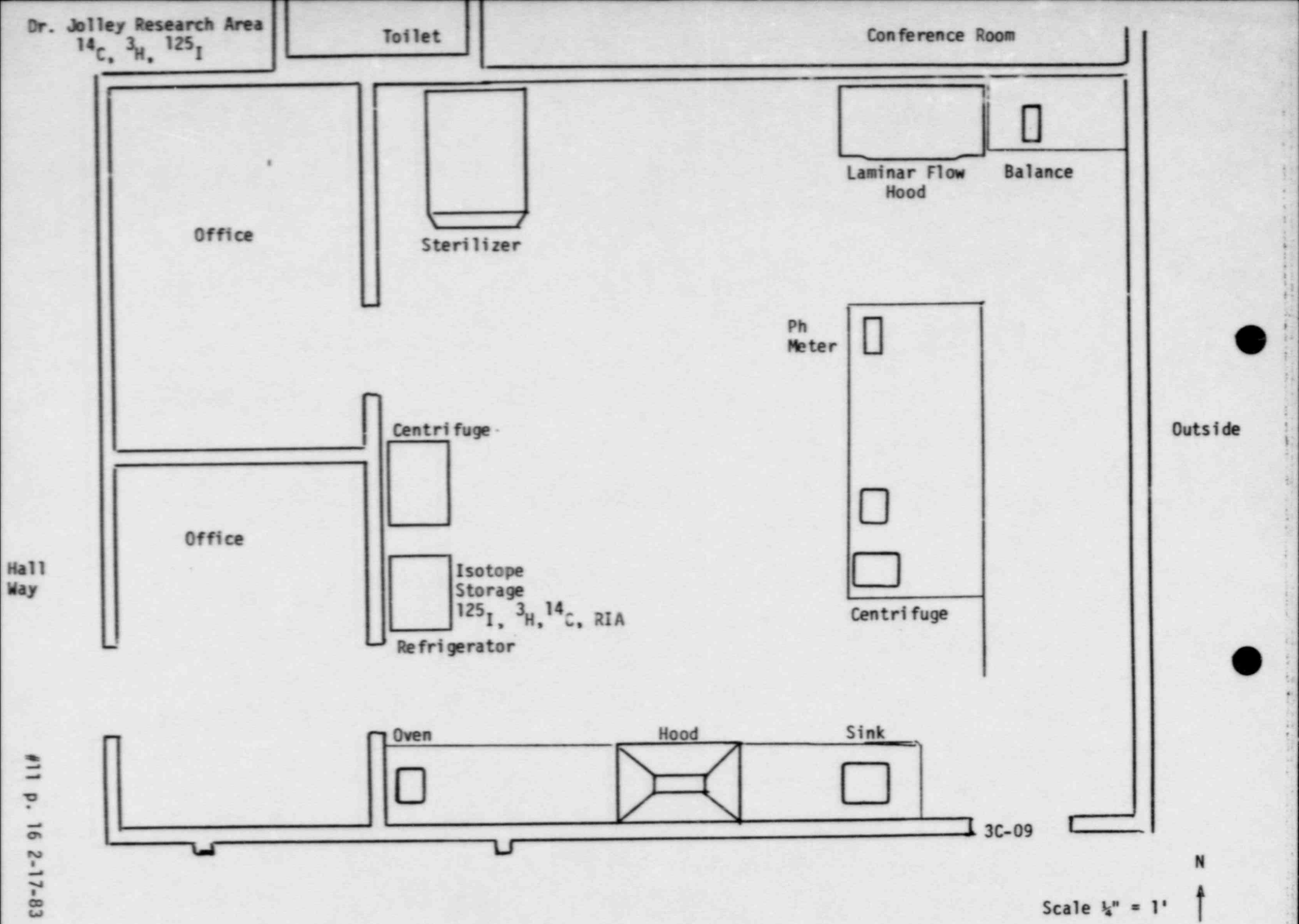
Dr. Adey/Stein Research
Area ^{125}I, ^{35}S



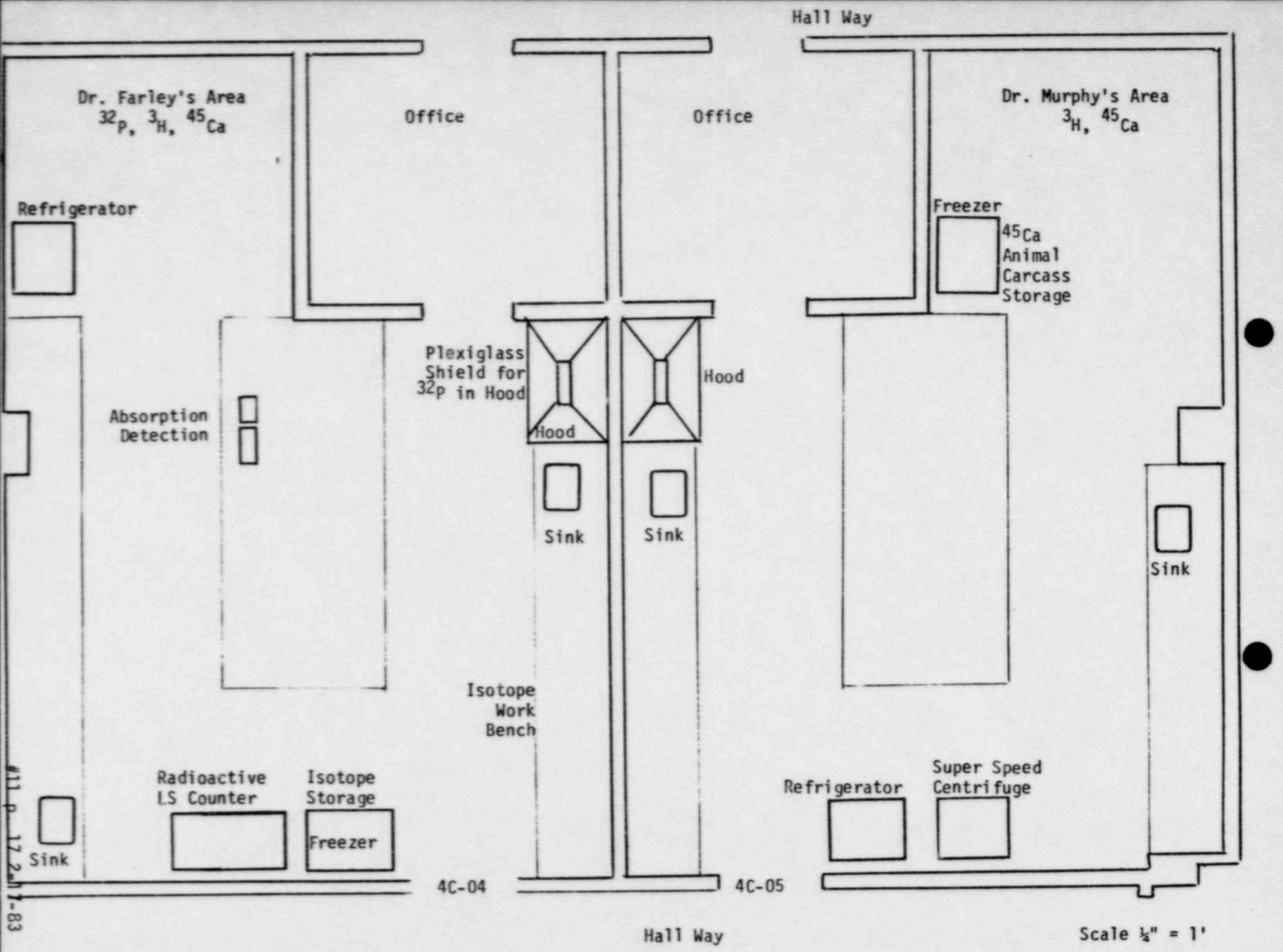
Scale ¼" = 1'

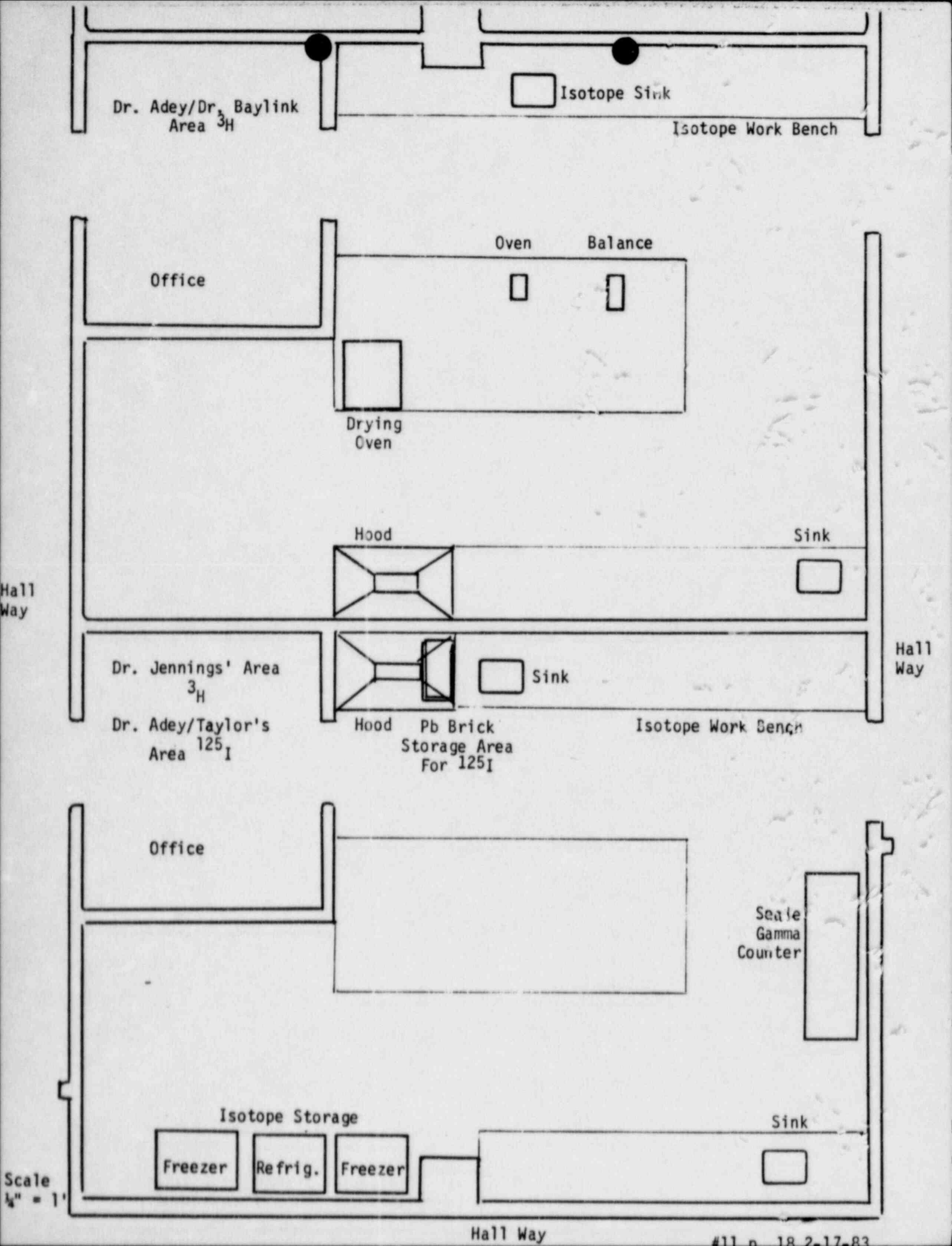
#11 p. 14 2-17-83


Dr. Adey's Research Area
^{3}H, ^{45}Ca
Hall Way
2C-28
Hood
Sink
Solid Radioactive Waste
Microwave Generator
Outside
Office
Liquid Radioactive Waste
Hall Way
Isotope Work Bench
Office
Isotope Storage
Refrigerator
Sink
#11 p. 15 2-17-83
Waiting Room
Nurse's Toilet
Conference Room
Scale ¼" = 1'


Dr. Jolley Research Area
^{14}C, ^{3}H, ^{125}I
Toilet
Conference Room
Office
Sterilizer
Laminar Flow Hood
Balance
Ph Meter
Centrifuge
Outside
Office
Isotope Storage
^{125}I, ^{3}H, ^{14}C, RIA
Refrigerator
Centrifuge
Hall Way
Oven
Hood
Sink
3C-09
N
Scale ¼" = 1'

#11 p. 16 2-17-83


Hall Way
Dr. Farley's Area
32P, 3H, 45Ca
Office
Office
Dr. Murphy's Area
3H, 45Ca
Refrigerator
Freezer
45Ca
Animal
Carcass
Storage
Plexiglass
Shield for
32P in Hood
Hood
Hood
Absorption
Detection
Sink
Sink
Sink
Isotope
Work
Bench
Radioactive
LS Counter
Isotope
Storage
Freezer
Sink
Refrigerator
Super Speed
Centrifuge
4C-04
4C-05
Hall Way
Scale ¼" = 1'
11-p-12-2-11-83


Dr. Adey/Dr. Baylink
Area ^{3}H
Isotope Sink
Isotope Work Bench
Office
Oven
Balance
Drying
Oven
Hood
Sink
Hall
Way
Dr. Jennings' Area
^{3}H
Dr. Adey/Taylor's
Area ^{125}I
Hood
Pb Brick
Storage Area
For ^{125}I
Sink
Isotope Work Bench
Hall
Way
Office
Scale
Gamma
Counter
Isotope Storage
Freezer
Refrig.
Freezer
Sink
Scale
¼" = 1'
Hall Way

#11 p. 18 2-17-83

^{133}Xenon

1. Quantities to be Used:

   a. Estimated 137 patient studies per year using 20 mCi ^{133}xenon/study.

   b. Possession limit - 500 mCi.

2. Use and Storage Areas:

   a. Three rooms with radioisotope fume hoods are available for use, storage, and waste disposal (Rooms 4E-28, 4E-37, and 4C-22 - see descriptions and diagrams under Item 13). One-eighth inch shielding will be used for storage, patient use, and waste disposal. The remaining hoods can be used for storage and waste disposal, if necessary.

   b. All rooms with radioisotope fume hoods are negative pressure rooms with complete non-recirculation of ventilation. The rooms are vented entirely through the continuously operating hood or by hood and a remotely controlled ceiling vent activated by a control on the hood. The hood exhaust in Room 4E-28 draws 800 CFM. (4E-37 draws 800 CFM and 4C-22 draws 1200 CFM.)

3. Procedure for Routine Use:

   a. Patients will be seated or lying in front of a scintillation camera placed adjacent to the fume hood. A trial study with air will be employed prior to actual use of ^{133}xenon. Any manipulation of the xenon container, syringe filling, etc., will be done in the hood.

   b. A single-dose commercial administration system (NEN Calidose dispensing system or MediPhysics Xenon Study System (VSS) or similar) will be used. These systems are basically unidirectional mouthpiece units with the xenon injected directly into the unit. Usually a single breath with washout study will be performed with the exhalant exhausted directly up the hood. If a rebreathing study is required, a 9-liter Collins spirometer will be used. In the event usage increases sufficiently to exceed approved ^{133}xenon disposal limits of this hood, exhalant will be trapped in shielded plastic bags and transported to other described hoods for disposal.

TRAINING

New personnel assigned to areas of radiation use are given an orientation to the work area by their respective supervisors, in compliance with 10 CFR:19.

Nuclear Medicine and Research personnel are given a slide presentation entitled "Perinatal Exposure to Ionizing Radiation", which outlines the information in Reg. Guide 8:13. Female workers in Nuclear Medicine are also given a copy of Reg. Guide 8:13 and are requested to sign a statement that they have read and understand the information therein. This documentation is then filed with their film badge application. A radiation training program is offered at least annually to users of radioactive materials.

Ancillary personnel are given orientation to radiation and radiation safety as arranged by the various services. Currently, there is an ongoing training schedule for annually updating nursing, housekeeping, and security personnel. The training includes one hour of lecture and discussion. The subject matter is tailored to meet the needs of the particular service as it interfaces with the various types of radiation use in the hospital and the particular involvement with that radiation by personnel of the particular service. Content includes information from Reg. Guide 8:13 and/or the Reg. Guide "Instruction Concerning Risk from Occupation Radiation Exposure".

The Nuclear Medicine staff is given training monthly on topics related to nuclear medicine. Examples of content include: equipment, safety procedures, diagnostic protocols, radiopharmaceuticals, quality control, etc. Attendance is documented and records maintained to verify training. Changes in duties, regulations, and terms of the License are discussed at the monthly staff meetings.

^{99}Mo Breakthrough is reviewed annually.

ORDERING AND RECEIVING RADIOACTIVE MATERIAL

Requests for any radioactive materials must be submitted on appropriate forms through the Radiation Safety Office. Upon approval of the Radiation Safety Officer or his designee, the request will be forwarded to the Supply Service. This procedure is applicable to the acquisition of any amount of radioisotope from any source. No shipments of radioactive material are allowed into this institution without prior approval by the Radiation Safety Office. Under no circumstances can an individual investigator place a telephone or telegram order for the procurement of radioactive material. An unauthorized order can be regarded as radioactive waste at the discretion of the RSO. The RSO will issue an Order File Number to each order and stamp it:

AUTHORIZED ORDER FOR
RADIOACTIVE MATERIALS
_____ RSO_____

Each order for radioactive material is reviewed for:

1. User authorization for that particular isotope.
2. Authorization for the amount of that particular isotope for the user.
3. Effect of the order on the amount of the isotope presently in this facility as it relates to our license limits.

Upon arrival of the shipment, Supply Service is to notify the Radiation Safety Office immediately. Unless instructed otherwise, delivery is to be directed by the receiving clerk to the Hot Laboratory (Room 1B-43) where the Radiation Safety Officer or his designee will check in the shipment. Personnel in Supply Service should not physically handle radioactive parcels. (If such contact is necessary, prior instruction on safety precautions must be given by the Radiation Safety Officer.) After hours deliveries will be directed by the Inpatient Pharmacy to the Hot Laboratory. The Pharmacy representative shall see that the package is deposited on a designated table, or placed in refrigerator or freezer as indicated, and the receipts are duly recorded. For deliveries made on Friday or Saturday night, it is the responsibility of the Pharmacy to notify the Radiation Safety Officer the following morning.

Radioactive materials are secured at all times against unauthorized removal.

Packages will be examined by the Radiation Safety Officer or his designee for external leakage, contamination, damage, and radiation level as soon as practical on the day of receipt or on the first work day after receipt of off hours shipments. The user shall be contacted to pick up the parcel. It is the responsibility of the user to determine the extent of contamination, if any, and the accuracy of the content. It is also the responsibility of the user to keep a continuous log of the disposition of the isotope. Packaging material will not be regarded as radioactive waste, unless contamination is detected.

Before any radioactive material shipping container can be disposed of in regular trash, all DOT Radioactive Shipping Labels must be removed or defaced.

ORDERING AND RECEIVING RADIOACTIVE MATERIAL
(Continued)

Acquisition of radioisotopes from other institutions is governed by state and federal regulations, therefore, all arrangements for such transfers shall be made in advance in cooperation with the Radiation Safety Office. Transfer of radioisotopes to other institutions will also require the approval of the Radiation Safety Officer.

PROCEDURES FOR SAFELY OPENING PACKAGES CONTAINING RADIOACTIVE MATERIAL

1. Special requirements will be followed for packages containing quantities of radioactive material in excess of the Type A quantity limits as specified in paragraphs 20.205(a)(1) and (c)(1) of 10 CFR Part 20 (more than 20 Ci for Mo-99 and Tc-99m). They will be monitored for surface contamination and external radiation levels within 3 hours after receipt if received during working hours or within 18 hours if received after working hours, in accordance with the requirements of paragraphs 20.205(a) through (c). All shipments of liquids greater than exempt quantities will be tested for leakage. The NRC Regional Office will be notified in accordance with the regulations if removable contamination exceeds 0.01 μCi/100 cm^2 or if external radiation levels exceed 200 mR/hr at the package surface or 10 mR/hr at 3 feet (or 1 m).

2. For all packages, the following additional procedures for opening packages will be carried out:

   a. Put on gloves to prevent hand contamination.

   b. Visually inspect package for any sign of damage (e.g., wetness, crushed). If damage is noted, stop procedure and notify Radiation Safety Officer.

   c. Measure exposure rate at 3 feet (or 1 m) from package surface and record. If >10 mR/hr, stop procedure and notify Radiation Safety Officer.

   d. Measure surface exposure rate and record. If >200 mR/hr, stop procedure and notify Radiation Safety Officer.

   e. Open the package with the following precautionary steps:

      (1) Open the outer package (following manufacturer's directions, if supplied) and remove packing slip.

      (2) Open inner package and verify that contents agree with those on packing slip. Compare requisition,* packing slip, and label on bottle.

      (3) Check integrity of final source container (i.e., inspect for breakage of seals or vials, loss of liquid, and discoloration of packaging material).

      (4) Check also that shipment does not exceed possession limits.

   f. Wipe external surface of final source container and remove wipe to low background area. Assay the wipe and record amount of removable radioactivity (e.g., μCi/100 cm^2, etc.). Check wipes with a thin-end-window G-M survey meter, and take precautions against the spread of contamination as necessary.

   g. Monitor the packing material and packages for contamination before discarding.

      (1) If contaminated, treat as radioactive waste.

      (2) If not contaminated, obliterate radiation labels before discarding in regular trash.

3. Maintain records of the results of checking each package, using "Radioactive Shipment Receipt Record" (see next page) or a form containing the same information.

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*In the case of special orders (e.g., therapy doses), also compare with physician's written request.

JERRY L. PETTIS MEMORIAL VETERANS HOSPITAL

RADIOACTIVE SHIPMENT RECEIPT REPORT

RECEIVING FILE #

1. Surveyor_____ DATE _____ TIME_____

2. Purchase order #_____ _____.

3. Measured Radiation Levels: (Stop and notify RSO if limit exceeded)

   a. Three feet from surface_____mR/hr (limit: 10 mR/hr).

   b. Package's surface _____mR/hr (limit: 200 mR/hr).

4. Condition of Package:

   _____OK. _____Stains _____ Wet

   _____Punctured _____Crushed _____Other

5. Wipe test on outer surface it "stained" or "wet". Notify RSO if limit exceeded. Limit: 22,000 DPM.

   Beta: reading/efficiency =_____CPM/_____ =_____DPM

   Gamma: reading/efficiency =_____CPM/_____ =_____DPM

6. Notify user and note person contacted _____

TO BE FILLED OUT BY USER

1. Signature_____ DATE_____ TIME_____

2. Results of wipe test on final source container. Notify RSO if limit exceeded. Limit: 11,000 DPM

   Betta: reading/efficiency = _____CPM/_____=_____DPM

   Gamma: reading/efficiency = _____CPM/_____=_____DPM

3. Survey results of packing material and cartons:
   _____ mR/hr or CPM above background.

4. Disposition of packaging materials after inspection:
   _____.

5. Return report to RSO (115).

TO BE FILLED OUT BY RSO

1. NRC: TIME_____ DATE_____ PERSON_____TELEGRAPH_____

2. CARRIER:TIME_____ DATE_____ PERSON_____TELEGRAPH_____

GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL

A. PROCEDURES FOR OBTAINING PERMISSION TO USE RADIOACTIVE MATERIAL:

The procedure for obtaining permission to use radioactive material in this hospital is initiated by the proposed user completing the Application for General Use of Radioactive Material. This along with a copy of the Training and Experience form for each individual involved in the project is then submitted to the Radiation Safety Officer for:

1. A check to see if the user is already NRC licensed and authorized to have the isotope requested.

2. Will this request (if granted) exceed the hospital limit for that isotope?

3. Has the applicant addressed each question on the application?

   a. Specific nature and purpose of use.
   b. Waste disposal.
   c. Facilities to be used and equipment list.
   d. Safety evaluations.
   e. Sketch of the laboratory noting work area.

After the Radiation Safety Officer has completed his review of the application and the user's training and experience, then the project is presented to the Radiation Safety Committee members for their evaluation. (The Radiation Safety Committee members are listed under Question #7.) The Radiation Safety Committee quorum consists of seven members, one of which must be the Radiation Safety Officer or his designee, and applications are approved by a majority. Projects are usually approved for a one-year duration subject to review and renewal by oral request at that time. Committee actions are documented in the minutes of the committee meetings.

H. PERSONNEL MONITORING DEVICES:

Monitoring is done by body film badges routinely worn by all personnel using radionuclides. TLD rings and/or wrist badges are worn by persons handling large amounts of radioisotopes where there is a possibility of high extremity exposure. These devices are obtained through the Radiation Safety Office, Room 4C-33, Ext. 2701. The RSO provides each user service with monitoring devices on the first of each month. It is the user services' responsibility to return the previous month's devices to the Radiation Safety Office promptly. This also facilitates the radioisotope user in assessing his work habits and encourages proper handling techniques. Currently, this service is being provided by R. S. Landauer, Jr., and Company of Glenwood, Illinois.

Pocket dosimeters (Victoreen 541R - range 0-200 mr, and Nuclear Associates 883 - range 0-500, standardized before each use against NBS reference source supplied by the manufacturers) may be substituted for the film badges. They are read daily or at the end of the specific procedure or test period being evaluated. See attached "film badge use" memorandum for instructions regarding recording of exposure results and proper storage to ensure accuracy.

GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL
(Continued)

I. WASTE DISPOSAL PROCEDURES:

Each user in his/her application for use of radioisotopes must address the procedure for waste disposal for each isotope to be used. This is reviewed by the RSO prior to evaluation by the Radiation Safety Committee to insure that the user is informed as to the hospital's policies regarding waste disposal of radioisotopes.

All wastes will be disposed of by the Radiation Safety Officer, unless specifically approved otherwise.

All liquid wastes with a half-life of more than 65 days are solidified and packaged as solids for transport to a nuclear waste burial site.

Gases will be held for decay in a radioisotope hood. If they cannot be held for decay in a radioisotope hood, the Radiation Safety Officer must authorize the release of any amount of radioactive gas into the environment. No radioactive material can be released from this institution without prior approval of the RSO.

Waste with a long half-life is packed to DOT specifications and shipped to a nuclear waste burial site.

Short half-life material is held for decay in the Radioactive Material Receiving Room and waste storage area, 1B-43.

Radioactive syringes and vials are held for radioactive waste pick up by the Radiation Safety Officer in a lead-brick storage area.

IV. RADIATION SAFETY:

A. Purpose: To provide maximum radiation protection for both patients and hospital personnel.

B. Procedures:

1. Rules posted in the 'hot lab' must be followed.

2. Designate and label appropriately radioactive work areas. Cover work surfaces with absorbent, plastic-backed paper to facilitate clean-up of spilled radioactivity. Use stainless steel or plastic trays to confine liquids, if spilled. Use disposable supplies whenever feasible.

3. Eating, drinking, smoking, or applying cosmetics in the radioisotope work area is prohibited. This 'work area' includes the camera and computer rooms as well as the Radiopharmacy.

4. Pipetting by mouth is not permitted.

5. Rubber gloves must be worn when handling liquid radioactive materials.

6. Protective shielding for syringes and injection vials must be used.

7. Radiation surveys shall be performed at least once a week and the results recorded.

8. Designate and label a 'hot sink' for clean-up of hands and contaminated equipment, but do not use for the disposal of radioactive wastes unless specifically approved by the Radiation Safety Officer. The 'hot sink' is located to the right when you enter the Hot Lab, Room 1B-49. It is labeled.

9. Use only properly labeled and shielded waste disposal receptacles for disposal of radioactive waste. One such labeled and shielded receptacle is kept under the work station. Only that receptacle must be used to dispose of radioactive gloves, sponges, etc. Radioactive syringes must be put in the space created within the lead block square.

10. All radioactive disposable items shall be stored in safety containers for at least ten half-lifes before disposal.

11. In the event of a major spill of radioactive material, the Radiation Safety Office shall be notified immediately.

12. Written authority shall be required for all non-physicians who administer radioisotopes to patients.

13. No unauthorized person is to enter the Hot Lab.

14. Keep all hallways within the Nuclear Medicine Clinic area free of obstructions so that patients in wheelchairs, on stretchers, etc., can be moved easily in case of emergency.

C. JCAH Manual Standard II, Pg. 118.

Veterans Administration

Memorandum

To:

Date: April 26, 1982

Subj: Film Badge Use

The enclosed film badge is supplied to you by the Radiation Safety Office to monitor your radiation exposure levels while employed at Loma Linda V.A. Hospital. The film badge is issued to you on one of the following schedules.

( ) weekly basis and should be changed each Monday.
(X) monthly basis and should be changed on the first of each month.
( ) quarterly basis and should be changed on the first of January, April, July, and October.

If you do not receive a badge when expected, please contact your supervisor or the Radiation Safety Office, Room 4C-32 or Ext. 2701.

These devices are amazingly accurate when properly used; therefore, certain precautions must be observed to ensure the accuracy of the reading:

1. Avoid excessive moisture, heat, and sunlight.
2. Do not damage the outer covering of the insert with sharp objects or by abrasions.
3. Before use, always place the film insert in the holder since it affects the accuracy of the readings dramatically.
4. Change the insert promptly when it arrives.
5. The film badge is to be worn at the collar level, if a lead apron is worn, the film badge must be worn outside the apron in the regions of the neck (e.g., collar).
6. The purpose of the film badge is to provide a legal record of your radiation exposure while at work; therefore, store the film badge in a radiation-free area, and do not wear the film badge during personal medical radiographic procedures performed on you.
7. Film badges are useful for measuring exposure from penetrating radiation only. This includes X-rays, gamma rays, and high energy beta radiation. Therefore, do not attempt to measure exposure from non-penetrating radiation; (e.g., low energy beta radiation from C-14 or H-3) by this method.

Radiation exposures recorded by the film badge are sent to your department and posted for you to review. Policy requires that exposures be as low as reasonably achievable and not to exceed 100 millirems per week, or 400 millirems per month, or 1250 millirems per quarter. If an exposure exceeds 1250 mr/quarter, it must be reported to the Radiation Safety Office as an over-exposure.

If you feel this film badge is not necessary or if individuals with whom you work feel they would like one, please contact the Radiation Safety Office, and we can discuss it. If you leave the facility or transfer to a department where a film badge is not required, please return the used holder to the Radiation Safety Office, since the company charges us for each one. (It is a considerable expense when film holders are lost or not returned upon termination.) Damaged or broken holders should be returned to the Radiation Safety Office for replacement.

We trust that the information contained here will be useful to you. If, however, we have not covered some aspect that interests you, call ext. 2701. Thank-you for your cooperation.

J. L. Pettis Memorial Veterans Hospital
Loma Linda, California 92357

Radiation Safety
(714) 825-7084, Ext. 2701

GENERAL APPLICATION FOR USE AND PURCHASE OF
RADIOISOTOPES AND RADIATION SOURCES

(For human use request the special forms for that purpose)

One form for EACH DIFFERENT procedure MUST be completed

1. Principal Investigator: _____

2. Title of Project: _____

3. Location of Use: _____ Ext.: _____

4. Survey Equipment List: (If list previously filed, list any recent acquisitions or deletions of survey equipment.)

5. Have you been listed on a NRC license before? Yes ( ) No ( )

   If Yes, where, when, and for what uses.

6. Investigator's radioisotope training and experience:

   Previously filed ( ) Attached ( )

   Have you had an authorization at this VA before? Yes ( ) No ( )

7. Name of each individual participating in this project: (All participants must complete the "Training and Experience" form and file it with the Radiation Safety Office.

   a. _____ e. _____

   b. _____ f. _____

   c. _____ g. _____

   d. _____ h. _____

8. Materials:

Isotope	Chemical & Physical Form	Activity per Procedure	Possession Limit (at any one time)
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

9. Duration of Use: Months_____ Years_____ Indefinite_____

   Describe briefly nature and purpose of use: _____

   _____

   _____

10. Storage, Handling, and Disposal:

a. Location of storage for radioisotopes:_____

b. Material and thickness of shielding around stored isotopes:_____

_____

c. Describe briefly the major steps in processing and handling the isotopes:

_____

_____

d. Distance from stored isotopes to nearest:

(1) Controlled occupied area:_____ feet
(2) Uncontrolled occupied area:_____ feet

e. Maximum dose-rate which will be permitted in:

(1) Controlled occupied area:_____ mr/hr
(2) Uncontrolled occupied area:_____ mr/hr

f. Describe any hazards foreseen:_____

_____

_____

List precautions to be taken:_____

_____

_____

g. What wastes will occur:_____

How will wastes be disposed of:_____

_____

h. Will experimental animals be used? Yes ( ) No ( ) If yes:

What kind? _____ Number per year? _____

Activity per carcass? _____

11. Equipment:

a. Indicate equipment which will be used:

Forced ventilation	( )	Rubber gloves	( )	Film badges	( )
Isotope fume hood	( )	Survey meters	( )	Lab bench	( )
Shielded containers	( )	Remote pipetter	( )	Long tongs	( )
Pocket dosimeters	( )	Hot waste can	( )	Glove box	( )
Scintillation vials	( )				

b. List any additional facilities and equipment using drawings if necessary.

c. Make a sketch of your lab(s) indicating:

(1) Isotope work areas.
(2) Isotope storage areas.
(3) Isotope sinks indicating ones which will be used for equipment decontamination and disposal.
(4) Isotope waste storage areas.
(5) Isotope - other pertinent information.

12. Calculate the radiation exposure in rads to the laboratory personnel handling the radioisotopes: _____

13. Is this application for radioactive tagged nucleic acids? Yes ( ) No ( )

* * * * * *

We certify that we have read the Jerry L. Pettis Memorial Veterans Hospital Radiation Safety Manual and that all uses of radioisotopes will be in accordance with the regulations set forth therein, and that the Veterans Hospital Radiation Safety Officer will be notified before any changes are made in the use of radioisotopes as herein described.

_____ _____
Signature of Applicant Date

SEND APPLICATION TO:

Radiation Safety Office (115A)

_____
Signature of Service Chief

NOTE: To save time, be certain to fill in all blanks and obtain necessary signatures.

Be certain to retain a copy of this application for your records.

GENERAL OPERATING POLICIES FOR LABORATORIES
USING RADIOACTIVE MATERIALS

GOOD LABORATORY PROCEDURES REQUIRE THAT:

Each Person

1. Confine work to as small an area as possible.
2. Wear a personal monitor when required in the authorization.
3. Wear protective clothing over street clothes.
4. Wear rubber gloves.
5. Use remote pipetter when pipetting (mouth pipetting is prohibited).
6. Use remote handling devices (tweezers, etc.) when source activity is greater than 1.0 mCi.
7. Perform all procedures over absorbent paper, preferably with non-absorbent backing.
8. Wash hands and exposed areas carefully before leaving lab.
9. Do NOT eat, drink, or apply cosmetics when in the laboratory.
10. Do NOT leave contaminated or work area unattended unless it is labeled appropriately.

General Practice

1. Where the possibility of a large-volume spill exists, work must be performed in a non-breakable tray large enough to contain a spill.
2. Where the possibility of aerosols exists, work must be performed in a fume hood.
3. Where the possibility of dust exists, work must be performed in a gloved box.
4. Food must not be stored in a refrigerator or other areas used for radioactive material storage.
5. Label contaminated glassware and equipment until it has been decontaminated.
6. Label all radioactive samples and stored isotopes.
7. Use shielding for storage and during work when necessary to maintain safe radiation levels as outlined in the Radiation Safety Manual.

Waste Disposal

1. Separate different types of waste (dry solid, liquid, scintillation vials, biological).
2. When possible, use separate containers for wastes with different half lives (< 1 day, 1-9 days, 9-15 days, 15-65 days, > 65 days).
3. Place radioactive waste in properly covered containers with the "Radioactive Material" symbol and the words "Janitor - Do NOT empty" prominently displayed.
4. When containers are full, call the Radiation Safety Office for instructions.
5. For disposal of radioactive animals or feces that will decay if stored, call the Radiation Safety Office for instructions. Radiation Safety provides a freezer for this type of disposal.
6. Disposal by sewer is limited to washings only.
7. Remove or destroy all "Radioactive Material" labels from non-radioactive waste before placing with the regular trash.

GENERAL OPERATING POLICIES FOR LABORATORIES
USING RADIOACTIVE MATERIALS
(Continued)

Monitoring

1. Must be performed by an appropriate method routinely or whenever contamination is suspected; if in doubt, contact the Radiation Safety Office.
2. Contact the Radiation Safety Office for assistance with major spills or when a question arises.

Records

1. Must be kept of each receipt, use, and disposal of radioactive material.
2. Must be kept of lab monitoring.
3. Must be kept of contamination levels on radioactive shipments when appropriate.

Ordering

1. Submit VA Form 90-2237 to the Radiation Safety Officer for approval.

FOR MORE COMPLETE INSTRUCTIONS, CONTACT THE RADIATION SAFETY OFFICE, EXT. 2701.

Employees Working with Ionizing Radiation: Please Note

Copies of appropriate sections of the Federal Regulations and the Radioactive Materials License are available at Room 4C-32. Please call Ext. 2701.

J. L. Pettis Memorial Veterans Hospital
Loma Linda, California 92357

Radiation Safety
(714) 825-7084 Ext. 2701

STATEMENT OF TRAINING AND EXPERIENCE: GENERAL

(For human use, submit the form, "Statement of Training and Experience: Human Use".)

1.. Name:_____ SSN:_____

Title:_____

Service:_____ Ext._____

2. Nature of Proposed Use:_____

_____

3. Training: College or University:

Name and Location:_____

Years Completed:_____ Degree:_____ Course of Study:_____

Education specifically applicable to use of radioactive material:_____

_____

4. Experience:

A. List experience with radioactivity beginning with most recent.

(1) Dates: From_____ to_____

Title and Duties:_____

_____

Employer:_____

Address:_____

(2) Dates: From_____ to_____

Title and Duties:_____

_____

Employer:_____

Address:_____

(3) Dates: From_____ to_____

Title and Duties:_____

_____

Employer:_____

Address:_____

B. Radioactive Materials previously used: (If more space is needed add additional sheets)

Name of Material	Unsealed	Sealed	Quantities you personally have handled
EXAMPLE: H^3	X		10 mci
1.			
2.			
3.			
4.			
5.			
6.			
7.			

TYPE C Good Chemical Laboratory	TYPE B Radioisotope Laboratory	TYPE A High Level Laboratory
Chemical hood Film badges G.M. survey meter Laboratory contamination monitor Lab coats	Radioisotope hood* Glove boxes Decontamination facilities Film badges G.M. survey meter Ionization chamber survey meter Laboratory contamination monitor Special protective clothing	Radioisotope hood* Glove boxes Special decontamination facilities Change room Film badges G.M. and ionization survey meters Laboratory monitor Air monitor Non-absorbent floor and working surfaces Special protective clothing

C. Using the above definitions, indicate which types of facilities you have used and key to Part 3-A on previous page.

( ) Ordinary chemical laboratories Type C

( ) "Controlled Area" laboratories Type B

( ) Glove boxes

( ) Shielded glove boxes

( ) Caves with remote manipulators

( ) Field operations with portable equipment

5. Certificate:

I hereby certify that all information contained in this Statement is true and correct

Signature: _____ Date: _____

EMERGENCY INSTRUCTIONS
(Posted in All Laboratories)

FOR NON-AIRBORNE RADIOACTIVE CONTAMINATION:

The Radiation Safety Office must be notified immediately of any accidents involving:

1. Possible body contamination of personnel.
2. Ingestion of radioactivity by personnel.
3. Over-exposure of personnel to radiation.
4. Severe contamination of equipment.
5. Spread of, or difficulty in cleaning a contaminated area.
6. In the event of the loss of radioactive materials or machines.
7. Sealed source rupture or spill involving radioactive powder, volatile liquid, or gas.
8. Major spills.*

SPECIAL INSTRUCTIONS:

Radioactive Liquid Spill -

The following procedures will be followed, unless the radioactive liquid is volatile, in which case use the procedure for "Airborne Contamination".

1. Minor Spills -

   a. Notify all persons in the room immediately.
   b. Permit only the minimum number of persons in the area necessary to deal with the spill.
   c. Confine the spill immediately.
   d. Put on protective gloves and drop absorbent paper on a liquid spill.
   e. Decontaminate, using a monitor to check the progress of the work.
   f. Monitor all persons involved in the spill and subsequent decontamination.

2. Major Spills -*

   a. Notify all persons not involved in the spill to leave the room at once.
   b. When feasible use reasonable effort to confine contamination.
   c. If the spill is on clothing, discard outer clothing at once.
   d. Vacate the room.
   e. Call the Radiation Safety Office for assistance.
   f. Take immediate steps to decontaminate involved personnel.

*For further assistance, contact the Radiation Safety Office, Ext. 2701.

EMERGENCY INSTRUCTIONS
(Posted in All Laboratories)
(Continued)

FOR AIRBORNE RADIOACTIVE CONTAMINATION:

Spill Involving Radioactive Powder, Gas, Volatile Liquid, or Sealed Source Rupture.

1. No immediate attempt should be made to clean up the spill.

2. All windows should be closed, fans and air-conditioners shut off or vents sealed, and everyone leave the room.

3. All persons leave the room to an area just outside the contaminated area where they should remain until assistance arrives.

4. All doors should be closed and locked.

5. Call the Radiation Safety Office for assistance, Extension 2701.

6. Doors and other openings leading into the room should be sealed with wide tape and heavy wrapping paper.

7. Restrict entrance to contaminated area or place a warning sign at each entrance.

8. To control the spread of radioactive contamination, potentially contaminated persons must remain near but outside the contaminated area until they have been monitored and decontaminated, if necessary. A person is considered contaminated until properly monitored.

For more complete instructions, contact the Radiation Safety Office, Ext. 2701.

EMERGENCY INSTRUCTIONS
(Nuclear Medicine Protocol Manual)

RADIATION - CONTAMINATION:

1. Purpose: To establish policy and procedures for handling radiation accidents within the hospital.

2. Procedures: IN ALL CASES, NOTIFY THE RADIATION SAFETY OFFICER PROMPTLY:

   a. Area Contamination:

      (1) Minor spills (e.g., single dose of radiopharmaceutical)

         (a) Notify nearby personnel to leave the area.

         (b) After donning proper protective attire, restrict spread of contamination.

         (c) Decontaminate area using approved procedures as directed by Radiation Safety Officer.

         (d) Monitor area and any involved personnel for residual contamination.

         (e) Leave contaminated clothing in room.

         (f) Notify supervisor.

      (2) Major spills (e.g., entire contents of generator elution, ^{131}I compounds, volatile compounds, sealed sources)

         (a) If spill is volatile, airborne, gaseous, or dust forming, call Extension 2889 immediately and request area ventilation be turned off at once. Give room number and location.

         (b) Notify nearby personnel to evacuate area.

         (c) Barricade area and place warning signs.

         (d) Remove contaminated clothing; leave in room where spill occurred.

         (e) Immediately notify supervisor as well as Radiation Safety Officer.

   b. Personal Contamination:

      (1) External:

         (a) Remove contaminated clothing; leave in room where contamination occurred.

(b) Wash contaminated skin areas with soap and water for two minutes. Monitor and repeat no more than three times if contamination persists.

(c) Notify supervisor.

(2) Contaminated Wounds:

(a) Immediately wash wound with stream of cold water.

(b) For very toxic materials, apply loose tourniquet.

(c) After notifying Radiation Safety Officer, report to Personnel Health Physician.

(3) Ingestion of Radioactivity:

(a) For large ingestions or ingestions of especially toxic materials, treat as for acute poisoning by inducing vomiting.

(b) Immediately notify Radiation Safety Officer and report to Personnel Health Physician.

(4) Inhalation of Radioactivity:

Immediately notify the Radiation Safety Officer and report to the Personnel Health Physician.

3. Unavailability of Radiation Safety Officer or His Designee:

In any situation where the Radiation Safety Officer or his designee is not available, contact the Chief, Nuclear Medicine Service, or another staff physician on that service.

4. Emergency Procedures:

Accidental release of xenon in designated rooms would pose no problem as they are negative pressure rooms with large capacity, non-recirculating exhaust ventilation systems. In the event of exhaust failure, Building Systems Emergency Service can by computer control shut off the normal ventilating operation in the contaminated area.

AREA SURVEY PROCEDURES

Each active user of radioactive material is required to do an area wipe test survey at least every month. A record of the results of this test is kept with a written copy sent to the Radiation Safety Office for review to insure compliance. The Radiation Safety Officer does unscheduled inspections of all radioisotope work areas at random intervals based on the lab's activity, possession limits, and hazardous materials used.

1. All elution, preparation, and injection areas will be surveyed weekly with an appropriate survey meter and wipe tests and decontaminated if necessary.

2. Laboratory areas where only small quantitites of radioactive material are used (less than 200 μCi) will be surveyed monthly.

3. Waste storage areas and all other laboratory areas will be surveyed monthly.

4. The weekly and monthly surveys will consist of:

   a. A measurement of radiation levels with a survey meter sufficiently sensitive to detect 0.1 mR/hr., and/or

   b. A series of wipe tests to measure contamination levels on areas as chosen by the RSO. The method for performing wipe tests will be sufficiently sensitive to detect 200 dpm per 100 cm^2 for the contaminant involved. Wipes of elution and preparation areas or other "high background" areas will be removed to a low background area for measurement.

5. A permanent record will be kept of all survey results, including negative results. The record will include:

   a. Location, date, and identification of equipment used, including the serial number and pertinent counting efficiencies.

   b. Name of person conducting the survey.

   c. Drawing of area surveyed, identifying relevant features such as active storage areas, active waste areas, etc.

   d. Measured exposure rates, keyed to location on the drawing (point out rates that require corrective action).

   e. Detected contamination levels, keyed to locations on drawing.

   f. Corrective action taken in the case of contamination or excessive exposure rates, reduced contamination levels or exposure rates after corrective action, and any appropriate comments.

6. Area will be cleaned if the contamination level exceeds 400 dpm/100 cm^2; or, if using survey meter, the detected radiation exceeds three times background.

THERAPEUTIC USE OF RADIOPHARMACEUTICALS

1. RADIATION SAFETY PROCEDURES DIRECTLY INVOLVED WITH CARE OF THERAPY PATIENTS:

Receipt of the radiopharmaceuticals will be handled in the same manner as are all radioactive shipments. Treatment dose will be assayed by our dose calibrator and results will be verified by the Nuclear Medicine physician before administration.

Before administering any therapeutic treatment, the Nuclear Medicine physician must alert the Nursing Service concerning the special measures that will be required (see Instruction to Nurses). A single room with toilet will be needed after the treatment. Arrangements will be made for the safe handling of the radioactive material.

a. ^{131}I therapy patients are assigned to a private room usually at the end of the nursing unit away from the main flow of staff and patients. The bed is moved to the center of the room, if necessary, as indicated by a survey of the patient, the patient's room, and the adjacent rooms with the therapy patient lying in his bed.

b. The room for the ^{131}I therapy patient is prepared by placing protective covering over areas likely to be in contact with the patient, floor, night stand, tray table, sink handles, toilet; rest room floors. Disposable trays, dishes, and utensils are used.

After the administration of therapeutic treatments, the Nuclear Medicine physician will make a detailed report in the patient's records. VA Form 10 1079 will be inserted into the patient's chart. The following labels or ones with similar information will be used.

Label for Cover of Patient's Chart

_____ HOSPITAL

PATIENT'S NAME_____ UNIT NUMBER_____

CAUTION

PATIENT CONTAINS RADIOACTIVE MATERIAL

DO NOT REMOVE THIS LABEL UNTIL

1) Radioactive material is removed from patient, or
2) Removal is authorized by Radiation Protection Supervisor (Ext._____).

VISITORS MUST CHECK WITH NURSING STATION BEFORE GOING TO PATIENT.

Date_____ Signature_____
RADIATION PROTECTION SUPERVISOR

09-484 Nuclear Associates, Carle Place, N.Y. Printed in U.S.A.

Lebels for Cover of Patient's Chart

_____ HOSPITAL

PATIENT'S NAME _____ UNIT NUMBER _____

CAUTION

RADIOACTIVE MATERIAL

PERMANENT IMPLANT OR INTERNAL DOSE

Radionuclide _____ mCi _____

Administered _____
(DATE)

Initial Exposure Rate at 1 Meter _____ mR/h

(SIGNATURE) _____

INSTRUCTIONS:

Patient must remain in hospital until _____
(DATE)

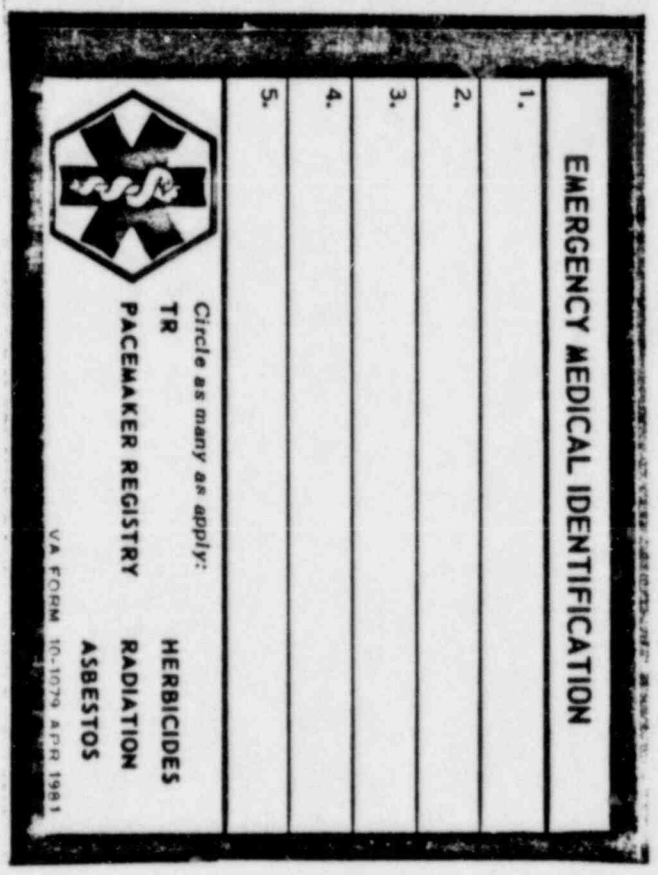
"Radioactivity Precautions" tag may be removed _____
(DATE)

The Radiation Protection Office (Ext. _____) must be notified before discharge or removal of patient.

For further information call Radiation Protection Office. In case of an emergency, the telephone operator has a call list for use when the Radiation Protection Office is not oper.

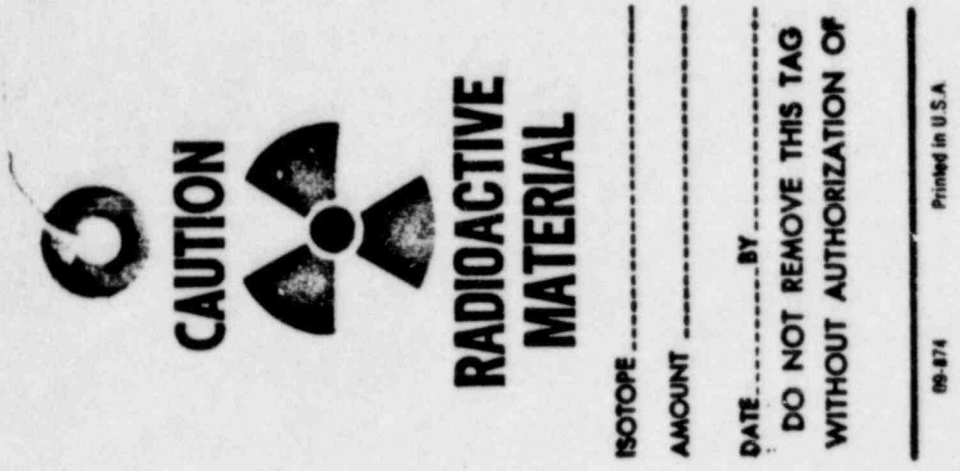
Date _____ Signature _____
RADIATION PROTECTION SUPERVISOR

09-488 Nuclear Associates, Carle Place, N.Y. Printed in U.S.A.



The wrist badge warning attached to the patient will consist of both medical alert sign and warning on radioactivity. The bed card warning sign will also be installed.

Bed Card Warning Sign



Nuclear Medicine Service shall immediately survey exposure rate at the patient's bedside, three feet away, and ten feet away (or entrance of the room).

Prior to the release of the patient, permission must be obtained from the Nuclear Medicine Service. The forms, "Radiation Safety Check List for Discharged Patients Containing Radionuclides" and "Instructions for Family of Released Patient" will be completed. One copy will be given to the patient and one copy be placed in the patient's record. These will be prescribed according to NCRP Report #37 "Precautions in the Management of Patients Who Have Received Therapeutic Amounts of Radionuclides". Before releasing the patient or room, contamination will be checked for.

The attending physician will review the clinical chart prior to referral of the patient to pathology, mortuary, or surgery. He will place the emergency symbol (VA Form 10-1079) on top of the record folder so that it will be seen instantly. Surgery will proceed with the same precautions as outlined in "Safe Handling of Radioactive Cadavers". In all cases, Nuclear Medicine Service must be contacted for special instructions.

2. NURSING INSTRUCTIONS FOR PATIENTS TREATED WITH IODINE-131:

   a. A single room, with toilet and with warning sing on door ("Radioactive, Caution"), will be needed after therapy treatment.

   b. Heed special instructions given by Nuclear Medicine Service.

   c. Ward personnel should limit close contact with patient. Working three feet or more from patient and for short periods of time will minimize possible radiation hazard.

d. If patient is unable to care for himself, then waterproof gowns and gloves must be worn by personnel.

e. Visitors should stay at least six feet from patient. Persons under eighteen years of age or pregnant are not allowed.

f. Utensils, all disposable items, and waste material will be kept in the room until the Nuclear Medicine Service has monitored for contamination and issued instructions on disposal.

g. Isolate linen contaminated with urine or emesis in plastic bags in the patient's room. Record time if patient vomits.

h. Patient should use toilet, but must flush twice after use.

i. Do not release patient or room until approved by Nuclear Medicine Service. Room will be surveyed and reassigned only if free of contamination.

3. SAFE HANDLING OF RADIOACTIVE CADAVERS:

a. General:

If a patient dies shortly after receiving a large therapeutic dose of radioisotope, the handling of the body may pose problems of radiation exposure for the pathologist and for the embalmer. While members of these groups are rather rarely exposed to radioactivity, it is important for them to recognize the existence of this problem and to know how to meet it.

The patient who is radioactive will have VA Form 10-1079, the emergency medical identification symbol and label, within his clinical record folder and a small emergency medical identification label will have been inserted in the patient's plastic identification bracelet and on an additional label attached to the patient's bed card. Mortuary personnel should be alerted by the emergency medical identification label on the patient's plastic bracelet. This bracelet should be examined before any extensive handling of the body. In all cases, Nuclear Medicine Service should be contacted for special instructions.

b. General Precautions to be Followed:

(1) No special precautions are required for a cadaver containing less than 5 mCi of activity.

(2) Should the cadaver contain more than 5 mCi, autopsy should be done only with the advice of the Nuclear Medicine Service, and the "Report of Radioactivity to Funeral Director" should be filled out.

(3) If the activity is more than 5 mCi and less than 30 mCi, the body may be released for embalming only after consulting with the Nuclear Medicine Service.

(4) When the activity is greater than 30 mCi, the Nuclear Medicine Service will recommend precautions to the funeral director.

(5) Autopsy and embalming procedures shall follow those available from the Nuclear Medicine Service.

(6) In General:

(a) Film badges and gloves should be worn, if advised by the Nuclear Medicine Service.

(b) The body should be surveyed to establish maximum working times, need for working in relays, need for goggles, and/or double gloves (for intense beta emitters), and need for storage and disposal of highly active body fluids and organs.

(c) Following autopsy or embalming, instruments, clothing, and the room should be monitored. Contaminated laundry should be turned over to the Nuclear Medicine Service for storage for a suitable decay period before washing. Instruments should be soaked in detergent and rinsed in running water. Before instruments are re-used they are to be checked by the Nuclear Medicine Service. All radioactive liquid wastes should be flushed down the sewer.

(d) Special care should be taken to prevent contamination of autopsy room floor and the spread of contamination to other parts of the hospital.

(e) Any solid radioactive wastes should be saved for disposal in plastic bags. Consult with the Nuclear Medicine Service for handling of these items.

(f) In general, all body fluids should be flushed or aspirated directly into a sewer.

(g) If the pathologist/embalmer is injured during autopsy or embalming, work should be halted, gloves removed, and the wound flushed with running water. All wounds should be checked for residual contamination, with washing and checking repeated if necessary. Any injury should be immediately reported to the Nuclear Medicine Service.

(h) Survey instruments and personnel monitoring equipment will be provided by the Nuclear Medicine Service with instructions for use.

c. Special Precautions for Pathologists to Follow:

(1) ^{131}I in large amounts usually indicates thyroid therapy or thyroid cancer therapy. When an autopsy is performed on such a cadaver, it is advisable to remove iodine concentrating tissue first.

Dissections must be performed with long-handled forceps and scissors. The removed tissue should be stored in an out-of-the-way place, carefully labeled as to its origin, date, and approximate amount of radioisotope contained.

(2) ^{32}P administered will not exceed 5 mCi. Therefore, only the general precautions outlined above are necessary.

d. Special Precautions for Morticians to Follow:

(1) All patients who received therapeutic doses of radioisotopes within 60 days of death should be considered a possible hazard. If the Nuclear Medicine Service determines that radiation dose rate is less than 30 mR/hour at body surface, embalming can proceed. All body fluids removed should be transferred directly down a suitable sink drain, with no splashing or spillage. Embalming personnel should always wear rubber gloves and protective gowns when handling radioactive cadavers.

(2) Cremation presents no problem unless the body contains more than 30 mCi. If this is the case, it may be necessary to store the cadaver for a period of time prior to cremation.

(3) Always consult "Report of Radioactivity to Funeral Director" for possible additional instructions.

THE JERRY L. PETTIS MEMORIAL VETERANS MEDICAL CENTER

REPORT OF RADIOACTIVITY TO FUNERAL DIRECTOR

It is hereby certified that the body of _____

has been examined this date with the following result:

(CHECK ONE)

( ) The body contains less than 30 mCi of radioactive material and requires no special precautions if standard embalming procedures are employed.

( ) The body contains more than 30 mCi of radioactive material, and the following precautions are recommended:

_____

_____

_____

_____

_____

_____

Signed: _____

Title: _____

Date: _____

THE JERRY L. PETERS MEMORIAL VETERANS MEDICAL CENTER

INSTRUCTIONS FOR FAMILY OF RELEASED PATIENT

Name of Patient _____

Name of Hospital _____ Address _____ Tel. No. _____

For further information contact _____ Tel. No. _____

Please show this form to every physician consulted concerning the patient until _____ (date).

_____ was treated on _____, 19___ with _____

millicuries of _____ in the form of _____.

NO SPECIAL RADIATION SAFETY PRECAUTIONS ARE NECESSARY AFTER _____ (date)

Until that date:

Persons under 45 years of age should not remain closer than the following distances from the patient, for the time period indicated:

(a) _____ (date) to _____ (date)

Permissible distance _____ feet or more, for _____ hours per week.
(At other times, remain farther than 6 feet)

(b) _____ (date) to _____ (date)

Permissible distance _____ feet or more, for _____ hours per week.
(at other times, remain farther than 6 feet)

Note: During the above times brief periods of closer contact (for example, while shaking hands or kissing the patient) are permissible.

SPECIAL PRECAUTIONS:

(a) Spouse or other person caring for patient: _____

(b) Children or pregnant women: _____

(c) Sleeping arrangments: _____

IF THE PATIENT IS TO BE HOSPITALIZED, OR IF DEATH SHOULD OCCUR, NOTIFY THE FOLLOWING INDIVIDUALS IMMEDIATELY: _____

THE JERRY L. PETTIS MEMORIAL VETERANS MEDICAL CENTER

RADIATION SAFETY CHECK LIST FOR DISCHARGED PATIENTS

CONTAINING RADIONUCLIDES

Name of Patient: _____ Age: _____

Social Security Number: _____

Address; _____ Telephone Number: _____

Name of Person Interviewed: _____

Description of Dwelling: _____

In multifamily buildings, possible proximity of neighbors. _____

Household: Names, relationship, ages: _____

_____

Regular visitors to dwelling: _____

_____

Persons regularly visited by patient outside dwelling: _____

_____

Matters discussed:

_____ Handling extruded source

_____ Importance of separate beds

_____ Importance of distance

_____ Importance of special care in regard to young persons

_____ Procedure in case of hospitalization or death

Film badges issued: _____

Identification card, or wristband issued: _____

Date: _____ _____
Physician or Radiation Safety Office

RADIATION SAFETY OFFICE
Department of Nuclear Medicine
Loma Linda VA Hospital
Loma Linda, California 92357
Phone 714-825-7084 Ex.2701

Date_____

Hour_____

Radiation Monitoring Record

Patient's Name_____Hospital #_____Ward_____Room #_____

Radioactive Isotope_____ Activity_____mCi

Type of Isotope administration (implant) or (injection). Site of administration_____

Survey Instrument Used, Make_____ Model # _____

Map of area

Site and Radiation measurment

A. 1 meter from source/Patient_____

b. At the bed side _____

C. 2.5 MR/HR line _____Feet

D. entery way _____

E. next to wall outside of room
West _____mR/hr room #_____
East _____mR/hr room #_____

F. Center of adjacent Rooms

West _____mR/hr room #_____

East _____mR/hr room #_____

Monitoring Device (Film Badge) (Pocket Dose Chamber)

FOR NURSES----------TIME AT BEDSIDE PER SHIFT; _____ Minutes

FOR VISITORS-------- TIME PER DAY AT THE DOOR; _____ Minutes

Remarks:_____

SURVEYOR:_____

Radioisotope Monitoring Record

Loma Linda VA Hospital
Loma Linda, Calif. 92357

DATE_____

PATIENT'S Name_____ Hospital #_____

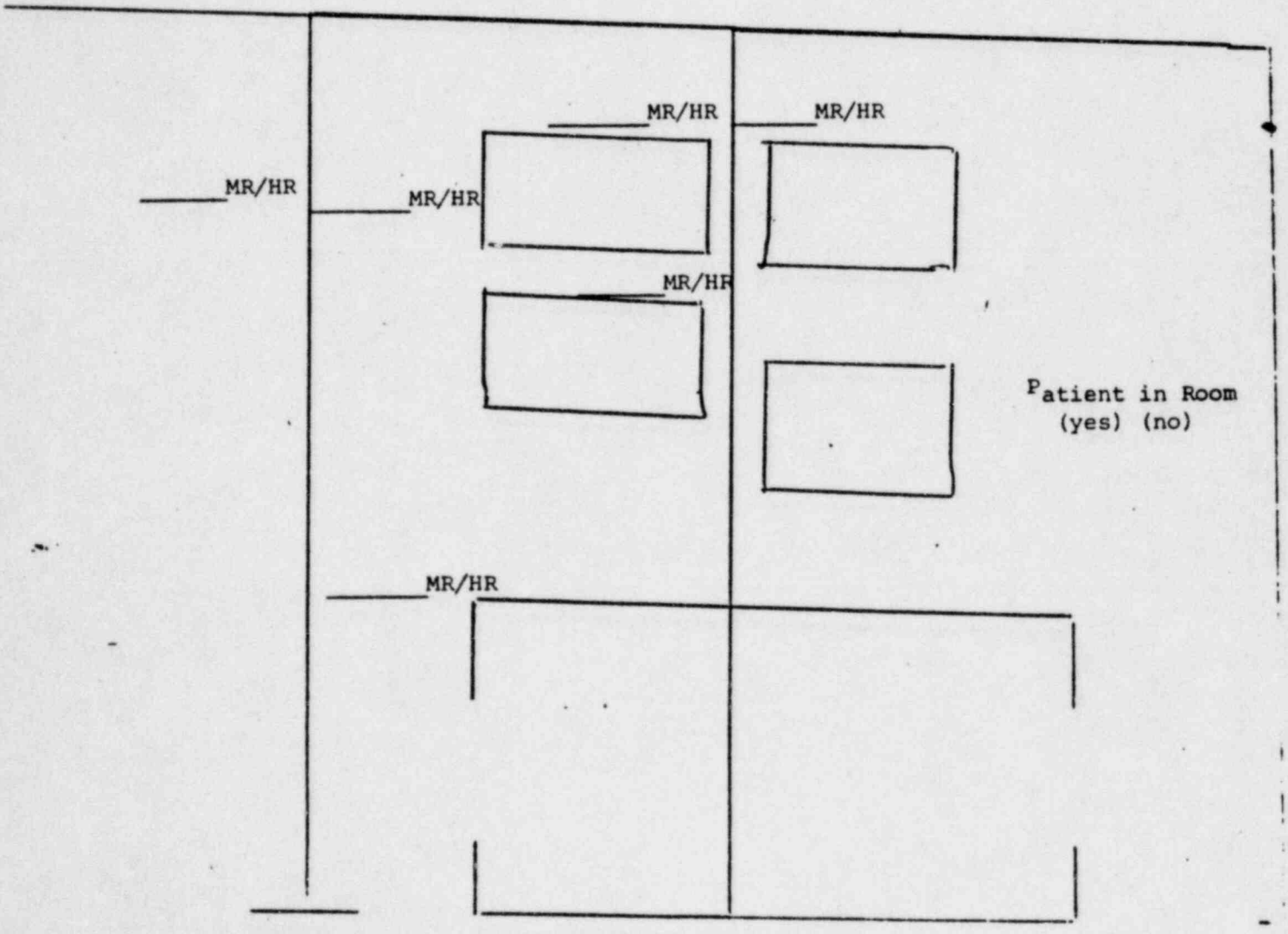
Location:_____ Hour_____

Isotope Used:_____ Activity:_____(mCi)

Type of Isotope Used, (implant) (injection)

Survey Instrument used: Make_____ Model #_____ Surveyor:_____

Instructions: NO PREGNANT NURSES



4. GENERAL CARE OF PATIENTS RECEIVING THERAPEUTIC DOSES OF RADIOACTIVE MATERIALS:

a. Purpose:

(1) To provide safe and effective nursing care for the patient.
(2) To inform nursing personnel of the safe limits of exposure which are recommended by the Radiation Safety Office.
(3) To assist the doctor in the uses of radioactive material.

b. Types of Therapy:

Therapy with solutions of radioactive iodine and phosphorus.

c. Radiation Facts:

(1) Good nursing care should not be abrogated because a patient is treated with a radioactive material.
(2) Safe limits of exposure and safe working time for personnel in the vicinity of the patient are determined by the Radiation Safety Office. These limits mean that an individual receiving up to that amount of radiation would not be expected to experience harmful results to the body.
(3) There is justification for concern about radiation and its effects on the human body and reproductive organs. However, by following the precautions of the safety rules established by the Radiation Safety Office, the possibility of serious threat to personal health or progeny will be minimized.

d. Standing Orders-Preparation and Procedures:

(1) Mental Preparation:

(a) The doctor will inform the patient of:

(i) The purpose, effects to expect, and mode of administration.
(ii) The necessity for limited nursing care during the treatment, and the activities a patient can perform for himself.

(b) It is the responsibility of the nurse to obtain adequate knowledge in order to answer questions about visitors and about doctor's instructions. She must be able to allay the patient's fears about the treatment he is receiving.

e. Physical Preparation:

(1) The nursing unit is notified when a patient is being admitted for radiation therapy.
(2) A single room away from the main flow of traffic, at the end of the corridor, for example, is to be selected.
(3) Orders will be written by the doctor as to medications and withholding diet before treatment.
(4) It is the responsibility of the doctor on Nuclear Medicine or the Radiation Oncology staff to obtain written permission from the patient or nearest relative for the treatment.

(5) Prepare room for return of patient.

(a) Place bed away from the wall adjoining the next room.
(b) When a patient is to receive phosphorus-32 of iodine-131, place a plastic sheet on the bed in an appropriate area to protect the mattress from drainage.
(c) Place the bedside table, and all necessary equipment, so that the patient may reach them easily. (Including emesis basin and bedpan.)
(d) The Radiation Safety Office will recommend or provide a container for contaminated linen. After linen has been monitored and considered safe, it may be placed with other soiled lined.

(6) Special cards and signs.

(a) A sign provided by the Radiation Safety Office will be placed on the door of the patient's room to indicate that he is receiving radioisotope therapy. The purpose of this card is to prevent other patients and visitors from entering the room.
(b) A special bedside safety card must accompany the patient as long as there is any hazard from the radioactive material.
(c) Should the patient die during therapy, the bedside tag is to be placed around his ankle and the Radiation Safety Office notified immediately (Ext. 2701 or after hours, call the hospital operator and have the Radiation Safety Officer called at home).

(7) Patient care and instruction.

(a) Because only limited care can be given the patient, it is most important that personnel work toward preventing a feeling of neglect and isolation by the patient. Someone should be assigned to go to the patient's door, or to the limit of the safety zone, at least once every one to two hours, if only to speak to the patient.
(b) RUBBER GLOVES WILL BE WORN BY ALL PERSONS HANDLING THE PATIENT, linen, utensils, etc. Also for handling urine, sputum, feces, and dressings. They are to be washed and dried thoroughly before being removed.

(8) Waste disposal.
(a) Dressings soiled with drainage should be carefully placed in a plastic bag. The bag is to be retained in the patient's room for the Radiation Safety personnel to monitor.
(b) Triple flush bedpan and sterilize after each use if pan is reuseable. All utensils should be disposible and should be held for monitoring by the Radiation Safety Office personnel.

(9) Day calls.

Nuclear Medicine . . . 2669
Radiation Safety . . . 2701 or Pager 383
After regular duty horus: call the hospital operator and ask her to call the Radiation Safety Officer on call.

5. RADIATION SAFETY PROCEDURES INVOLVED WITH ALL OTHER ASPECTS OF THERAPY PROCEDURES:

a. Radioisotope hoods with a flow rate of 800 cfm will be used whenever possible for the preparation of the therapy dose. Remote handling equipment is to be used as much as possible, and all work is to be done behind a lead L-Block. All precautions are to be taken to lessen the possibility of contamination (absorbent paper is to be used on the surfaces).

b. Bioassay of Nuclear Medicine personnel is not done routinely as the number of ^{131}I therapy patients is approximately four per year, and the exposure to the dose and the patient is very limited. However, we are equipped to do thyroid scanning on iodine exposed personnel. Bioassay is currently done at the request of the individual or the Nuclear Medicine physicians.

c. Surveys are done of the administration tray of each therapy dose to insure no contamination occurs. If contamination does occur, the absorbent paper (plastic backed) is removed to radioactive waste and a new covering applied. Should contamination be found on a non-protected area, that area is corded off and decontaminated with decontamination solution. It is then resurveyed. If the decontamination attempts fail to produce the desired results, the area is shielded with lead sheeting or the room closed for decay, depending upon the size of the area involved and the need to use the area and the difficulty in controlling the radiation level.

WASTE DISPOSAL

All radioactive wastes are disposed through the Radiation Safety Officer (RSO) or with specific permission from the RSO.

SHORT HALF-LIFE MATERIALS:

1. Short half-life materials are held for decay in storage (Room 1B-43) then disposed of as biohazardous wastes (syringe needles) or normal trash.

2. $^{99}Mo/^{99m}Tc$ generators will be held for decay until the radiation levels as measured by a low level survey meter in a low-background area with all shielding removed have reached background levels. All labels will be removed or obliterated before disposal as normal trash.

LONG HALF-LIFE MATERIALS:

1. Solids are packaged to DOT specifications for transport and burial at a nuclear waste site.

2. Liquids are solidified in cement and disposed of as solids as in Para. 1.

3. Liquid scintilation vials are packaged to DOT specifications for transport and burial at a nuclear waste site unless the sole isotope contained is ^{14}C or ^{3}H of a quantity which has been deregulated by NRC. These then are disposed of as toxic waste in accordance with state regulations.

4. Animal carcasses will be packaged to DOT specifications and disposed of at a nuclear waste site.

SEWER SYSTEM:

No user other than the Radiation Safety Officer will dispose of any radioactive material in the sewer system. All sewer disposals by the RSO will be in accordance with 20:303 of 10 CFR, Part 20.

RELEASE TO THE AIR:

All release to the air must have RSO authorization to insure conformance with 10 CFR, Part 20.106 limits.

WASTE SHIPMENT TO BURIAL SITES:

Transfer of radioactive waste to burial sites is done by Thomas Gray and Associates licensed under California State License #2105-30.

ATTACHMENT B

APPLICATION FOR ROUTINE MEDICAL USE OF RADIOACTIVE MATERIAL
FOR RADIATION THERAPY AT THE
VETERANS ADMINISTRATION HOSPITAL
LOMA LINDA, CALIFORNIA

1. Proposed users of radioactive materials for internal administration, therapy, and brachytherapy: (All four are from the Department of Radiation Oncology at the Loma Linda University Medical Center.)

   a. David Mantik, M.D., Ph.D.

   b. James Slater, M.D.

   c. Orval Swarm, M.D.

   d. William Spanos, M.D.

2. Technicians:

   a. Ralph Thomas (see Attachment XII).

   b. Dan Lee (see Attachment XIII).

   See Attachment XI for the Training and Experience Form for each of the above-named.

3. Radioisotopes and forms to be used:

Cesium 137	Needles/tubes	Interstitial & Intracavitary	As prescribed
Cobalt 60	Needles/tubes	Interstitial & Intracavitary	As prescribed
Gold 198	Seeds	Interstitial	As prescribed
Iridum 192	Seeds in ribbon	Interstitial & Intracavitary	As prescribed
Radium 226	Needles/tubes	Interstitial & Intracavitary	As prescribed
Radon 222	Seeds	Interstitial	As prescribed
Strontium 90	Applicator	Ophthalmic	As prescribed
Iodine 125	Seeds	Interstitial	As prescribed

4. Radioisotope sources for brachytherapy will be stored and handled in 1B-43.

   a. Principal use of room in which sources will be stored is receipt and distribution of radioactive sources and waste.

   b. All radioisotopes and radioactive supplies will be stored in appropriate lead-lined cabinet, SM-80½.

   c. Distance from stored sources to nearest occupied area is 10 feet.

   d. Maximum dose rate which will be permitted in occupied area is 2 mR/hour or 100 mR/week.

   e. The storage area will be locked or supervised at all times.

f. All materials will be shielded for transport with 1"-2" lead as appropriate.

g. Applicators will be returned promptly to shielded storage after use.

ATTACHMENT I
Questions from NRC Application for Amendment

Item 20 Therapeutic Use of Sealed Sources. Describe special procedures for patients treated with byproduct materials listed in Group VI on Schedule A, §35.100 of 10 CFR Part 35. These procedures[11] should include descriptions of:

a. The areas where sealed sources will be stored, including (1) placement and thickness of shielding, (2) proximity of the storage area to unrestricted areas, and (3) any calculations or measurement data used to check the adequacy of the shielding and other facility protection specifications. Radiation levels in unrestricted areas must be less than 2 millirems in any 1 hour and less than 100 millirems in any 7 consecutive days (see paragraphs 20.105(b)(1) and (b)(2) of 10 CFR Part 20).

b. Special precautions to be used while handling sealed sources.

c. Your method for determining the radiation doses to the extremities of personnel handling sealed sources.

d. The equipment and shielding available for transporting sources from storage sites to the place of use.

e. Your method for maintaining source accountability at all times. This should include a description of sign-in and sign-out procedures, periodic inventory, and the method for determining that all sources are accounted for and returned to storage immediately following the conclusion of treatment.

f. Surveys to be performed during the course of treatment and at the conclusion of treatment. The patient and room should be surveyed with a radiation survey instrument immediately following the conclusion of treatment and before the patient is discharged. This survey should include a source count and should be adequate to determine that all temporary implant sources have been removed from the patient and from all areas that the patient occupied.

g. Special instructions for nursing care of patients who are treated with sealed sources. (Appendix L to this guide contains a description of procedures to be followed for patients treated with sealed sources.)

Submit detailed responses to Item Nos. 20a through 20f. In response to Item 20g, indicate, by checking the appropriate box in Item 20, that the procedures described in Appendix L will be followed, or submit equivalent procedures.

ATTACHMENT II

(Responses to Questions in Attachment I)

a. Storage at the VA will be in Room 1B-43. See Attachment III. Typically, the leaded containers will have approximately 1½" of lead for Ir-192, Au-198, and Ra-226, and 1 mm of lead for I-125. Additional shielding utilizing lead bricks may be required for long-term storage.

b. Special precautions to be used while handling the sealed sources: All sources must be handled with remote devices such as tweezers. Any procedures involving lengthy handling of the sources should be done behind an L Block for Ir-192, Au-198, and Ra-226, and behind leaded glass or its equivalent for I-125. A careful record will be kept of each source inserted and, if appropriate, removed from a patient. All sources shall be accounted for before a patient leaves the hospital unless they are part of a permanent implant. For a suggested handling procedure, see Attachment VI.

c. The dose rate from I-125 is such that we do not feel it necessary to monitor during implantation procedures. However, the Ir-192, Au-198, and Ra-226 would be monitored using finger badges during implantation. At other times this should not be necessary.

d. Transportation devices will fall into three categories requiring the following carriers:

   1. Ra-226 can utilize a carrier similar to that shown in Attachment IV. Ra-226 would use both the Heyman and Ernst carriers transported by the wheeled car.

   2. Ir-192 will require a transport device similar to that shown in Attachment V. Since this kind of device is also the shipping container, nothing needs to be purchased.

   3. I-125 would be transported in lead sheeting of at least .25 mm Pb. In addition, a portable shield should be available to the physicians during implants similar to that shown in Attachment VIII.

e. This proposal deals with I-125 and Au-198 which are permanent implants; Ir-192 which is used only once and then discarded; and Ra-226, a temporary implant. All sources except the Ra-226 will be purchased and stored at the VA, and Ra-226 will come from Loma Linda University Medical Center and return to it. Complete records will be required at the VA Radiation Safety Office including receipt, usage (the number of seeds used, the activity of each seed, the name of the patient and type of procedure involved), and appropriate disposition (disposal or return to LLUMC). For an example of such a log, see Attachment VII. Appropriate information should also be recorded on the chart of the specific patient.

f. There are two somewhat different situations involved with the use of I-125, Ir-192, Au-198, and Ra-226. Since the I-125 is a very low energy gamma emitter and is a permanent implant, the major consideration is accountability of sources during the implantation to be certain that sources are

not lost during this procedure. Therefore, surveys shall be conducted during and immediately following the procedure to determine whether a source might have been dropped inadvertantly. Surveys during the procedure should be made using a thin window GM. After implantation there is essentially no external hazard so no other surveys are required except that urine, feces, bed linen, and dressings should be checked before they leave the room so that any sources that might be excreted are found. All such checks should be performed using a GM detector. After the patient has left the room, a careful survey using the same detector should be performed to be certain that all of the sources have been removed from the room. Ir-192, Au-198, and Ra-226 are high-energy gamma emitters and, therefore, relatively easy to detect with a GM, scintillation detector, or ion chamber (cutie pie). When it is desirable to determine only the presence of a source, a GM or scintillation detector is quite suitable. If, however, it is the intention to measure exposure levels, then it is necessary to use an ion chamber (cutie pie) type of instrument. Exposure measurements would be taken during the implantation and immediately after the patient is placed in his or her room to measure or confirm existing radiation levels so as to ascertain the degree of radiation hazard to personnel caring for the patient and others. And finally, check the patient and room to be certain that temporary transplants have been removed from the patient and that no sources remain in the room after the treatment is completed.

g. For nursing instructions see Appendix L of Regulatory Guide, 10.8. (Attachment IX.) Nursing and other personnel will be alerted to the presence of therapy sources by:

1. A patient wrist label (½" x ½" radioactive material label).

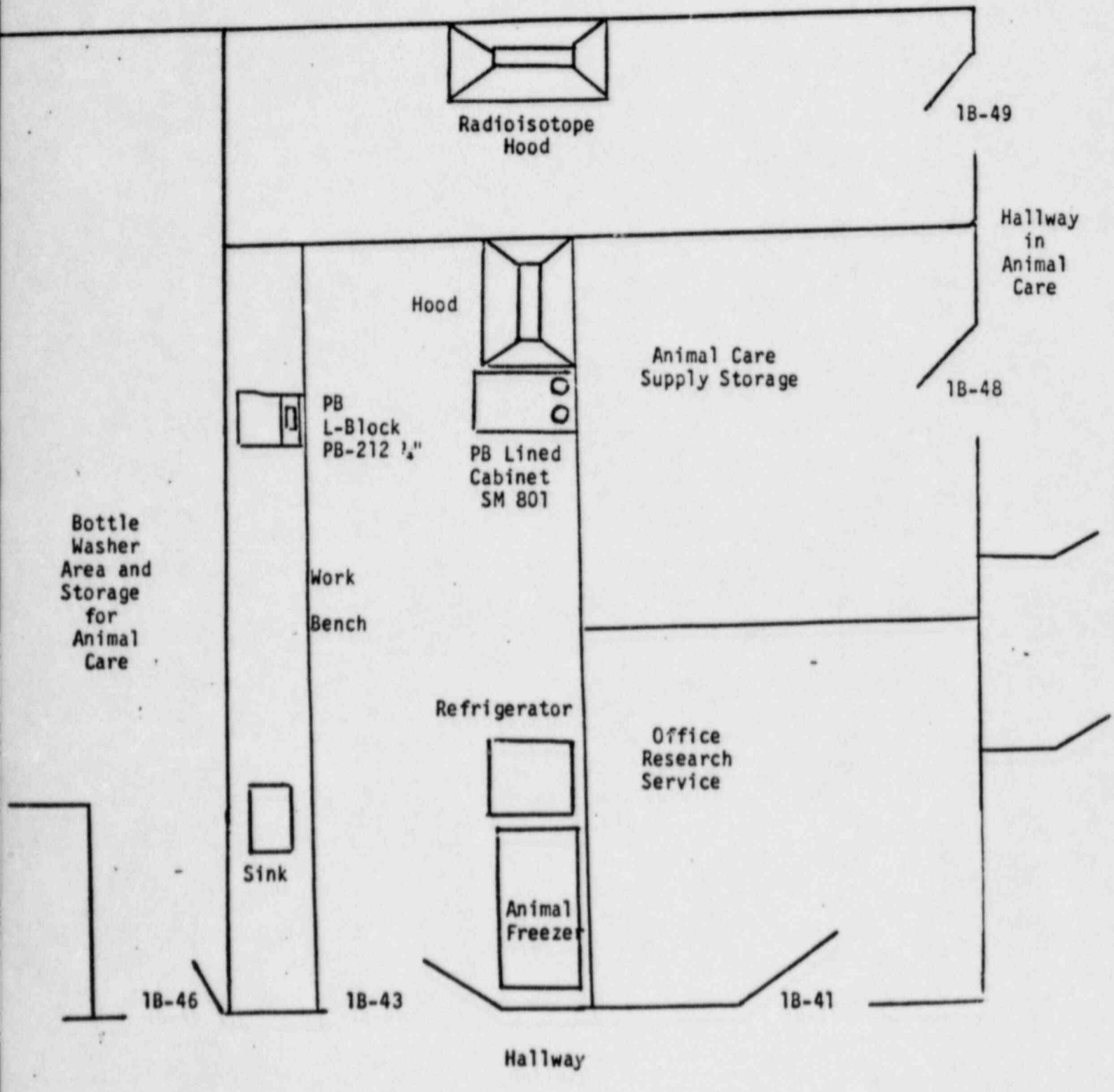
2. Chart (1" x 3" radioactive material sign).

3. Room door sign (4" x 4" radioactive material sign).

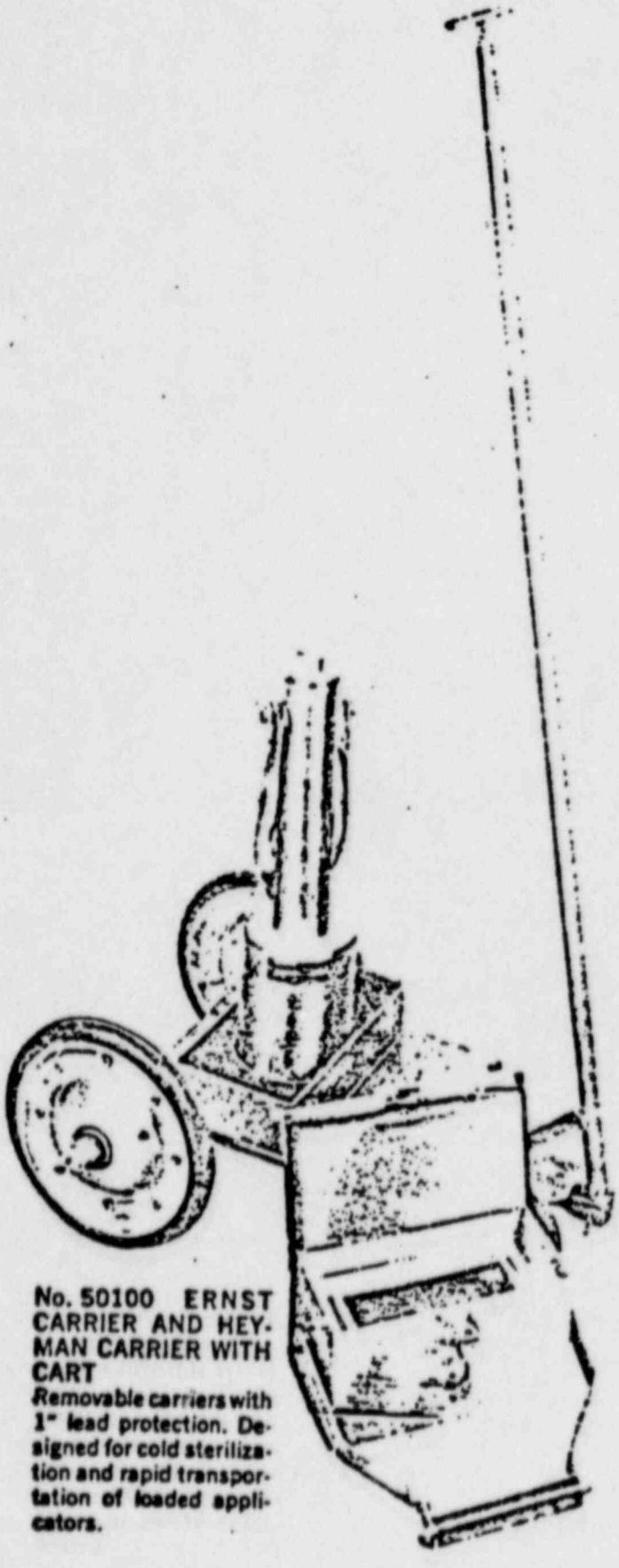
4. Patient's bed sign (4" x 4" radioactive material sign).

ATTACHMENT III

Drawing of 1B-43 radioisotope receiving, waste storage, and proposed therapy sealed source storage room and surrounding rooms.



ATTACHMENT IV



No. 50100 ERNST CARRIER AND HEYMAN CARRIER WITH CART

Removable carriers with 1" lead protection. Designed for cold sterilization and rapid transportation of loaded applicators.

ATTACHMENT V

Alpha-Omega Services, Inc.

NUCLEAR • MEDICAL • INDUSTRIAL • HEALTH SERVICES

TO UNPACKAGE IRIDIUM-192 CONTAINER

Open top flap of box (1) by removing staples carefully to preserve box for return shipment.

Lift assembly by grasping "T" handle (8) and lift. The items which lift from the box are numbers (3) through (8), including item (6).

Place items removed from box on some support surface (approx. wt. 16 lbs.) and turn "T" handle (8) so it is in line with flap edges of item (6) and at 45° to slit in item (6).

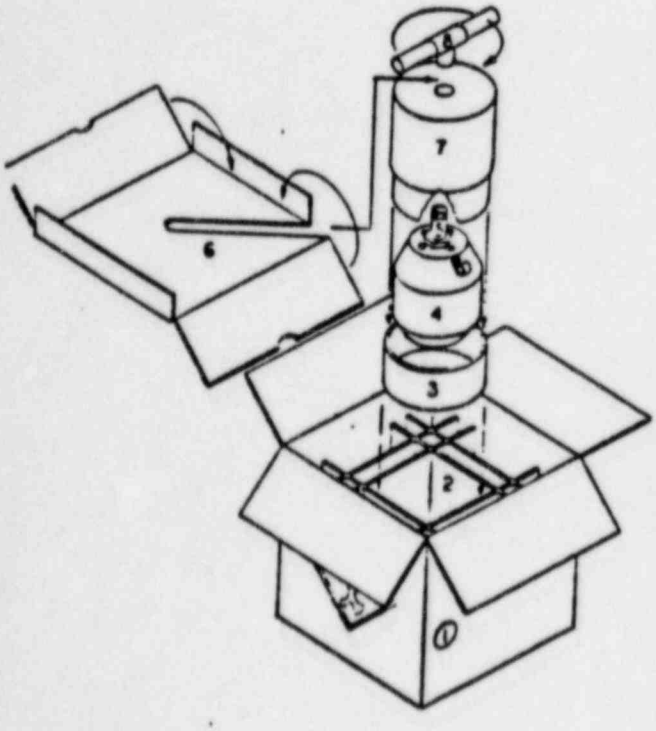
Lift and fold out two flaps of item (6). Slip the insert (item 6) off stem (5) and save for repackaging use.

Remove tape on joint of (7) and (3) then remove "T" handle (8) which is threaded to item (5) stem.

With "T" handle (8) removed, cover item (7) can be lifted off stem (5). Replace "T" handle (8) on stem (5) for ease in lifting pig (4) out of cup (3).

Lead container is now ready to transport to point of use.

Save all container materials and paper work as most items will be used to repackage used sources for return.



REPACKAGING FOR RETURN

Iridium-192 shipments include radiation yellow III labels, shippers certification, and address labels when they leave our lab.

If container is being returned without any radioactive material, obliterate the yellow III labels affixed for outbound shipment (spray paint is recommended). Repackage, omitting seed loading details and radioactive labels.

For radioactive shipments, follow the printed instructions for return and repackage as follows:

Seeds are placed in central cavity (under "T" handle) by holding ribbons with long forceps and snipping lengths which fit into cavity, approx. 4 seeds. See Drawing B. (Note wooden "T" handle may be used to push ribbons with seeds down into cavity).

With Iridium-192 seed ribbons in lead container, "T" handle and stem assembly are threaded into cavity to close the opening.

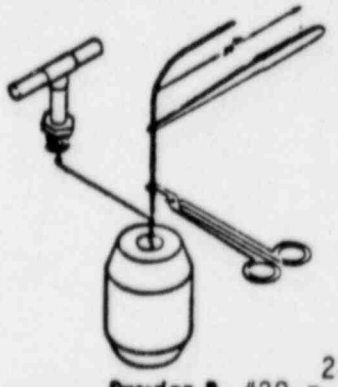
Place lead pig (4) into cup (3) and remove "T" handle (8) from stem (5) (hex portion of stem assembly may require holding with pliers or wrench to permit turning "T" handle (8) on stem (5)).

Place cover (7) over container and push down into cup (3). Replace "T" handle (8) and tape joint (7) and (3).

Insert (6) is slipped into place around stem (5) (between (7) and (8)). Then "T" handle major axis is aligned in direction of edges of item (6) so the flaps when folded in, will pass handle and come to rest flat and snug around the stem (5). Rotate "T" handle a few degrees.

All items (3) through (8) are lifted and placed into box (1) positioned by insert (2).

Close box flaps and tape container closed. Affix all labels, shippers, certification and address labels per instructions, and call freight lines.



Drawing B

2-17-83
#20 p. 8

16220 GUNDRY AVENUE • PARAMOUNT, CALIFORNIA 90723 • (213) 630-4221

Alpha-Omega Services, Inc.

NUCLEAR • MEDICAL • INDUSTRIAL • HEALTH SERVICES

MEMORANDUM:

Our shipping container has been designed to fill several needs.

1. Adequate shielding for protection while carrying.
2. Light weight for ease of carrying.
3. Coiled location of radioactive material to reduce radiation exposure at handle.
4. Center cavity for placement of sources for return shipment.
5. Handle shaped for compaction of used ribbons in center cavity.
6. NOTE: This container may be left in patient's room for storage of ribbon or seed in the event a ribbon is accidently removed. Attendent personnel should be instructed to place ribbon in center cavity and not use the shipment tubes.

16220 GUNDRY AVENUE • PARAMOUNT, CALIFORNIA 90723 • (213) 630-4221

ATTACHMENT VI

Instructions for radium and radioactive isotope use.

A. Routine Use

General:

1. Use long tongs or remote devices when handling sources.
2. Perform all source manipulations behind L block.
3. Record all source transactions in log book.
4. When transporting sources to or from areas of use, place them in the shielded transport devices provided.*
5. Place Radiation Warning Signs and instructions with name, date, type and amount of radioactive material:
   a. on patient's wrist: Radioactive Material Label (½" x ½")
   b. On front of patient's chart: Radioactive Material Label (1" x 3" tape)
   c. In patient's chart: Precautions
   d. On room door: Radioactive Material Sign (4" x 4" sign) & precautions
   e. On patient's bed: Radioactive Material Sign (4"x4" sign) & precautions
6. Chart insertion and removal times.
7. Monitor bed linen and dressings before releasing them to routine laundry or for disposal.**
8. Monitor patient, bed, and room before removing Radioactive Material Sign.**
9. Inventory will be taken each regular working day and recorded in log book by the source custodian.

Source Placement:

1. Staff physician or resident to arrange for a registered Radiation Therapy Technician or Physicist to assost with <u>all</u> placements.

2. The tech. or physicist is responsible for:
   a. preparing sources for transport (including logging out)
   b. transporting sources to patient and until sources are transferred to physician or resident.
   c. placing required signs and labels
   d. performing required surveys.

Source Removal:

1. Staff physician or resident to arrange for a registered radiation therapy tech. or physicist to assist with <u>all</u> removals.

2. The tech or physicist is responsible for:
   a. sources when they are transferred to him by physician or resident.
   b. transporting sources from patient to storage area.
   c. recording in log bood number of sources returned to the temporary storage safe.
   d. determining that number of sources returned to temporary storage is equal to the number of sources removed from safe
   e. performing required surveys
   f. removing signs

3. The source custodian will return sources to safe from temporary storage on t

B. Emergency Procedures

1. If source damage is suspected:

   a. Seal source in glass vial***.
   b. report to Radiation Safety Office, ext. 2701.

2. If source rupture is suspected or obvious:

   a. do not attempt to clean up.
   b. close air vents in ceiling.
   c. leave room and lock door but stay in immediate area outside room being certain that no unauthorized person enters room.
   d. ask person in surrounding area to notify Radiation Safety, ext. 2701 that help is needed at the radium room immediately.
   e. remain at door entrance until help arrives.

* Use: a. 4" x 4" lead block on wheels (for ovoid and tandem)
b. Small L block or hand carrier for Ra needling and Ta, Irseed, or I-125 seeds.

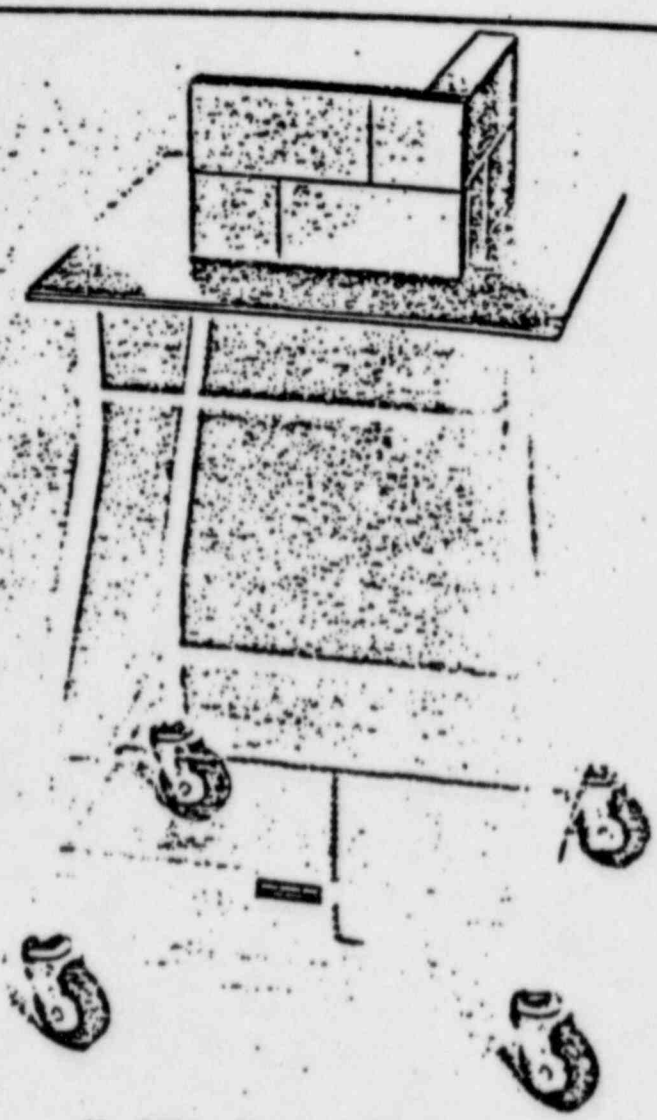
** A suitable monitor is kept with radium cart used for removal. Special monitors are available for I-125.

*** From emergency kit provided in radium room.

ATTACHMENT VIA

DATE	ISOTOPE	# OF SOURCES	ACTIVITY/ SOURCE(mCi)	TYPE OF SOURCE (needle,etc)	SUPPLIER	BY	PATIENT NAME & #	DATE IN	BY	# OF SOURCES	TYPE OF IMPLANT (perm/temp)	DATE OUT	BY	# OF SOURCES	DATE	BY

#20 p. 12 2-17-83



No. 6505 ROLLING STAND—
Steel table with 23" square stainless steel cover. Height 37"—base 27" square.

Pictured with

No. 708 LEAD BLOCKS 2" x 4" x 8"—weight 26 pounds
No. 704 LEAD BLOCKS 2" x 4" x 4" weight 13 pounds

ATTACHMENT IX

APPENDIX L

RADIATION SAFETY PROCEDURES FOR THERAPEUTIC USE OF SEALED SOURCES*

1. All patients treated with brachytherapy sources will be placed in a private room that has a toilet.

2. The patient's room will be properly posted or attended in accordance with §§ 20.203 or 20.204 of 10 CFR Part 20.

3. Surveys of the patient's room and surrounding areas will be conducted as soon as practicable after sources are implanted. Exposure rate measurements will be taken at 3 feet (or 1 m) from the patient with sources implanted, at the patient's bedside, at 3 feet (or 1 m) from the bed, and at the entrance to the room. The Radiation Safety Officer or his designee will then determine how long a person may remain at these positions and will post these times and the exposure rate at 3 feet (or 1 m) from the patient on the patient's chart.

4. Immediately after sources are implanted, the form "Nursing Instructions for Patients Treated with Brachytherapy Sources" will be completed and attached to the patient's chart.

5. Radiation levels in unrestricted areas will be maintained less than the limits specified in paragraphs 20.105(b)(1) and (b)(2) of 10 CFR Part 20.

6. Nurses caring for brachytherapy patients will be assigned film or TLD badges. TLD finger badges will also be assigned to nurses who must provide extended personal care to the patient. Pocket dosimeters may be assigned in addition to a film or TLD badge.

7. At the conclusion of treatment, a survey will be performed in accordance with paragraph 35.14(b)(5)(vii) of 10 CFR Part 35 to ensure that all sources other than permanent implants have been removed from the patient and that no sources remain in the patient's room or in any other area occupied by the patient. At the same time, all radiation signs will be removed and all film and TLD badges assigned to nurses will be collected. If the patient is to be discharged, the final survey will also include a notation on the patient's chart that the activity remaining in the patient meets conditions for release from the hospital.

8. Instructions to Nurses

   a. Special restrictions may be noted on the precaution sheet on the patient's chart. Nurses should read these instructions before administering to the patient. The Radiation Safety Officer should be contacted to answer any questions about the care of these patients in regard to radiation safety precautions.

   b. Nurses should spend only the minimum time necessary near a patient for routine nursing care. Obtain and wear a film or TLD badge or a pocket chamber as instructed by the Radiation Safety Officer.

   c. When a nurse is assigned to a therapy patient, a film or TLD badge should be obtained immediately from the Radiation Safety Officer or his designee. The badge shall be worn only by the nurse to whom it is issued and shall not be exchanged among nurses.

   d. Pregnant nurses should not be assigned to the personal care of these patients.

   e. Never touch needles, capsules, or containers holding brachytherapy sources. If a source becomes dislodged, use long forceps and put it in the corner of the room or in the shielded container provided; contact Radiation Therapy, the Radiation Safety Officer, or the Nuclear Medicine Department at once.

   f. Bed bath given by the nurse should be omitted while the sources are in place.

   g. Perineal care is not given during gynecologic treatment; the perineal pad may be changed when necessary unless orders to the contrary have been written.

   h. Surgical dressings and bandages used to cover the area of needle insertion may be changed only by the attending physician or radiologist and MAY NOT BE DISCARDED until directed by the radiologist. Dressings should be kept in a basin until checked by the Radiation Safety Officer or his designee.

      Special orders will be written for oral hygiene for patients with oral implants.

   i. No special precautions are needed for sputum, urine, vomitus, stools, dishes, instruments, or utensils unless specifically ordered, but these items should be saved for a check with a radiation survey meter to ensure that no sources have been inadvertently displaced into them.

* Be sure to submit complete responses to Items 20e through 20f in addition to referencing procedures in Appendix L.

j. All bed linens must be checked with a radiation survey meter before being removed from the patient's room to ensure that no dislodged sources are inadvertently removed.

k. These patients must stay in bed unless orders to the contrary are written. In any event, patients will remain in their assigned rooms during the treatment period.

l. Visitors will be limited to those 18 years of age or over unless other instructions are noted on the precaution sheet on the patient's chart.

m. Visitors should sit at least 3 feet (or 1 m) from the patient and should remain no longer than the time specified on the form posted on the patient's door and on his chart.

n. No nurse, visitor, or attendant who is pregnant should be permitted in the room of a patient while brachytherapy sources are implanted in the patient. Female visitors should be asked whether they are pregnant.

o. Emergency Procedures

(1) If an implanted source becomes loose or separated from the patient, or

(2) If the patient dies, or

(3) If the patient requires emergency surgery, immediately call _____

_____

Telephone No. (days) _____

(nights) _____

p. At the conclusion of treatment, call the Radiation Safety Officer to (1) survey the patient and room, (2) count the radiation sources to be sure that all temporary implants have been removed prior to discharging the patient, and (3) record a summary of the final survey results on the patient's chart. If any permanent implants are to remain in the patient, the Radiation Safety Officer will brief the patient on precautions for minimizing radiation exposure to others after discharge from the hospital.

NURSING INSTRUCTIONS FOR PATIENTS TREATED WITH BRACHYTHERAPY SOURCES

Patient's Name: _____

Room Number: _____ Physician's Name: _____

Isotope and Activity: _____

Date and Time of Administration: _____

Date and Time Sources Are To Be Removed: _____ Isotope: _____

Exposure Rates in mR/hr

Bedside	3 feet from bed	10 feet from bed

(Comply with all checked items.)

_____ 1. Wear film or TLD badge.

_____ 2. Wear pocket chambers for supplementary personnel monitoring of individual tasks.

_____ 3. Wear rubber gloves.

_____ 4. Tag the following objects and fill out the tag:

_____ door _____ chart

_____ bed _____ wrist

_____ 5. Place laundry in linen bag and save.

_____ 6. Housekeeping may not enter the room.

_____ 7. Visiting time permitted: _____

_____ 8. Visitors must remain _____ from patient.

_____ 9. Patient may not leave the room.

_____ 10. Patient may not have visitors.

_____ 11. Patient may not have pregnant visitors.

_____ 12. Patient may not have visitors under 18 years of age.

_____ 13. Patient must have a private room.

_____ 14. A dismissal survey must be performed before the patient is discharged.

_____ 15. All items must remain in the room until approved for disposal by the Radiation Safety Officer or his designee.

_____ 16. Contact the Radiation Safety Office when temporary sources (nonpermanent implants) are removed to perform a survey to be sure all sources are removed from the patient, to do a physical source count, and to be sure no sources remain in the room.

_____ 17. Contact the Radiation Safety Office when the patient is discharged to survey the room prior to its assignment to another patient.

_____ 18. Other instructions.

RSO

Name

On-duty/Off-duty Telephone Numbers

ATTACHMENT X

Patient Room Selection Criteria

As a general rule, patients receiving radiation therapy should be in private rooms or a room shared with another individual receiving radiation therapy.

Most radiation therapy patients other than those receiving I-125 therapy produce significant radiation levels in surrounding areas. Therefore, it is necessary to consider occupancy and distance from the therapy patient to the surrounding areas. The following principles should be followed when choosing a patient room:

Based on a brief review, rooms at the VA fall into three general categories of arrangement: (1) private with bath, (2) two-bed with bath, and (3) four-bed with bath. Since all rooms have private baths, all are satisfactory from that standpoint. The four-bed rooms are probably ideal for use since they are generally located on the outside corner of the building. However, it may be impractical to make use of a four-bed room for only one patient. Most of the one and two-bed rooms are arranged such that for adjacent rooms, the head of the bed in one room is adjacent to the head of the bed in the next. This in not ideal, but can be improved somewhat if the bed can be moved when possible so that the head of the bed is toward the outside window. The best choice seems to be the very few one-bed rooms that are arranged such that the head of one bed is adjacent to the foot of the bed in the adjacent room. This arrangement would be the most suitable.

On rare occasions, it may be necessary for a patient with a radioactive implant to be transferred to SICU. In that event, bed positions 1 and 10 are the best.

On occasions when implants are inserted in surgery and the patient needs to spend some time in the recovery room, the best location is at the north end of the recovery room, with space between adjacent patients. This should not present a serious problem, since the time of stay is short.

ATTACHMENT XI

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America,
the Section on Radiology of the American Medical Association
and the American Society of Therapeutic Radiologists
Hereby certifies that

William Joseph Spanos, Jr., M.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this eleventh day of June, 1977
Thereby demonstrating to the satisfaction of the Board
that he is qualified to practice the specialty of

Therapeutic Radiology

THE AMERICAN BOARD OF RADIOLOGY
INCORPORATED IN THE DISTRICT OF COLUMBIA
1934

Sidney W. Nelson
President

C. Allen Good
Secretary

#20 p. 20 2-17-83

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America,
the Section on Radiology of the American Medical Association
and the American Society of Therapeutic Radiologists
Hereby certifies that

David Wayne Mantik, M.D., Ph.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this seventh day of June, 1980
Thereby demonstrating to the satisfaction of the Board
that he is qualified to practice the specialty of

Therapeutic Radiology

AMERICAN BOARD OF RADIOLOGY
INCORPORATED IN THE DISTRICT OF COLUMBIA
1934

E. Richard Levy, President

C. Allen Good, Secretary

AMERICAN BOARD OF MEDICAL SPECIALTIES

#20 p. 21 2-17-83

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America
and the Section on Radiology of the American Medical Association
Hereby certifies that

Orval Jay Swarm, M.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this ninth day of June, 1973
Thereby demonstrating to the satisfaction of the Board
that he is qualified to practice the specialty of

Radiology

Ralph Reeves Leach
President

C. Allen Good
Secretary

#20 p. 22 2-17-83

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America
and the Section on Radiology of the American Medical Association
Hereby certifies that

Orval Jay Swarm, M.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this fourteenth day of December, 1974
Thereby demonstrating to the satisfaction of the Board
that he is qualified to practice the specialty of

Therapeutic Radiology

AMERICAN BOARD OF RADIOLOGY INCORPORATED IN THE DISTRICT OF Columbia

Robert N. Cooley
President

C. Allen Good
Secretary

AMERICAN BOARD OF MEDICAL SPECIALTIES EXCELLENCE

#20 p. 23 2-17-83

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America
and the Section on Radiology of the American Medical Association
Hereby certifies that

James Munro Slater, M.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this thirteenth day of December, 1968
Thereby demonstrating to the satisfaction of the Board
that he is qualified to practice the specialty of

Therapeutic Radiology

John A. Evans
President

[illegible]
Secretary

THE AMERICAN BOARD OF RADIOLOGY
INCORPORATED IN THE DISTRICT OF COLUMBIA
1934

ADVISORY BOARD
MEDICAL SPECIALTIES

LOMA-LINDA UNIVERSITY
LOMA LINDA, CALIFORNIA 92350

ATTACHMENT XII

RADIATION SAFETY OFFICE
(714) 796-7311 x 3272

STATEMENT OF TRAINING AND EXPERIENCE: GENERAL

(for human use submit the form, "Statement of Training and Experience: Human Use".)

1. Name of proposed user RALPH THOMAS

   Dept RADIATION ONCOLOGY ext. 5958

   Social Security No. 585-14-6328

2. Training:

   a. High School Graduate: (X)yes ( )no

   b. College or University: Name & Location LL University

      Years completed 3 Degree A.S. Course of Study RAD TECH.

   c. Education specifically applicable to use of radioactive material

3. Experience:

   a. List experience with radioactivity beginning with most recent

      (1) Dates: From June '78 to June '82

      Title and duties: Radiation Therapy Dosimetrist
      Radioactive Source Curator,

      Employer: LLUMC Address:

      (2) Dates: From _____ to _____

      Title and duties: _____

      _____

      Employer: _____ Address: _____

      (3) Dates: From _____ to _____

      Title and duties: _____

      _____

      Employer: _____ Address: _____

b. Radioactive materials previously used. Cite typical radioisotopes in appropriate box and key to Part 3, a, above.

Quantities Handled

	Microcuries	Millicuries	Curies	Kilocuries
Sealed sources	Ra 226 In 192	625 mCi 150-200 mCi		
Unsealed alpha sources				
Unsealed beta-gamma emitters				
Neutron sources				

(Co 60 I 125)

c. Indicate which types of facilities you have used and key to Part 3, a.

( ) Ordinary chemical laboratories

(X) "Controlled Area" (Type B) laboratories

( ) Glove boxes

( ) Shielded glove boxes

( ) Caves with remote manipulators

( ) Field operations with portable equipment

4. Certificate:

I hereby certify that all information contained in this Statement is true and correct.

Ralph W. Thomas
(signature)

2 June 82
(date)

LOMA-LINDA UNIVERSITY
LOMA LINDA, CALIFORNIA 92350

ATTACHMENT XIII

RADIATION SAFETY OFFICE
(714) 796-7311 x 3272

STATEMENT OF TRAINING AND EXPERIENCE: GENERAL

(for human use submit the form, "Statement of Training and Experience: Human Use".)

1. Name of proposed user Dan Lee

   Dept Radiation Oncology ext. 4378

   Social Security No. 567 94 1623

2. Training:

   a. High School Graduate: (X)yes ( )no

   b. College or University: Name & Location Loma Linda University

   Years completed 1972 / 1977 / 1979 Degree AS / BS / BS Course of Study Radiological Technology / Physicians Assistant

   c. Education specifically applicable to use of radioactive material
   Radiological Technology

3. Experience:

   a. List experience with radioactivity beginning with most recent

   (1) Dates: From 1972 to 1982

   Title and duties: Staff Technologist, Chief Technologist
   Dosimetrist, Instructor (Radiological Technology)

   Employer: Loma Linda U. Med. Ctr Address: Loma Linda

   (2) Dates: From _____ to _____

   Title and duties: _____

   _____

   Employer: _____ Address: _____

   (3) Dates: From _____ to _____

   Title and duties: _____

   _____

   Employer: _____ Address: _____

b. Radioactive materials previously used. Cite typical radioisotopes in appropriate box and key to Part 3, a, above.

Quantities Handled

	Microcuries	Millicuries	Curies	Kilocuries
Sealed sources		✓		
Unsealed alpha sources				
Unsealed beta-gamma emitters				
Neutron sources				

c. Indicate which types of facilities you have used and key to Part 3, a.

( ) Ordinary chemical laboratories

(X) "Controlled Area" (Type B) laboratories

( ) Glove boxes

( ) Shielded glove boxes

( ) Caves with remote manipulators

(X) Field operations with portable equipment

4. Certificate:

I hereby certify that all information contained in this Statement is true and correct.

Daniel Lee
(signature)

6-11-82
(date)

USE OF RADIOACTIVE GASES AND AEROSOLS
(Answers to Appendix M)

1. QUANTITIES TO BE USED:

   a. The number of studies expected per week are between three and five with an average activity per patient of either 3-5 ML of ^{99m}Tc DTPA or 10-20 ML of ^{133}Xe.

   b. Our possession limit for ^{99m}Tc should be 2000 mCi as this is only one of its many uses.

      The proposed possession limit for ^{137}Xe is 500 mCi.

2. USE AND STORAGE AREAS:

   The ^{133}Xe will be used and stored in Room 4E-28 in the radioisotope hood with a calibrated air flow of 800 cfm (see drawing).

3. PROCEDURES FOR ROUTINE USE:

   See attached.

4. EMERGENCY PROCEDURES:

   Because the area is under negative pressure, the isotope is stored in an isotope hood (dedicated out flow line with Hepa filter), and the ventilation studies are done directly in the opening in the hood, an accidental release can be controlled by closing the doors to 4E-28 - 4E-30. The ventilation system is such that it can handle the exhaustion of any accidental release.

5. AIR CONCENTRATIONS OF ^{133}Xe IN RESTRICTED AREAS:

   ^{133}Xe is stored in a fume hood so that leakages are vented through the hood. The exhaust from the rebreathing apparatus and collection systems are also vented through this hood.

   a. Assuming: Maximum activity/week (A) for 3-5 patients at 10 mCi/patient

      $A = 50 \text{ mCi} = 5 \times 10^4 \ \mu\text{Ci/wk}$

   b. Assuming a 20% loss rate (f)

   c. Measured airflow rate and volume of air available per week (V):
      Measured airflow rate = 705 ft 3/minutes. Restriction 10 CFR 20:103 requires $\frac{A}{V} \times f \leq 1 \times 10^{-5} \ \mu\text{Cu/ml}$. $V = \frac{A \times f}{1 \times 10^{-5} \ \mu\text{Ci/ml}} =$

      $\frac{5 \times 10^4 \ \mu\text{Ci/wk} \times .20}{1 \times 10^{-5} \ \mu\text{Ci/ml}} = 1.0 \times 10^9$ ml/wk The required vent rate =

      $\frac{1.0 \times 10^9 \text{ ml/wk}}{40 \text{ hr/wk}} \div \frac{1.7 \times 10^6 \text{ ml/hr}}{\text{ft 3/min}} = 14.7$ ft 3/min.

USE OF RADIOACTIVE GASES AND AEROSOLS
(Answers to Appendix M)
(Continued)

The actual flow rate (705 ft 3/min) far exceeds the required safety limit in 10 CFR 20:103.

6. AIR CONCENTRATIONS OF ^{133}Xe IN UNRESTRICTED AREAS:

a. 10 CFR 20:106 requires concentrations averaged over a period of one year shall not exceed 3×10^{-7} µCi/ml.

(1) Maximum amount ^{133}Xe released/year (A): Assuming all xenon is released through the hood including patient exhaust, collection bags, and leakage.

A = max. act./wk x 52 wks/yr
= 50 mCi/wk x 52 wks/yr
= 2600 mCi/yr = 2.6×10^6 µCi/yr

(2) Vent rate of exhaust system = 705 ft 3/min measured by

(3) Airflow/yr (V) = 705 ft 3/min x $1.49 \times 10^{10} \frac{\text{ml/yr}}{\text{ft 3/min}}$ =

1.05×10^{13} ml/yr

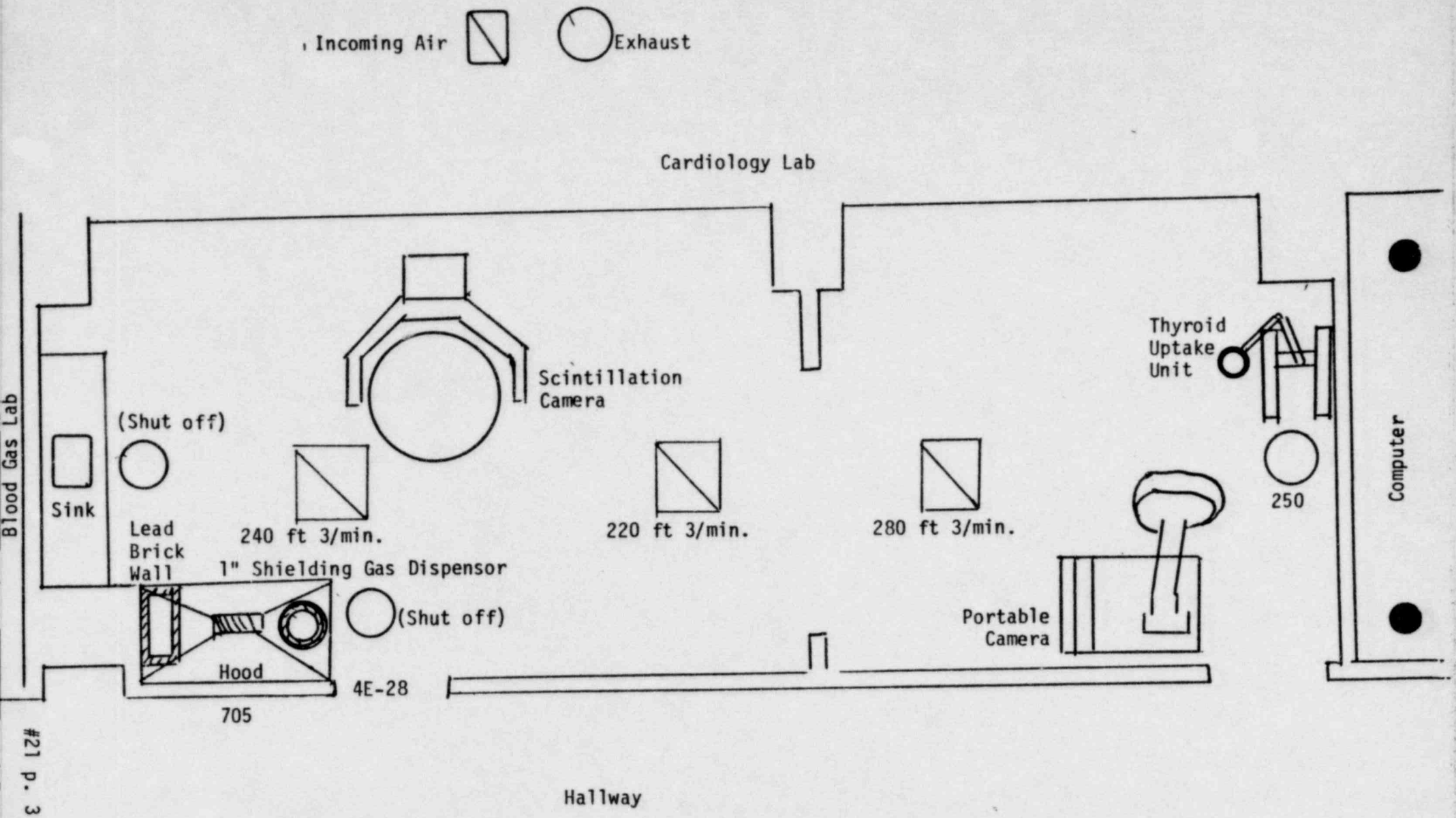
(4) Average concentration for unrestricted area (C):

$$C = \frac{A}{V} = \frac{5.2 \times 10^6 \text{ µCi/yr}}{1.05 \times 10^{13} \text{ ml/yr}} = 2.47 \times 10^{-7} \text{ µCi/ml}$$

C is less than the 10 CFR 20:106 restriction of 3×10^{-7} µCi/ml.

By interpolation, the maximum amount of ^{133}Xe that can be released per week without exceeding the average concentration of 3×10^{-7} µCi/ml for an exhaust rate of 705 ft 3/min is: 60.3 mCi. This requirement is met, since the maximum release of ^{133}Xe from our facility is 50 mCi.

b. Absorption of ^{133}Xe onto charcoal traps is not used at this facility.


Incoming Air
Exhaust
Cardiology Lab
Blood Gas Lab
Scintillation Camera
Thyroid Uptake Unit
(Shut off)
Sink
240 ft 3/min.
220 ft 3/min.
280 ft 3/min.
250
Computer
Lead Brick Wall
1" Shielding Gas Dispensor
(Shut off)
Portable Camera
Hood
4E-28
705
Hallway
Scale ¼" = 1'

#21 p. 3 2-17-83

ADMINISTRATION OF XENON-133

1. Attach noseclip and place mouthpiece so that its flared end is between the patient's lips and teeth and forming a tight air-seal.

2. Instruct the patient to exhale and then after turning the brown, T-shaped stopcock so that the arrow points toward the reservoir bags, to take a deep breath and hold it for the time required for a 100K image.

   The following images should be obtained:

Breath-holding	100K
Initial Rebreathing	100K
1, 2, 3-minute Rebreathing	100K

   Washout images every 30 seconds to three minutes
   (0-30, 30-60, 60-90, 90-120, 120-150, 150-180 seconds)

   An optimal ventilation study should consist of 11 images.

XENON VENTILATION PROTOCOL

The purpose of this procedure is to assess regional lung ventilation in acute (e.g., PE, asthma) or chronic (e.g., empnysema, CA, COPD) disorders. This assessment is obtained by evaluating the regional distribution of inhaled xenon gas.

Due to superior imaging resolution, decreased patient dose and technical superiority, xenon-127 is to be used when available, rather than xenon-133.

Prior to Administration:

1. Assemble apparatus as in photograph. Individual component parts are in labeled containers on the shelf.

2. Peak camera with xenon-127.

3. Explain procedure to patient. If the patient appears apprehensive regarding the procedure, have him go through a partial trial run without using radioactive material. (Don't tire him out practing the procedure!)

4. Open stopcock and fill one of the 3-liter bags with 100% oxygen through the extension tube coming from the carbon dioxide absorber. . Close stopcock.

5. Open stopcock and inject 10mCi ^{127} Xe-gas through the extension tube. Close stopcock.

6. Position patient in front of camera. (The staff physician will determine the desired view based on information from perfusion images.)

7. Sign on the computer, if necessary, and go into the acquisition menu. Obtain 100K technetium image, then switch to xenon window.

8. Still in the acquisition menu, type in the prefix VT for the predefined acquisition sequence for ventilation studies.

9. Obtain a 1-minute Compton image on the xenon peak. Hit "Control S" after acquisition is finished. The computer will automatically set up for the ventilation study. Hit "Control B" to start acquisition at the same time the patient begins to breathe xenon.

Administration:

1. Attach noseclip and place mouthpiece so that its flared end is between the patient's lips and teeth and forming a tight air-seal.

2. Instruct the patient to exhale. Then, after turning the brown, T-shaped stopcock so that the arrow points toward the reservoir bags, have the patient take a deep breath and hold it for 15 seconds. Start the computer ("Control B") when the patient begins to inhale. Image 1 will thus be produced on the computer.

3. The patient rebreathes for 3 minutes, which will be images 2 thru 13.

4. Turn stopcock up for washout, which lasts 1 minutes 45 seconds (images 14 thru 28). Type "Control S" to stop acquisition.

Note: The computer will be acquiring images every 15 seconds. The technologist must note the times to begin rebreathing and washout. If the patient is uncooperative, then the study may be shortened. To stop computer acquisition, hit "Control S" and the computer will stop at the finish of the frame it is acquiring.

Note also that 32 frames are available for acquisition. If washout needs to be lengthened, simply keep acquiring. The computer will automatically stop after frame #32.

Processing:

1. Use the predefined sequence for ventilation processing (VP) on the analysis menu for processing.

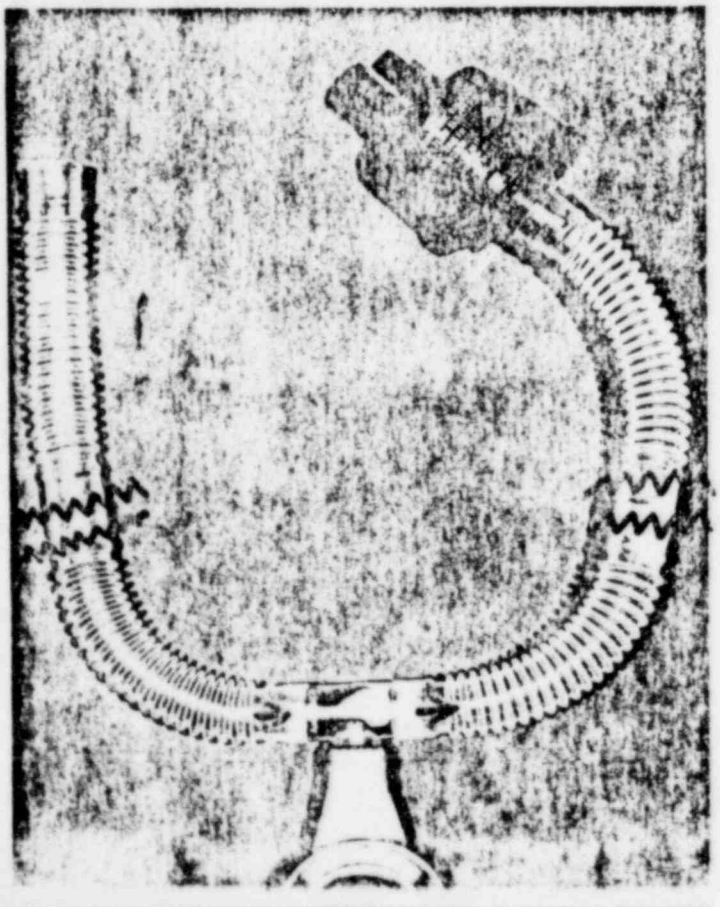
2. Images are taken off the Dunn camera, taking the perfusion study in the same view first, before using static image display (setting multiple views to four) for the ventilation study. Remove text for the pictures.

Views on the Dunn camera should be changed in the sequence 1, 2, 3, 4 to position the images correctly.

Assemble as in Photographs

Disposable Parts

After Each Patient



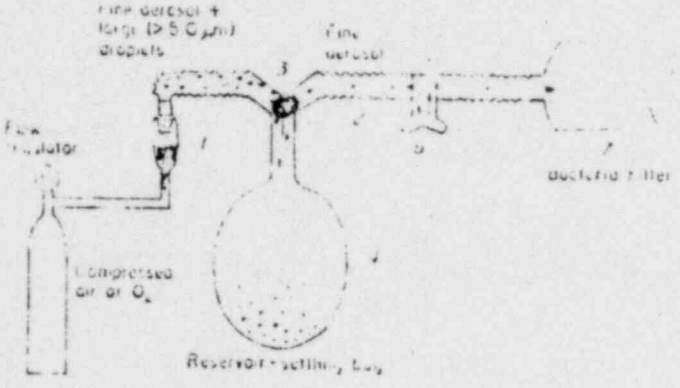
Monthly

Wednesday (2-23)
week of 17th

LOMA LINDA VA AEROSOL INHALATION APPARATUS AND PROCEDURE

(Dennis Elam, M.S. and Anil Bharne, M.D.)

DIAGRAM-ADMINISTRATION SYSTEM



LIST OF COMPONENTS

1) Positive Pressure Nebulizer (driven by compressed air or oxygen at a flow rate of 15 liters/minute). Includes internal baffle.

2) Disposable tubing.

3) One-way inlet valve.

4) Reservoir-Settling bag (removes aerosol droplets >2.0 μm by sedimentation, impaction and turbulance).

5) Two-way breathing valve.

6) Mouthpiece.

7) Bacteria Filter (traps any aerosol leaving the system from patient's exhaled air).

ADMINISTRATION PROCEDURE

1) Assemble system as shown in diagram and shield nebulizer behind 1/8 inch lead. Rinse the reservoir-settling bag (4) with 2 ML saline. (This wetting of the bag decreases the amount of aerosol that will stick to it.)

2) Explain the procedure to the patient.

3) Fill the nebulizer with high specific activity ^{99m}Tc-DTPA (10-20 mCi/ml, 2 ml total).

4) Clamp the tubing between the bag and the two-way breathing valve with a hemostat. (See (2) in diagram.)

5) Turn the O_2 on to a flow rate of 15 liters/minute and fill the bag with aerosol.

6) When the bag is full, turn the O_2 off.

7) Attach nose clip to patient. (Be certain that no air can pass in or out of his nose.)

8) Simultaneously, place the mouthpiece between the patient's lips and teeth and unclamp the hemostat.

9) Instruct the patient to relax and to breathe as normally as possible.

10) Inhale the patient until the count rate over the posterior chest is 3-5 times that after a perfusion image.

11) Turn O_2 back on any time the bag appears about ½ full. (Occasionally, the O_2 is left on throughout the inhalation procedure.)

If after explaining the procedure (Step 2) to the patient, he still seems apprehensive, run through the entire procedure using <u>saline</u> in the nebulizer instead of Tc-DTPA.

The extremely ill patient may need frequent interruptions during the inhalation procedure. <u>Interruptions after every 30 seconds of inhalation are quite possible without jeopardizing the quality of the examination</u>. (Be sure to turn O_2 off and clamp tubing with hemostat to prevent radioactive contamination.)

Aerosol Inhalation Equipment - California Suppliers

1. #1058 Raindrop Medication Nebulizer (50/case) — $24.00/case

   Medical Equipment Supply (213) 846-4343
   912 South Victory Boulevard
   Burbank, California 91502

2. #001529 Disposable Corrugated Flex Tubing (100' rolls) — $16.00/roll

   Tri-Anim Health Services (213) 247-9181
   1630 Flower
   Glendale, California

3. #225-2607-700 Ohio Universal Main Flow Bacteria Filter (10/box) — $25.20/box

   Livingston Medical Products (213) 595-1612
   6900 Aragon Circle
   Buena Park, California 90620

4. #1008 Disposable Noseclips (100/box) — $31.00/box

   Vacumed, Inc. (805) 644-7461
   2261 Palma Drive
   Ventura, California 93003

5. #1570 Aerotrach Unit (50/case) — $75.25/case

   Tri-Anim Health Services (213) 247-9181
   1630 Flower
   Glendale, California

6. #1464 Disposable T-Valves (10/box) — $20.00/box

   Vacumed, Inc. (805) 644-7461
   2261 Palma Drive
   Ventura, California 93003

7. #22241 Disposable Mouthpieces (10/pkg) — $26.50/pkg

   Calox, Inc. (213) 255-5175
   3034 Fierro Street
   Los Angeles, California 90065

8. DTPA - Unit Dose Kits (10 Units/kit) — $35.00/kit

   Union Carbide Corporation (800) 431-1146
   Clinical Diagnostic
   P.O. Box 324
   Tuxedo, New York 10987

PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL IN ANIMALS

A project using radioisotopes in animals is so noted by the Radiation Safety Committee when the applicant applies for use of radioactive material.

At that time, specific instructions are given in his project approval as to what precautions and procedures are to be followed during the animal's use.

These special instructions will depend on the isotope used, the proposed use, and foreseen hazards (will the body excreta be contaminated and if so, how; urine, aerosols, or contaminated bedding only).

The housing of the animal will be determined by the Animal Research Veterinarian as appropriate for the species and with the required safety precautions as prescribed by the Radiation Safety Committee, e.g., such as mice and rats to be housed in an isolated hood and all bedding will be collected for disposal by the Radiation Safety Office (see attached). Cages will be checked after use for contamination before being returned to normal service.

Specific instructions are given to the Animal Research facility staff for each specific Animal Research project using radioisotopes as they all differ as to the type of animals used, required care, along with the type and hazards of the different isotopes.

All animal rooms containing radioactive animals are access limited to persons participating in the project, if the hazards so dictate.

To: David Baylin / Mark Lundy Approv No.

Example of project approved using Avimals

RADIATION SAFETY OFFICE
JERRY L. PETTIS MEMORIAL VETERANS HOSPITAL
Loma Linda, CA 92357 Telephone 825-7084, Ext. 2701

APPROVAL FOR RADIOISOTOPE USE

Approval (from the standpoint of radiation safety) has been granted by the Hospital Radiation Safety Committee to your application dated 10-8-82. This approval is for your use only. The isotope(s) must be used as approved only under your direction, as Authorized User, by participants as listed on this project's application in Room 1B-49 4C-03 at this hospital. (Each order for the isotope(s) must be approved by this office prior to being sent to Supply for procurement. The order must have "Radioactive Material" written plainly on the requisition.)

THIS APPROVAL WILL EXPIRE ONE YEAR FROM THE DATE APPROVED UNLESS RENEWED.

I.	AUTHORIZED ISOTOPE(S)	PHYSICAL AND CHEMICAL FORM	POSSESSION LIMIT
1.	H-3	Proline	5 mCi
2.			
3.			
4.			
5.			
6.			
7.			
8.			

II. AUTHORIZED USE

Cause and treatment of Osteoporosis: Use of H-3 (proline) as a measure of Bone Forming Surface, in mice and rats.

A film badge (must/need not) be worn when working with the above material(s).

Appropriate radiation (survey/monitoring) instruments shall be used during the use of the radioactive material(s).

A lab survey including wipe test of the area must be done monthly and reports kept for inspection.

Disposal of all radioactive materials including wastes will be done through the Radiation Safety Office, unless specifically authorized in writing by that office.

THE PRINCIPLE INVESTIGATOR IS RESPONSIBLE TO ASSURE THAT RECORDS ARE MAINTAINED AS REQUIRED and that the radiation safety policies of the Jerry L. Pettis Memorial Veterans Hospital are fully complied with.

III. SPECIFIC PROVISIONS

1. All injected animals are to be housed in the radio isotope hood in Room 1B-49.

2. All beding materials are to be kept for radioactive waste disposal by the Radiation Safety Office.

3.

4.

5.

6.

Tom R. Bennett

TOM R. BENNETT
Radiation Safety Officer

Dec. 18, 1982
Date

JOSEP G. LLAURADO, M.D.
Chairman, Radiation Safety Committee

Date

GENERAL APPLICATION FOR USE AND PURCHASE OF
RADIOISOTOPES AND RADIATION SOURCES

(For human use request the special forms for that purpose)

One form for EACH DIFFERENT procedure MUST be completed

1. Principal Investigator: ~~Mark Lundy, Ph.D.~~ David Baylink, M.D.

2. Title of Project: Cause and Treatment of Osteoporosis: Use of ^{3}H-proline as a ~~Measure of Bone Forming Surface~~

3. Location of Use: 4c-03 1B-43 Ext.: 2694

4. Survey Equipment List: (If list previously filed, list any recent acquisitions or deletions of survey equipment.)

5. Have you been listed on a NRC license before? Yes ( ) No (x)

If Yes, where, when, and for what uses.

6. Investigator's radioisotope training and experience:

Previously filed (x) Attached ( )

Have you had an authorization at this VA before? Yes (x) No ( )

7. Name of each individual participating in this project: (All participants must complete the "Training and Experience" form and file it with the Radiation Safety Office.

a. Jon Vergedal, Ph.D. e. _____

b. Mark Lundy, Ph.D. f. _____

c. _____ g. _____

d. _____ h. _____

8. Materials:

Isotope	Chemical & Physical Form	Activity per Procedure	Possession Limit (at any one time)
^{3}H	Proline	1.4 mCi	5 mCi

9. Duration of Use: Months _____ Years 3 Indefinite _____

Describe briefly nature and purpose of use: The ability of effectors to increase bone forming surface and bone formation will be determined by processing mice vertebrae and tibia for autoradiography and measuring the length of label produced by the ^{3}H-proline incorporated in the newly synthesized collagen. See attached protocol.

10. Storage, Handling, and Disposal:

a. Location of storage for radioisotopes: Refrigerator in 4C-07.

b. Material and thickness of shielding around stored isotopes: NEN shipping container

c. Describe briefly the major steps in processing and handling the isotopes: Transfer isotope with syrunge into covered test tube; inject appropriate amount subcutaneously; remove bones and process for autoradiography.

d. Distance from stored isotopes to nearest:

(1) Controlled occupied area: 10 feet
(2) Uncontrolled occupied area: 20 feet

e. Maximum dose-rate which will be permitted in:

(1) Controlled occupied area: negligible mr/hr
(2) Uncontrolled occupied area: negligible mr/hr

f. Describe any hazards foreseen: Ingestion of isotope. Proline is metabolized to H_2O and CO_2, therfore the ^3H would be excreted.

List precautions to be taken: Handle isotope in laminar flow biohazard hood when possible, and use prodedures to prevent ingestion.

g. What wastes will occur: ~~Mice carcasses~~, bedding, gloves, syringes.

How will wastes be disposed of: Solid waste in container in 4C-03. Keep bedding in hood in 18-47; carcasses in refrigerator in 4C-07 and notify radiation safety.

h. Will experimental animals be used? Yes (x) No ( ) If yes:

What kind? Swiss Webster Mice Number per year? 100

Activity per carcass? 140 microcuries maximum

11. Equipment:

a. Indicate equipment which will be used:

Forced ventilation	(x)	Rubber gloves	(x)	Film badges	(x)
Isotope fume hood	(x)	Survey meters	( )	Lab bench	( )
Shielded containers	(x)	Remote pipetter	( )	Long tongs	( )
Pocket dosimeters	( )	Hot waste can	(x)	Glove box	( )
Scintillation vials	( )				

b. List any additional facilities and equipment using drawings if necessary.

c. Make a sketch of your lab(s) indicating:

(1) Isotope work areas.
(2) Isotope storage areas.
(3) Isotope sinks indicating ones which will be used for equipment decontamination and disposal.
(4) Isotope waste storage areas.
(5) Isotope - other pertinent information.

12. Calculate the radiation exposure in rads to the laboratory personnel handling the radioisotopes: insignificant

13. Is this application for radioactive tagged nucleic acids? Yes ( ) No (x)

* * * * * *

We certify that we have read the Jerry L. Pettis Memorial Veterans Hospital Radiation Safety Manual and that all uses of radioisotopes will be in accordance with the regulations set forth therein, and that the Veterans Hospital Radiation Safety Officer will be notified before any changes are made in the use of radioisotopes as herein described.

Mark W. Lumley
Signature of Applicant

10/5/82
Date

SEND APPLICATION TO:

Radiation Safety Office (115A)

Signature of Service Chief

NOTE: To save time, be certain to fill in all blanks and obtain necessary signatures.

Be certain to retain a copy of this application for your records.

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

I. SEALED SOURCES:

Leak tests are done biannually (every six months) on all sealed sources.

II. BIOASSAY PROGRAM FOR RADIOACTIVE ISOTOPE USERS:

A. Policy: To protect the users of radioactive isotopes, the following will be performed:

1. Urine bioassays:

a. Tritium users:

(1) Perform baseline, quarterly and post-operational, on individuals utilizing 10 mCi ^{3}H compounds or 1 mCi $^{3}TdR_{H}$ at any one time.

(2) Repeat any positives (5 µCi/l) within 48 hours.

(3) Perform assays yearly on all personnel using more than 10 mCi ^{3}H per year.

b. ^{125}I or ^{131}I users:

(1) Perform baseline, quarterly and post-operational, on individuals utilizing these isotopes in open form in laboratory experiments in excess of 1 mCi per experiment.

(2) Perform assays at 24 hours on individuals doing radioiodinations using 1 mCi or more.

(3) Assay as needed if process on open bench could lead to volatilization and individual exposure to levels of 0.1 mCi.

2. Perform external thyroid monitoring on individuals referenced in Item 1.a.(2). Action points are 0.12 µCi ^{125}I in thyroid and 0.04 µCi ^{131}I in thyroid.

B. Procedures:

1. Tritium:

a. We do not utilize HTO and labeled compounds or nucleotide precursors in open room processes in excess of 100 mCi or 10 mCi, respectively. We do not use other forms indicated in the other right hand columns of the NRC tritium bioassay guide. The above-referenced levels are utilized in radioisotope fume hoods, as a matter of precaution.

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

b. We perform baseline urine bioassays on individuals utilizing 10% of the above figures. We also require routine quarterly bioassays on these persons. Post-operational bioassays are performed. Bioassays are repeated within 48 hours if urinary excretion of monitored personnel exceeds 5 µCi/l. This is also our action point for corrective measures.

2. ^{125}I and ^{131}I:

a. We perform baseline bioassays on all employees before using these radionuclides, at the levels referenced in the following paragraph c. Post-operational bioassays are also performed.

b. Routine bioassays are performed between 24 and 72 hours of exposure to isotopes and levels referenced in Paragraph c.

c. Activity levels above which bioassay for ^{125}I or ^{131}I is required:

	Activity Levels	
	Volatile	Bound or Nonvolatile
Process in open room or bench with possible escape of iodine	0.1 mCi	1.0 mCi
Process with possible escape of iodine, in fumehood of adequate design & performance	1.0 mCi	10.0 mCi

Processes requiring the use of glove boxes, at levels referenced in NRC Guide 8.20, are not ordinarily encountered at this institution. Should the need arise, this equipment will be added.

d. Action points are:

^{125}I thyroid burden = 0.12 µCi

^{131}I thyroid burden = 0.04 µCi

C. Action Levels and Actions to be Implemented:

1. An investigation of the operations involved, including surveys, should be carried out to determine the causes of exposure and to evaluate the potential for further exposures.

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

2. If the investigation indicates that further work in the area might result in exposure of a worker to concentrations that would cause the limiting intakes established in § 20.103 of 10 CFR Part 20 to be exceeded, the licensee should restrict the worker from further exposure until the source of exposure is discovered and corrected.

   a. Corrective actions that will eliminate or lower the potential for further exposures should be implemented.

   b. A repeat bioassay should be taken within two weeks of the previous measurement and should be evaluated within 24 hours after measurement in order to confirm the presence of internal radioiodine and to obtain an estimate of its effective half-life for use in estimating dose commitment.

3. If the thyroid burden at any time exceeds 0.5 μCi of ^{125}I or 0.14 μCi of ^{131}I, the following actions should be taken:

   a. Carry out all steps described above, and

   b. As soon as possible, refer the case to appropriate medical consultation for recommendations regarding therapeutic procedures that may be carried out to accelerate removal of radioactive iodine from the body. This should be done within 2-3 hours after exposure when the time of exposure is known so that any prescribed thyroid blocking agent would be effective.

   c. Carry out repeated measurements at approximately one week intervals at least until the thyroid burden is less than 0.12 μCi of ^{125}I or 0.04 μCi of ^{131}I. If there is a possibility of longer-term compartments containing ^{125}I or ^{131}I that require evaluation, continue measurements as long as necessary to ensure that appreciable exposures to these other compartments do not go undetected.

III. PROCEDURE FOR RADIOACTIVE ^{32}P USE:

A. Phosphorous-32 emits a beta particle with a maximum energy of 1.71 millions electron volts and with a range in air of 18-20 feet. Local shielding, such as a low density shielding material (Plexiglass), should be used.

B. Guidelines for Use of ^{32}P:

1. Use remote-handling tools whenever practical.

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

2. Employ a low density shield near the source and a high density shield between the user and the low density shield to stop any Bremsstrahlung radiation produced.

3. Persons using 10 millicuries or more of ^{32}P must wear safety glasses for eye protection.

4. Gloves should be worn at all times to avoid skin contact with the isotope.

5. A film badge is to be work by all ^{32}P users. Anyone using two millicuries or more of ^{32}P in an open form is also required to wear a film ring badge.

6. A survey is required after <u>each</u> use using a Geiger-Muller tube. If radiation is detected, a wipe test is required.

C. <u>Emergency Procedures</u>:

If skin becomes contaminated, wash promptly with soft soap and plenty of water <u>and</u> contact Radiation Safety Office at Extension 2701.

PERSONNEL MONITORING DEVICES

Refer to 15 H.

COMMENTS

It is requested that the Radiation Safety Committee (within the limits of this hospital's Nuclear Regulatory Commission License 04-17862-01) be authorized to review, restrict, authorize, or reject applications (of which a part is the training and experience of the users) for radioactive isotope use in "research and development" as defined in 10 CFR 30.4 (g). This request is not to dispose of any authority of the NRC, as we will always remain subject to our license limitations, but to give some local control to the rapid changes and requirements of research and development. Thus the Radiation Safety Committee, as mandated in 10 CFR 35:11, will represent the NRC as an authority at local level to authorize the proposed user to start the project under our license immediately thereby eliminating the waiting period for license amendment approval. In due course, the user will be added to our license.

1. The procedures used in selecting non-human use users are begun by the user filling out an application for general use (copy enclosed) and a Statement of Training and Experience, General, (copy enclosed). These are first submitted to the Radiation Safety Officer who checks to see:

   a. Will this request (if granted) exceed the hospital limit for that isotope?

   b. Has the applicant addressed each question on the application such as:

      (1) Specific nature and purpose of use.
      (2) Waste disposal.
      (3) Facilities and equipment list.
      (4) Safety evaluations.
      (5) Sketch of the lab (note work area).

   After the Radiation Safety Officer has completed his review, the project and user's training and experience are presented to the Radiation Safety Committee members for their evaluation. A Radiation Safety Committee quorum consists of seven members, one of which must be the Radiation Safety Officer or his designee. Committee membership includes one member from each type of use permitted, a Nursing Service representative, and a hospital management representative. Applications are approved by a majority. Projects are usually approved for a one-year duration subject to review and renewal at the end of that time. Committee actions are documented in the minutes of the meetings.

2. The criteria used by the committee to verify a person's training and experience is done similarly to the Nuclear Regulatory Commission's procedure. If the applicant can show certification in Nuclear Medicine, the applicant can be granted use approval subject to this hospital's license limits. If, however, the applicant is not board certified and has not previously been listed on a Nuclear Regulatory Commission license which we can also use as evidence of some previous knowledge and work with isotopes, then the question of adequate training comes in. Some people applying at this hospital come from the local Loma Linda University, which is under a State of California license (Agreement State). These persons can often show a certificate of radiation safety training offered at the university, and we can trace a record of their radiation work history and work experience

COMMENTS
(Continued)

through that line. As a minimum, each authorized user is to have the training and experience described on 10 CFR 33:15 (b) (1) and (2) or an equivalent. The proposed user should have had previous experience with the type of isotope requested as that shows that he may have some knowledge of the particular hazards involved with its use. If the applicant cannot produce evidence of formal training and experience, a background check is conducted with past employers to establish a record.

3. Each project is approved on an individual basis, as we state to our users. There is no blanket coverage for a user to use any isotope for any purpose, only that use for which it has been specifically approved for the user. All projects are submitted to the Radiation Safety Committee for review. For types of projects using small quantities, such as possession limits of less than 1 mCi of ^{3}H or ^{14}C, general lab safety precautions are prescribed. All persons using ^{125}I in open form iodination must use a radioisotope fume hood which has a dedicated out flow line providing more suction and is surveyed more frequently. Projects are approved in the user's lab, subject to that lab's location being appropriate for that use. Non-acceptable labs are ones with no hood using an isotope where a hood is required; or a lab using an isotope requiring a controlled area and the user cannot control that area; or an ill-equipped lab for the work that is to be done.

Waste disposal must be addressed by the user in his application. This is reviewed by the Radiation Safety Officer prior to its going to committee to see that the user is informed as to this hospital's policies regarding waste. If the isotopes proposed are of a half-life of greater than 65 days, then it is suggested that the user look to an isotope with a shorter half-life or justify his need for the proposed isotope.