

**Veterans  
Administration**RECEIVED  
MAY 1 1985HEAR MEDICAL DIV  
F1121

MAY 20 PM 1:40

May 7, 1985

In Reply Refer To: 600/152

Ms. Beth A. Reidlinger  
Health Physicist, Nuclear Materials Safety Section  
United States Nuclear Regulatory Commission  
Region V  
1450 Maria Lane, Suite 210  
Walnut Creek, CA 94596

Re: Docket No: 030-0125; License No.: 04-00689-07; Control No. 18779

Dear Ms. Reidlinger:

This is in response to your letter dated April 23, 1985, concerning our amendment request dated March 4, 1985.

1. a. No Tc-99m generators will be stored or used in the new research building. They will continue to be stored and used, as they are under the current license, in Nuclear Medicine Service high-level room, Building 1, Room 430. Any Tc-199m used in research will be prepared in Room 430 and transported in a suitable lead carrier to the new research building.

b. The small quantities of radio-pharmaceuticals used in research will be stored in lead containers adequate to keep the exposure rate below the limit set by 10 CFR 10.105.

c. Radioactive waste from Research will be stored for decay and pending disposal as low level radioactive waste in the New Research Building, Building 138, Room B 43. A diagram of this room and attached areas is attached. Weekly surveys of this room and the area immediately outside of its door will be conducted. A monthly radiation badge will be attached to the inside of the door. The room will be locked at all times when not occupied. The keys will be under the exclusive control of the Radiation Safety Officer, the Associate Chief of Staff for Research and Development, and the Chief of Hospital Police. Any others needing access to the room will have to check keys out from one of the above.

d. No generators or reagent kits for Group III will be used in Building 138. Any radio-pharmaceuticals used in Building 138 will be prepared in the currently licensed location in Building 1, Room 430 and transferred to Building 138 in shielded carriers.

e. No Group VI materials will be used in the new research building.

f. The J. L. Shepherd Model 28-6A calibrator will continue to be stored in its presently licensed location, Building 126, Room 55, under lock and key. It will be used, as at present, in the shielded Radiation Therapy rooms.

B507190143 B50522  
REGS LIC30  
04-00689-07 PDR

FEE EXEMPT

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2.

Ms. Beth A. Reidlinger

Within 30 days after completing the move to Building 138, each user of radioisotopes will be required to supply the RSO with a diagram of his space, indicating the areas where isotopes are to be stored and used. The RSO will, by calculation and/or measurement determine the possibility that the radiation in any occupied area could exceed the limits specified in 10 CFR 20.105. If so, corrective measures will be taken immediately. (Actually the possession limits of the research users are far below what could possibly produce radiation levels exceeding 10 CFR 20.105.)

2. Xe-133 will be used in Room 133 of the new Research Building. The average quantity used per week will be less than 25 millicuries. The flow rate into the laboratory is taken as 400 cfm, and the air conditioning system is single pass.

Assuming all the Xe-133 used is released to the laboratory, then

$$A = 25 \text{ mCi/wk} \times 1000 \text{ uCi} \times 52 \text{ wk/yr} = 1.3 \times 10^6 \text{ uCi/Yr}$$

$$V = 400 \times 1.49 \times 10^{10} \text{ ml/yr/cfm} = 5.96 \times 10^{12} \text{ ml/yr}$$

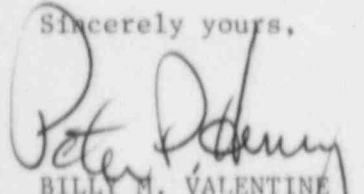
$$C_{\text{avg}} = A/V = 1.3 \times 10^6 / 5.96 \times 10^{12} = 2.2 \times 10^{-7} \text{ uCi/ml}$$

This is below the air concentration permitted in an unrestricted area ( $3 \times 10^{-7}$  uCi/ml. The Xe-133 is used in this laboratory to measure blood flows and is used in an essentially closed system. A xenon trap is incorporated into the system (Nuclear Associates Xenon Gas Trap #36-023, or equivalent), and it is estimated that better than 90% of the Xenon trap is also checked periodically with this instrument.

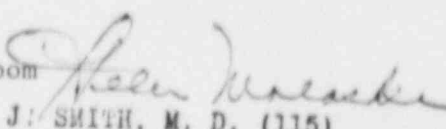
3. Decontamination and survey of the vacated old facilities will be handled by an outside contractor specializing in such matters. When this has been completed to ours and NRC's satisfaction, and the facility is released for demolition, we will submit a request to delete the former facilities from our license.

4. The move from the Old Research Buildings to the New Research Building has been scheduled for May 20, 1985. Will you kindly expedite the issuance of the license amendment so that the move can be on schedule.

Sincerely yours,

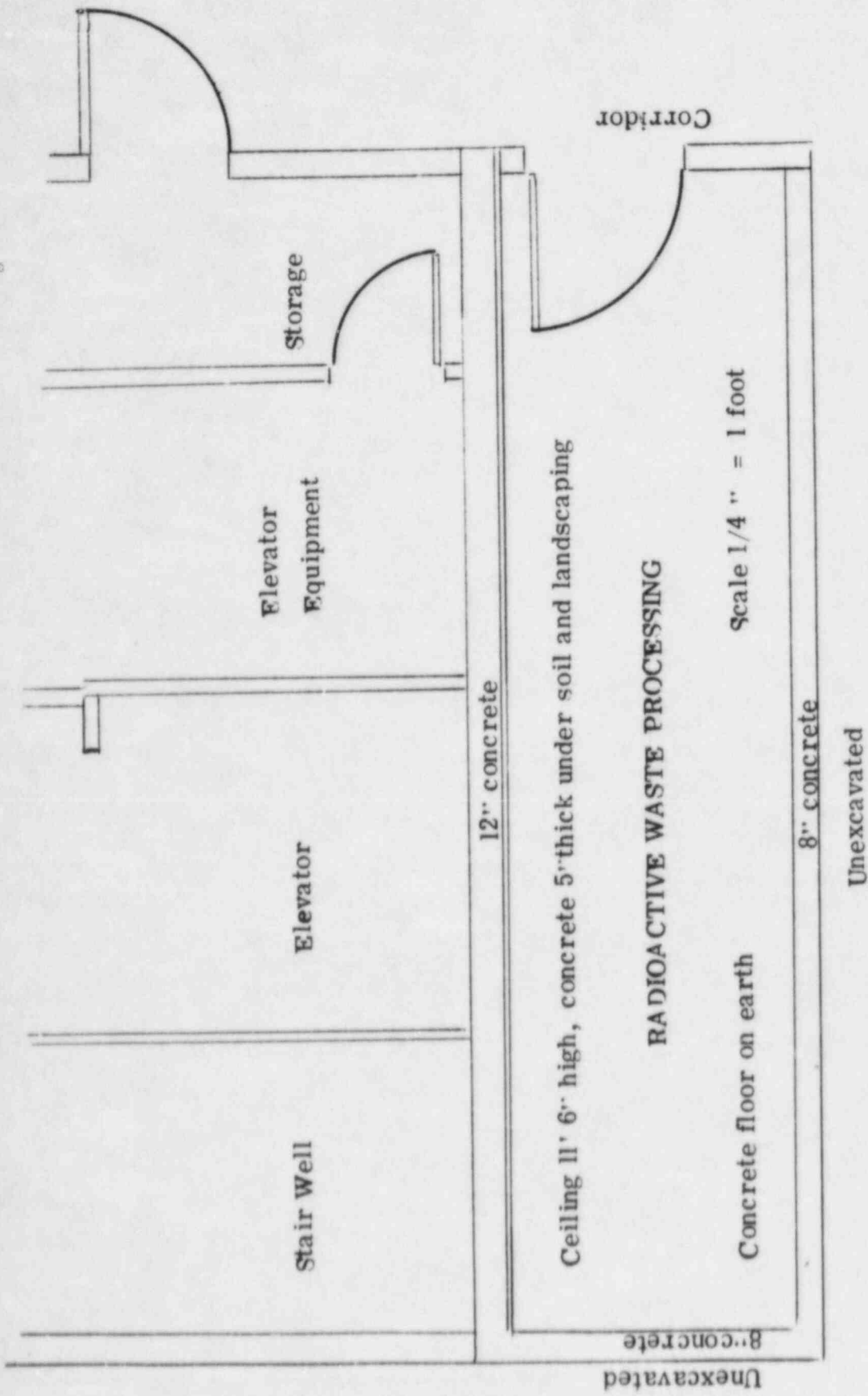
  
BILLY M. VALENTINE  
Acting Medical Center Director

Enclosure: Diagram of Radioactive Waste Processing Room

  
JAMES J. SMITH, M. D. (115)  
Director, Nuclear Medicine Service  
VA Central Office  
Washington, D.C. 20420

18779





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**Veterans  
Administration**

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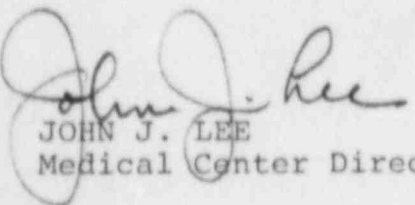
March 4, 1985

In Reply Refer To: 600/152

Director, Nuclear Medicine Service (115)  
Department of Medicine and Surgery  
Veterans Administration  
Washington, D.C. 20420

SUBJ: Amendment of Nuclear Regulatory Commission License No.  
04-00689-07

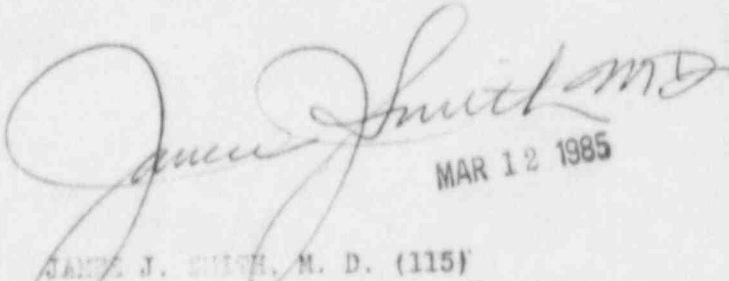
1. We recommend that broad license No. 04-00689-07 be amended to permit the moving of research activities involving radioisotopes from their present location in Buildings 70 thru 81 and 86 to newly constructed Research Building No. 138.
2. Attached is (a) a tabulation identifying each room in the new building to be designated as a radiation-controlled area, together with the types of activities, floor areas, isotopes to be used, and fume hood facilities, and (b) a crude floor plan of each floor of the new building with the rooms numbered to correspond with the room numbers in the tabulation.
3. Presently the move is planned for late April, 1985.
4. Our current broad license expires July 31, 1985. Application for renewal is in preparation and will designate the new Building 138 as the center for research activities involving radioisotopes.
5. The old research buildings are to be demolished and the site cleared in accordance with procedures to be worked out with NRC.
6. Will you kindly review this request and forward it to the Nuclear Regulatory Commission so that there will be no delay in moving to the new Research Building.

  
JOHN J. LEE  
Medical Center Director

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MAR 11 1985

Nuclear Medicine Serv  
(115)

  
MAR 12 1985  
JAMES J. SMITH, M. D. (115)  
Director, Nuclear Medicine Service  
VA Central Office  
Washington, D.C. 20420

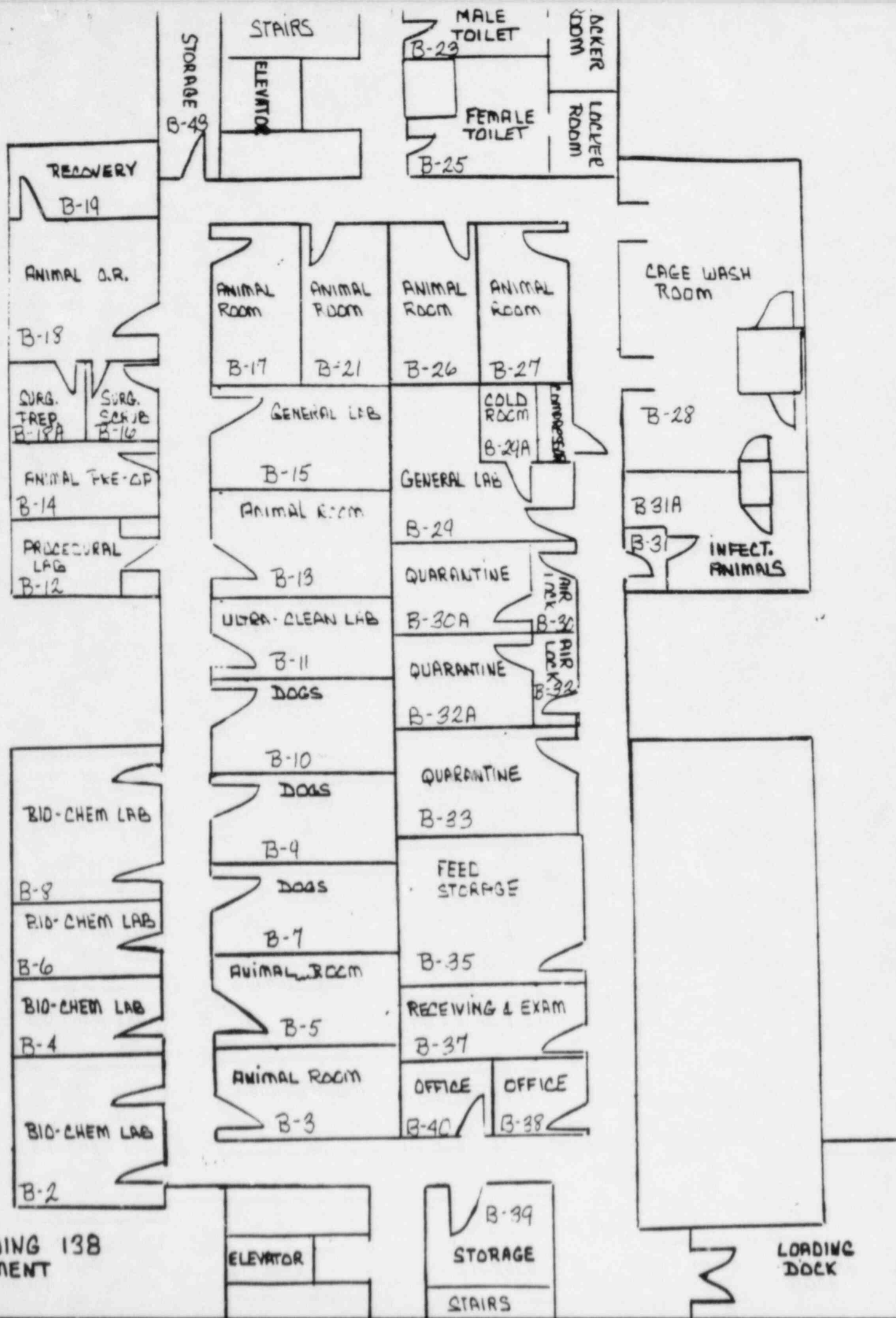
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## RADIATION CONTROLLED SPACE IN NEW RESEARCH BUILDING - VA MEDICAL CENTER, LONG BEACH, CALIFORNIA

Activity	Room No.	Area (sq.ft.)	Approved Isotopes	Hood		
				Provided	Flow (cfm)	Projected Use
Endocrinology Lab	B-08	400	3-H, 14-C, 113-In, 125-I	Yes	875	Isotope labeling
Animal care facilities*	B-09 to B-19					
GI Research	102	400	3-H, 125-I	Yes	875	Isotope labeling
	104	100	3-H, 125-I	No		
	106	300	3-H, 125-I	No		
Dermatology Research	110	200	3-H			
Molecular Endocrinology	118	200	3-H, 14-C	No		Isotope labeling
	120	400	3-H, 14-C	Yes	875	
Plastic Surgery Lab	127	200	85-Kr, 133-Xe	Yes	875	Isotope labeling
Radiation Physics	131	200	3-H, 99m-Tc	Yes	875	Isotope labeling
Nuclear Medicine Lab	133	400	99m-Tc, 111-In, 133-Xe, 201-Tl, 125-I	Yes	875	Isotope labeling
Mycology Research Lab	206	200	125-I, 3-H	No		Isotope labeling
	208	200	125-I, 3-H	Yes	875	
	210	200	125-I, 3-H	No		
Hypertension Lab	214	200	3-H, 125-I	No		Isotope labeling
	216	200	3-H, 125-I	No		
	217	300	3-H, 125-I	Yes	875	
Pharmacokinetic Lab	218	200	3-H, 125-I	No		Isotope labeling
	220	200	3-H, 125-I	Yes	875	
Chemical Biology Lab	219	400	3-H, 14-C, 29-Fe, 35-S, 51-Cr, 125-I	Yes	875	Isotope labeling
	221	200	Same	No		
	222	100	Same	No		

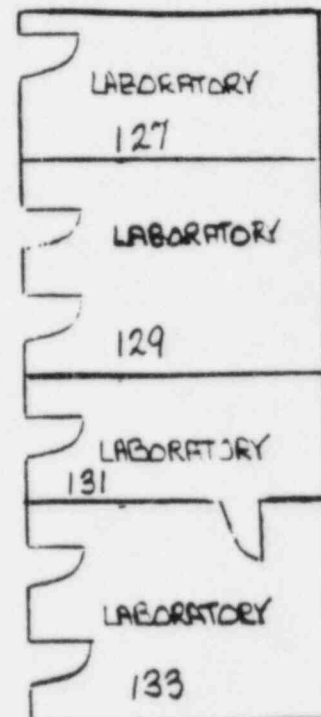
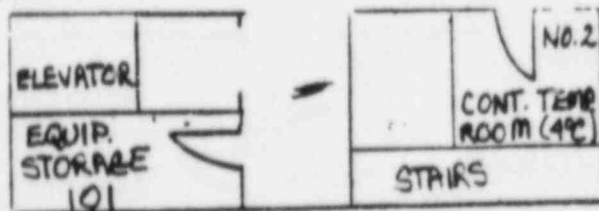
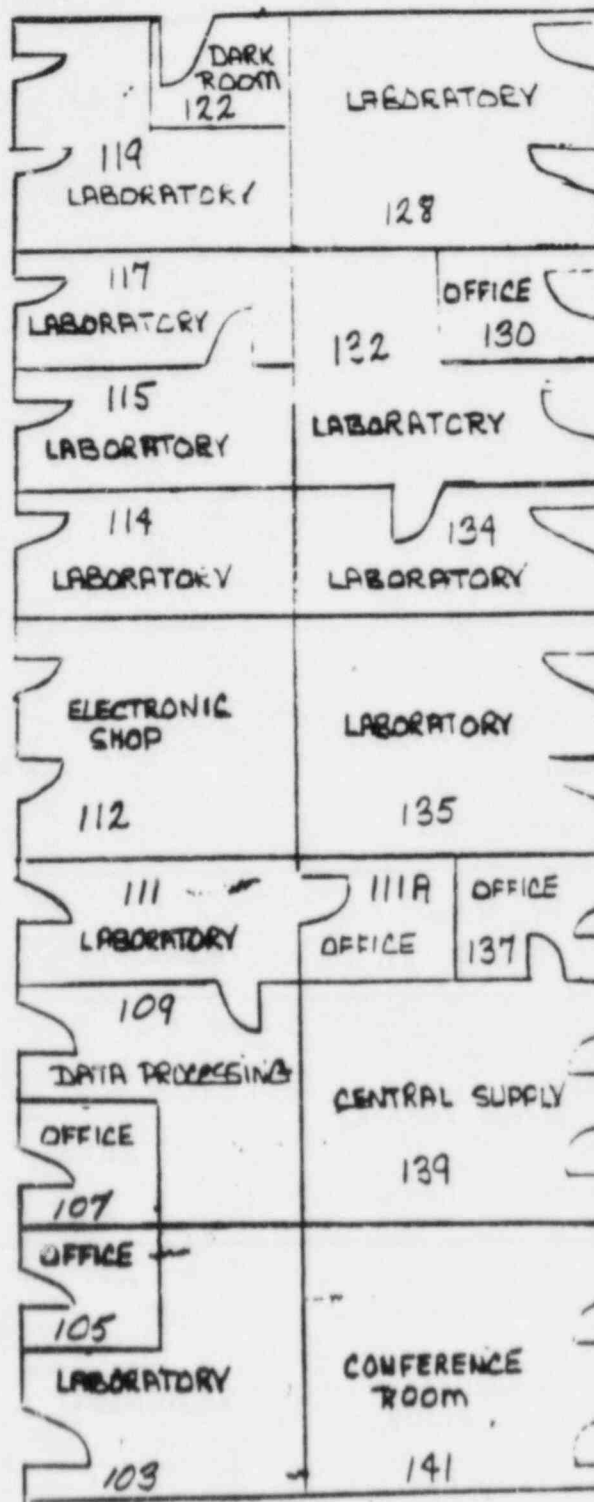
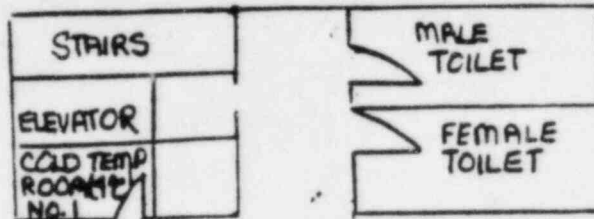
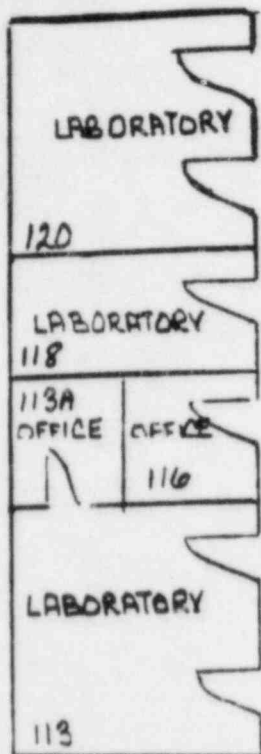
\*Animal care facilities. To be designated controlled areas only when radioactive animals are present. To be decontaminated before de-controlling.

Activity	Room No.	Area (sq.ft.)	Approved Isotopes	Hood		
				Provided	Flow (cfm)	Projected Use
Endocrinology Lab	228	400	3-H	Yes	1375	Isotope labeling
	232	200	3-H	Yes	875	Isotope labeling
Rheumatology Lab	229	400	3-H, 35-S, 51-Cr, 111-In	Yes	875	Isotope labeling
	231	200	3-H, 51-Cr, 35-S, 111-In	Yes	875	Isotope labeling
Gastrointestinal Lab	230	300	3-H, 14-C, 51-Cr, 86-Rb, 125-I	No		
	233	100	3-H, 14-C, 51-Cr, 86-Rb, 125-I	Yes	1375	Isotope labeling
	234	200	3-H, 14-S, 51-Cr, 86-Rb, 125-I	No		
Neuroendocrinology Lab	235	200	125-I	No		
	237	200	125-I	Yes	875	Isotope labeling
Thyroid Lab	236	200	14-C, 125-I	No		
	238	200	14-C, 125-I	No		
	240	200	14-C, 125-I	Yes	1375	Isotope labeling
Common Counting Equip.	239	400	All licensed isotopes	No		
Oncology Lab	241	200	3-H, 14-C, 32-P	No		
	242	200	3-H, 14-C, 32-P	Yes	875	Isotope labeling
	243	200	3-H, 14-C, 32-P	Yes	875	Solvents
	244	200	3-H, 14-C, 32-P	Yes	875	Solvents
	245	200	3-H, 14-C, 32-P	No		

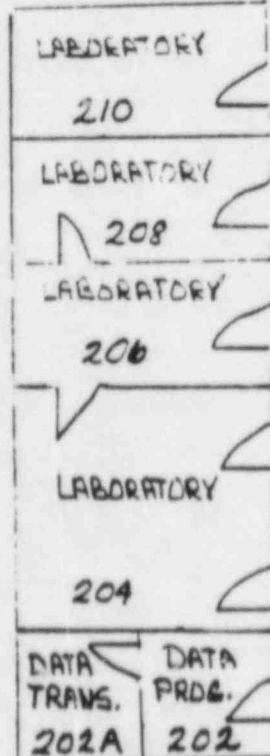
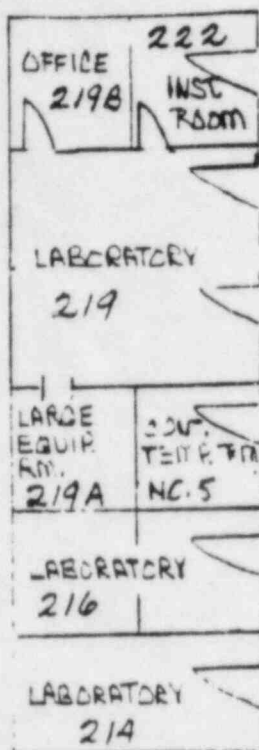


BUILDING 138  
BASEMENT

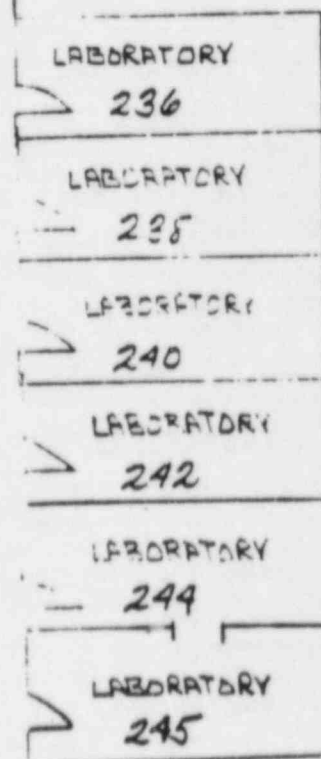
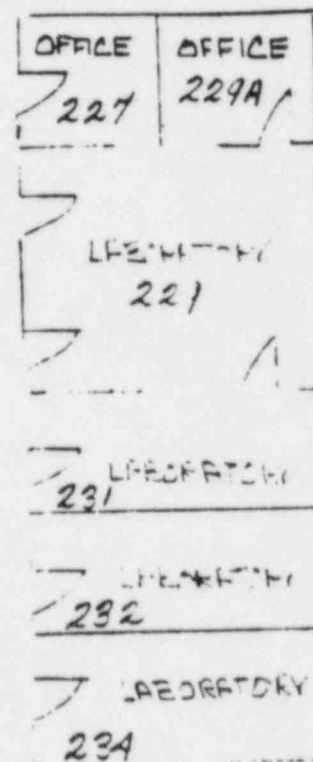
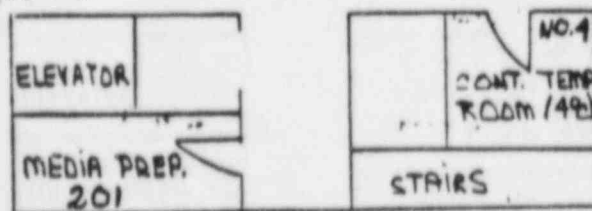
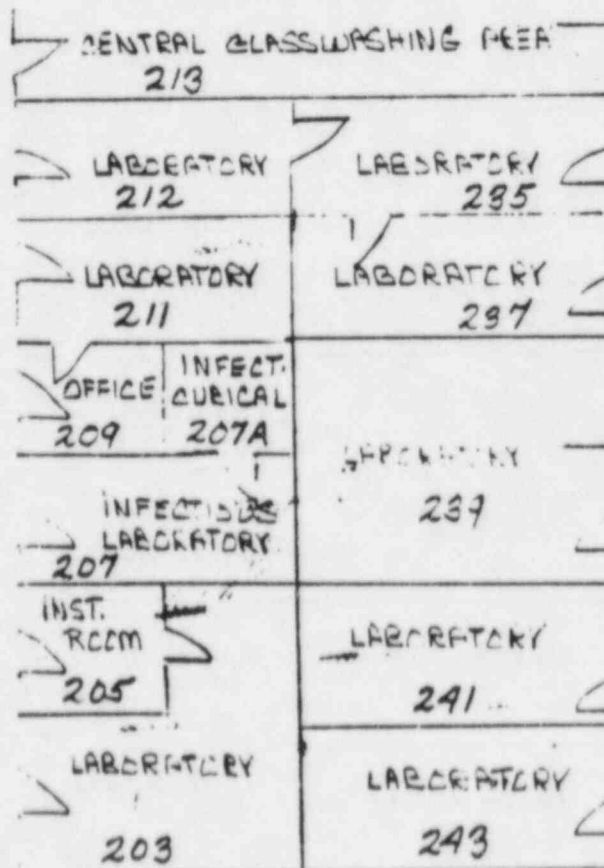
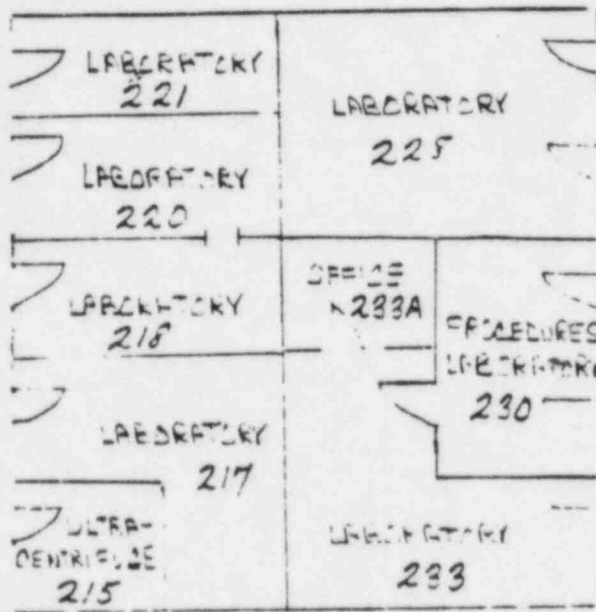
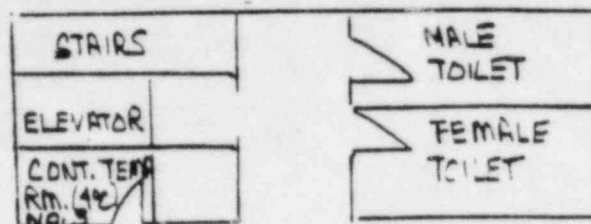




BUILDING 138  
GROUND FLOOR



BUILDING 138  
SECOND FLOOR



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Veterans  
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NUCLEAR MEDICINE SERVICE  
(115)

MAY 26 AM 10 52

March 24, 1982

In Reply Refer To: 600/115

Regional Director, Western Region (10046/115)  
 Department of Medicine and Surgery  
 Veterans Administration  
 810 Vermont Avenue, N.W.  
 Washington, D.C. 20420

SUBJ: Amendment of Nuclear Regulatory Commission (NRC) License No. 04-00689-07

1. It is requested that the floor plan for Nuclear Medicine be amended to include the additions of adjoining Rooms 201, 204, and 206 which once housed the Radioimmunoassay Laboratory. Air flows into these rooms are indicated in Figure 1. The only significant change in operations because of the additional space is the movement of the Xenon Preparation and Storage Hood to Room 201 as shown in Figure 1. The exhaust in the new location goes directly to the roof instead of into the courtyard.

2. It is requested that the current floor plan for the RIA Laboratory be deleted and replaced by the floor plan shown in Figure 2. The new RIA facility is located in Building 126. RIA floor plan is shown in Figure 3. No changes in operations are indicated.

3. It is requested that our license be amended to include the following:

- |   |   |   |
|---|---|---|
| (6) Byproduct, source and/or special nuclear material | (7) Chemical and/or physical form                           | (8) Maximum amount that licensee may possess at any time under this license |
| Americium 241   | Sealed source, Isotope Products Laboratories Model PHI241-1 | 2 millicuries   |

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(9) Authorized use

Inspection of shielding materials, structures, and devices

4. It is requested that the following changes be made in the membership of the Hospital Isotope Committee.

- (a) Deletions: Albert D. Williams, Ph.D.  
George S. Nakai, M.D.

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INSPECTION AND ENFORCEMENT

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Regional Director, Western Region (10BA6/115)

(b) Appointments:

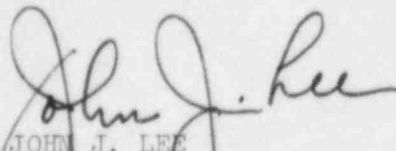
(1) Larry M. Weisenthal, M.D., Ph.D. Dr. Weisenthal has been a staff physician in the Hematology and Oncology Section of the Medical Service since 1979. He received his M.D. at the University of Michigan in 1975. Dr. Weisenthal is Board certified in Internal Medicine (1978) and Medical Oncology (1979). He is an Assistant Professor in Residence in the Department of Medicine at the University of California, Irvine. (Curriculum Vitae enclosed.)

(2) William M. James. Mr. James is the Administrative Assistant to the Chief of Staff. Prior to this appointment, he was the Administrative Officer in the Laboratory Service from 1974 to 1981. The members of the Hospital Isotope Committee feel that Mr. James, as a representative of hospital management, will lend another dimension to the membership of the committee. (Curriculum Vitae enclosed.)

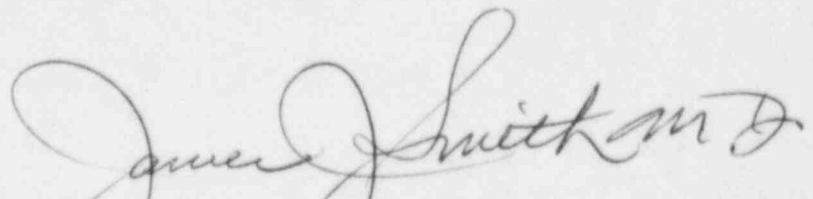
The appointment of these two members will fill the Committee's required membership and ensure a continuity of the safety standards set out by the Nuclear Regulatory Commission.

5. The Long Beach VA Medical Center's ALARA program is enclosed.

6. With your approval and endorsement, it is requested that the above changes in the license, recommendations for the Hospital Isotope Committee membership, and the Long Beach VAMC ALARA Program be forwarded to the Nuclear Regulatory Commission for their consideration.

  
JOHN J. LEE  
Medical Center Director

Encl: 6  
Curriculum Vitae (2)  
Floor Plans (3)  
ALARA Program

  
JAMES J. SMITH, M.D. (115)  
Director, Nuclear Medicine Service  
14 Central Office  
Washington, D.C. 20420

Larry M. Weisenthal, M.D., Ph.D. SS # 374-48-1664

Born: April 17, 1947 Chicago, Ill.

Married: Constance Marie Rueff  
July 19, 1969

Children: None

Current Address: 17031 Courtney Lane  
Huntington Beach, CA. 92649

Education: Undergraduate U. of Louisville  
Louisville, Ky.  
1965-68 Major: Chemistry  
Degree: None (entered medical school  
after 3 undergraduate years)

Honors: Most Outstanding Freshman,  
Sophomore, and Junior Man  
College of Arts and Sciences

Graduate U. of Michigan  
Ann Arbor, Michigan  
1968-75 Major: Pharmacology and  
Medicine (Combined  
M.D./ Ph.D. program)  
Degree: Ph.D. (Pharmacology) 1974  
M.D. 1975

Post Graduate University Hospital  
Ann Arbor, Mi.  
1975-77 House Officer I and II  
(Straight Medicine)

National Cancer Institute, N.I.H.  
Bethesda, Md.  
1977-79 Clinical Associate, Medicine  
Branch, Division of Cancer  
Treatment

Board Certification: Internal Medicine, 1978  
Medical Oncology, 1979

Professional Licensure: Maryland and California

Military Service: Surgeon, U.S. Public Health Service 1977-79  
(active duty); inactive reserve 1979-present



Academic Positions:

Staff Physician  
Section of Hematology-Oncology  
Veterans Administration Medical  
Center  
Long Beach, California 1979-present

Assistant Professor in Residence  
Department of Medicine  
University of California, Irvine  
1979-present

Lecturer in Pharmacology  
U. of Michigan School of Medicine  
1973-75

Journal Reviewer (ad hoc): Cancer Treatment Reports

Grant Awards:

1. Co-principal investigator  
NIH Contract: "Phase III Study  
Evaluating the Efficacy  
of Total Parenteral Nut-  
rition as an Adjunct to  
Combination Chemotherapy  
in Advanced Measurable  
Small Cell Carcinoma of  
the Lung" 12/79 - 12/82  
Total Amount \$158,000
2. Principal investigator  
VA Merit Review Grant: "In Vitro Assays  
Predictive of Clinical  
Response to Chemotherapy  
in Lung Cancer and Other  
Neoplasms" 2/80 - 9/83  
Total Amount \$219,000

Thesis: Weisenthal, L.M. Content and Catabolism of  
Chromatin Proteins in Control and PHA-Stimul-  
ated Human Lymphocytes, Leukemic Leukocytes,  
and Burkitt Lymphoma Cells. Ph.D. Thesis,  
University of Michigan, University Microfilms,  
May, 1974

## BIBLIOGRAPHY

1. Weisenthal, L.M., Hug, C.C., Jr., Weisbrodt, N.W., and Bass, P. Adrenergic mechanisms in the relaxation of Guinea-Pig taenia coli in vitro. *J. Pharmacol. Exptl. Therap.* 178:497, 1971
2. Bartolini, A., Weisenthal, L.M., and Domino, E.F. Effect of photic stimulation on acetylcholine release from cat cerebral cortex. *J. Neuropharmacol.* 11:113, 1972
3. Weisenthal, L.M. and Ruddon, R.W. Characterization of human leukemia and Burkitt lymphoma cells by their acidic nuclear protein profiles. *Cancer Res.* 32:3009, 1972
4. Weisenthal, L.M. and Ruddon, R.W. Catabolism of nuclear proteins in control and phytohemagglutinin-stimulated human lymphocytes, leukemic leukocytes, and Burkitt lymphoma cells. *Cancer Res.* 33:2923, 1973
5. Ruddon, R.W., Weisenthal, L.M., Lundeen, D.E., et al. Stimulation of mitogenesis in normal and leukemic human lymphocytes by divalent and tetravalent lima bean lectins. *Proc. Natl. Acad. Sci. (USA)* 71:1848, 1974
6. Von Hoff, D.D. and Weisenthal, L.M. In vitro methods for predicting patient response to chemotherapy. *Adv. Pharmacol. Chemother.* 17:133, 1980
7. Von Hoff, D.D., Weisenthal, L.M., Ihde, D., et al. Growth of lung cancer colonies from bronchoscopy washings. *Cancer* 48:400, 1981
8. Weisenthal, L.M. Treatment of small cell lung cancer-1981. *Arch. Intern. Med.*, In Press
9. Weisenthal, L.M. In vitro assays in preclinical antineoplastic drug screening. *Semin. Oncology*, In Press

## ABSTRACTS

1. Weisenthal, L.M., Hug, C.C., Jr., and Bass, P. Adrenergic mechanisms in the relaxation of Guinea-pig taenia coli. *Fed. Proc.* 29:550, 1970
2. Weisenthal, L.M. and Ruddon, R.W. Content of acidic nuclear proteins in human leukemia cells, Burkitt lymphoblasts, and PHA-stimulated lymphocytes. *Fed. Proc.* 31:629, 1972
3. Weisenthal, L.M. and Ruddon, R.W. Chromatin-associated protease activity in proliferating and non-proliferating human lymphoid cells. *Proceedings of XIth International Cancer Congress, Florence, Italy, 1974*
4. Weisenthal, L.M., Von Hoff, D.D., Lippman, M.E., and Becker, R.O. Differentiation of neuroblastoma cells occurring within an electrical field system. *Proc. Am. Assoc. Cancer Res.* 20:252, 1979
5. Weisenthal, L.M. and Marsden, J. A novel dye exclusion assay for predicting response to cancer chemotherapy. *Proc. Am. Assoc. Cancer Res.* 22:155, 1981
6. Weisenthal, L.M., Marsden, J.A., Malefatto, J., and Dill, P. Predicting response to cancer chemotherapy with a novel dye exclusion assay. *Proceedings of XIIth International Congress of Chemotherapy, Florence, Italy, 1981*

## CURRICULUM VITAE

WILLIAM M. JAMES

Home Address: 2128 W. Chalet Ave.  
Anaheim, CA 92804

Administrative Assistant to Chief of Staff  
Veterans Administration Medical Center  
5901 E. 7th Street  
Long Beach, CA 90822

Home Telephone: (714) 535-0667

Telephone: (213) 498-6219

Date of Birth: April 16, 1932

Place of Birth: Laurel, Mississippi

### EDUCATION:

- 1955      Advanced Medical Laboratory Procedures (52 weeks), Ft. Sam Houston, Texas - September 1955
- 1962      Selected by Army Surgeon General to attend University of Mississippi, all expense paid scholarship for 2 years - January 1962
- 1964      Bachelor of Science, University of Mississippi - January 1964
- 1965      Medical Technology Internship, Brooke General Hospital - March 1965
- 1977      Master of Arts - Management and Supervision, Central Michigan University - December 1977
- 1980      Master of Public Administration, California State University, Fullerton - January 1980

### EXPERIENCE:

- 1981-Date:    Administrative Assistant to Chief of Staff, VA Medical Center, Long Beach, California
- 1974-1981:    Administrative Officer, Laboratory Service, VAMC, Long Beach, California (1500 Bed Hospital - Number of Laboratory Personnel - 130)
- 1969-1974:    Medical Technologist, Veterans Administration Medical Center, Long Beach, California - August 1969
- 1949-1969:    U.S. Army - Retired July 1969 - Medical Service Corps

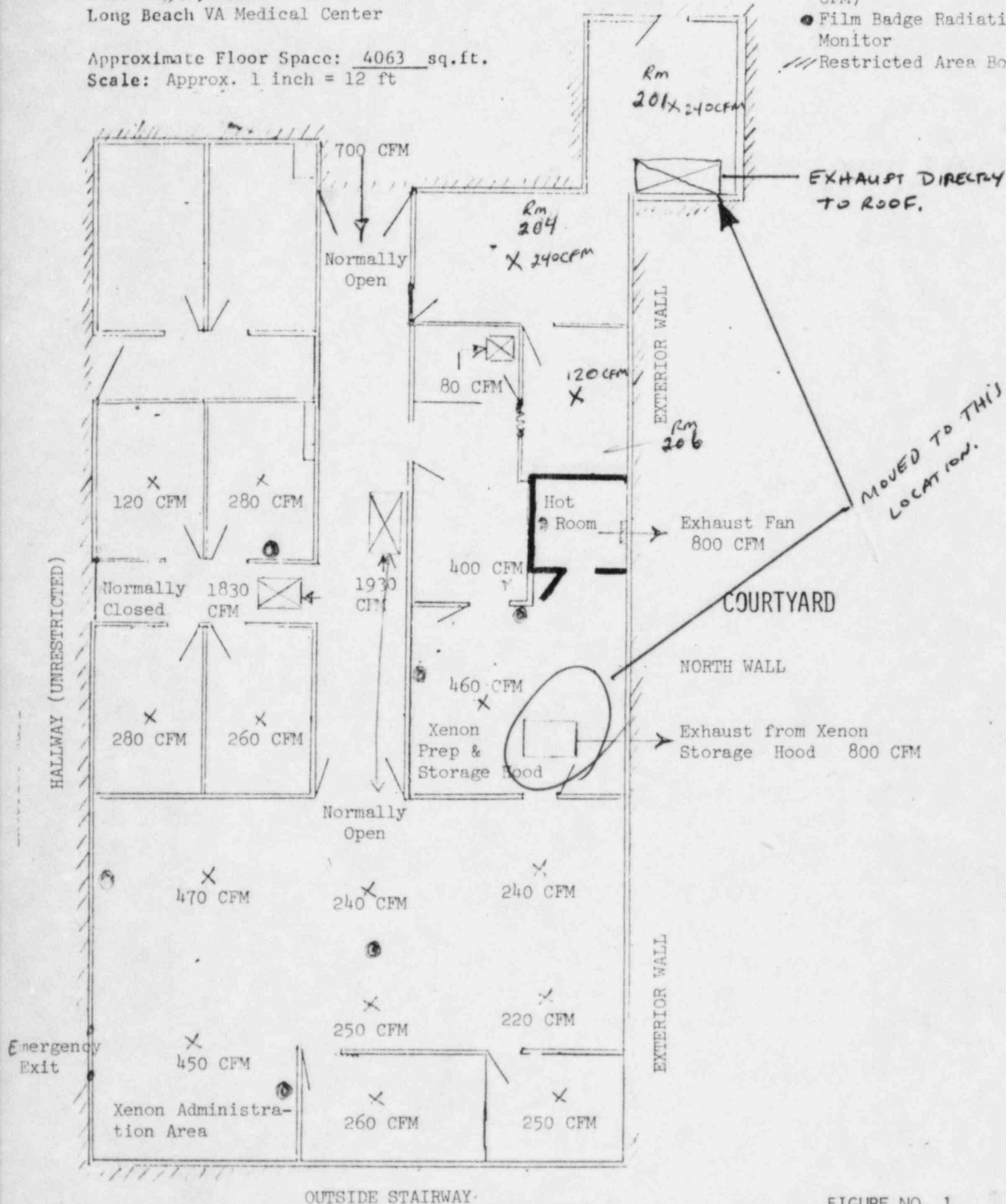
### SOCIETIES:

American Society of Medical Technology  
American Society of Microbiology  
American Society of Clinical Pathologists  
California Society of Medical Technologists

Nuclear Medicine Floor Plan  
Building 1, Second Floor  
Long Beach VA Medical Center

Approximate Floor Space: 4063 sq.ft.  
Scale: Approx. 1 inch = 12 ft

- ☒ Air Returns (3840 CFM)
- ✕ Air Inlets (Total: 4900 CFM)
- Film Badge Radiation Monitor
- /// Restricted Area Boundary



KEY

APPROXIMATE SCALE: 1mm = 1 FT

||||| = RESTRICTED AREA BOUNDARY

⊠ = AIR OUTLETS TO COURTYARD

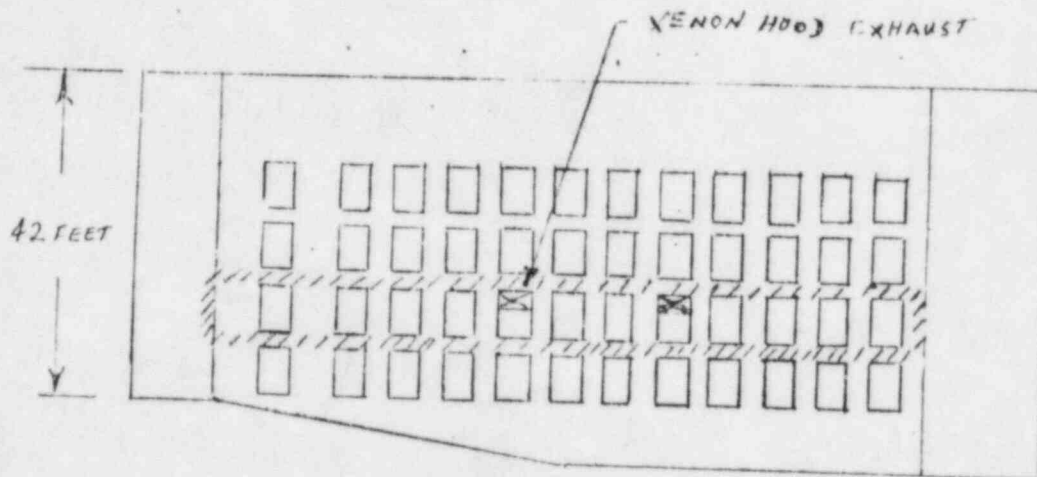
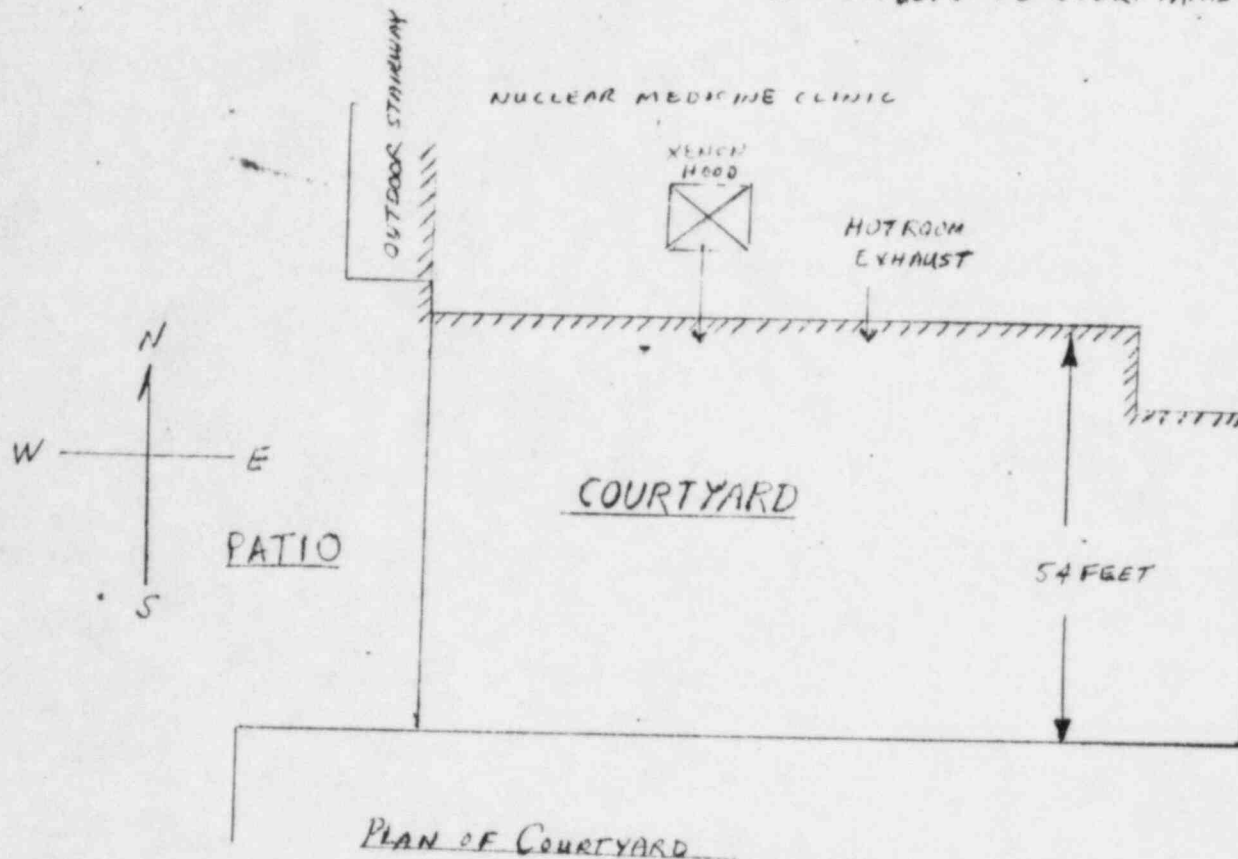
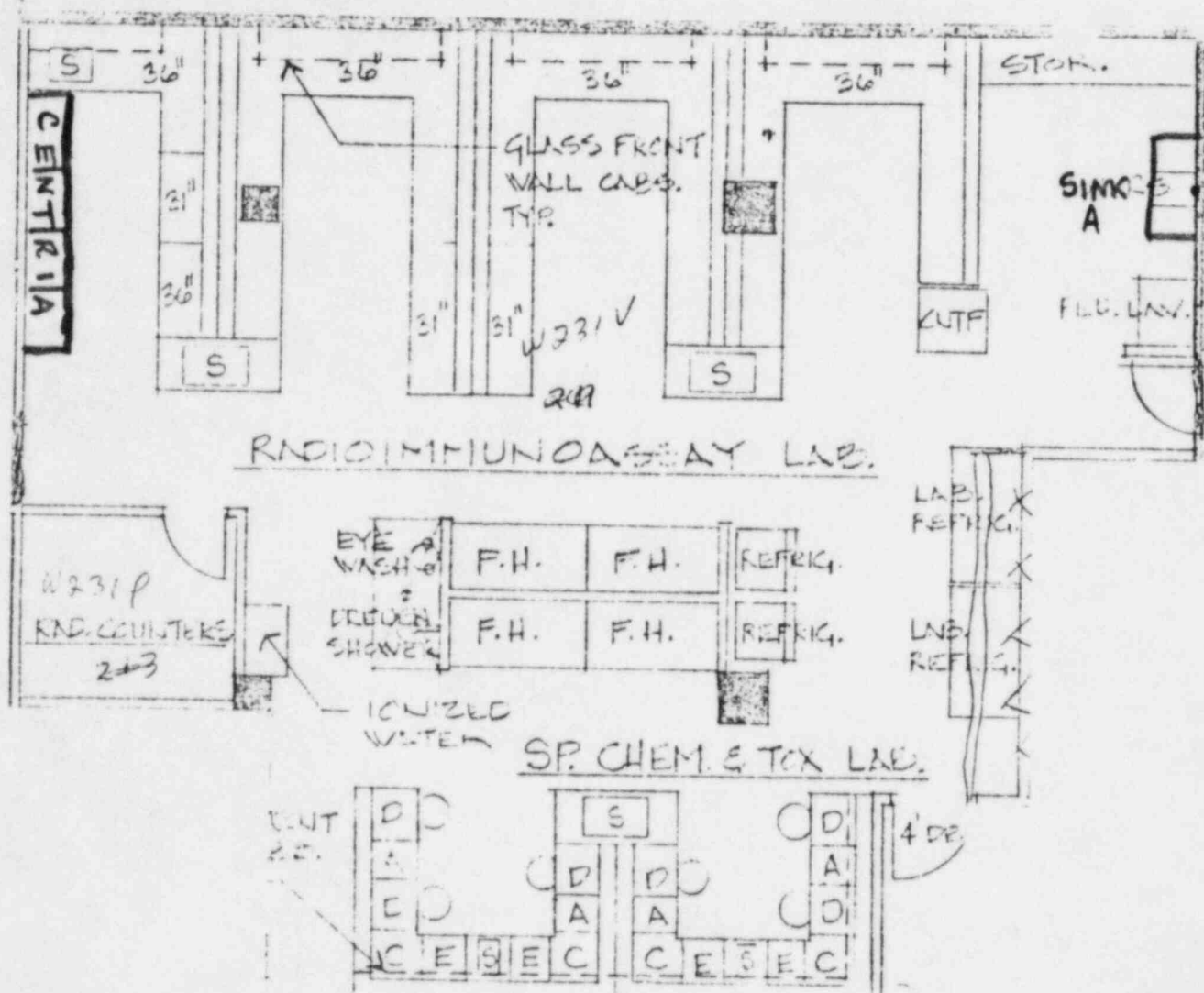


FIG. 2 LAYOUT OF COURTYARD & LOCATION OF EXHAUSTS TO COURTYARD





RIA LAB - BLDG 126

LONG BEACH VA MEDICAL CENTER PROGRAM  
FOR MAINTAINING OCCUPATIONAL RADIATION EXPOSURES ALARA

March 22, 1982

I. MANAGEMENT COMMITMENT

- A. We, the management of the Long Beach Veterans Administration Medical Center are committed to the program described in this paper for keeping exposures (individual and collective) as low as reasonably achievable (ALARA). In accord with this commitment, we hereby describe an administrative organization for radiation safety and will develop the necessary written policy, procedures, and instructions to foster the ALARA concept within our institution. The organization will include a Hospital Isotope Committee (HIC) and a Radiation Safety Officer (RSO).
- B. We will perform a formal annual review of the radiation safety program including ALARA considerations. This shall include reviews of operating procedures and past exposure records, inspections, etc., and consultations with the radiation protection staff or outside consultants.
- C. Modification to operating and maintenance procedures and to equipment and facilities will be made where they will reduce exposures unless the cost, in our judgment, is considered to be unjustified. We will be able to demonstrate, if necessary, that improvements have been sought, that modifications have been considered, and that they have been implemented where reasonable. Where modifications have been recommended but not implemented, we will prepare to describe the reasons for not implementing them.
- D. In addition to maintaining doses to individuals as far below the limits as is reasonably achievable, the sum of the doses received by all exposed individuals will also be maintained at the lowest practicable level. It would not be desirable, for example, to hold the highest doses to individuals to some fraction of the applicable limit if this involved exposing additional people and significantly increasing the sum of radiation doses received by all involved individuals.

II. HOSPITAL ISOTOPE COMMITTEE (HIC)

- A. Review of Proposed Users and Uses.
  1. The HIC will thoroughly review the qualifications of each applicant with respect to the types and quantities of

materials and uses for which he has applied to assure that the applicant will be able to take appropriate measures to maintain exposure ALARA.

2. When considering a new use of byproduct material, the HIC will review the efforts of the applicant to maintain exposure ALARA. The user should have systematized procedures to ensure ALARA, and shall have incorporated the use of special equipment such as syringe shields, rubber gloves, etc., in his proposed use.
3. The HIC will ensure that the user justifies his procedures and that dose will be ALARA (individual and collective).

B. Delegation of Authority.

(The judicious delegation of HIC authority is essential to the enforcement of an ALARA program.)

1. The HIC will delegate authority to the RSO for enforcement of the ALARA concept.
2. The HIC will support the RSO in those instances where it is necessary for the RSO to assert his authority. Where the RSO has been overruled, the Committee will record the basis for its action in the minutes of the Committee's quarterly meeting.

C. Review of ALARA Program.

1. The HIC will encourage all users to review current procedures and develop new procedures as appropriate to implement the ALARA concept.
2. The HIC will perform a quarterly review of occupational radiation exposure with particular attention to instances where Investigational Levels in Table I below are exceeded. The principle purpose of this review is to assess trends in occupational exposure as an index of the ALARA program quality and to decide if action is warranted when Investigational Levels are exceeded (see paragraph VI).
3. The HIC will evaluate our institution's overall efforts for maintaining exposures ALARA on an annual basis. This review will include the efforts of the RSO, authorized users, and workers as well as those of management.

### III. RADIATION SAFETY OFFICER (RSO)

#### A. Annual and Quarterly Review.

1. Annual review of the Radiation Safety Program. The RSO will perform an annual review of the Radiation Safety Program for adherence to ALARA concepts. Reviews of specific procedures may be conducted on a more frequent basis.
2. Quarterly review of Occupational Exposures. The RSO will review at least quarterly the external radiation exposures of authorized users and workers to determine that their exposures are ALARA in accordance with the provisions of paragraph VI of this program.
3. Quarterly review of records of Radiation Level Surveys. The RSO will review radiation levels in unrestricted and restricted areas to determine that they were at ALARA levels during the previous quarter.

#### B. Education Responsibilities for an ALARA Program.

1. The RSO will schedule briefings and educational sessions to inform workers of ALARA program efforts.
2. The RSO will assure that authorized users, workers and ancillary personnel who may be exposed to radiation will be instructed in the ALARA philosophy and informed that management, the HIC and the RSO are committed to implementing the ALARA concept.

#### C. Cooperative Efforts for Development of ALARA Procedures.

Radiation workers will be given opportunities to participate in formulation of the procedures that they will be required to follow.

1. The RSO will be in close contact with all users and workers in order to develop ALARA procedures for working with radioactive materials.
2. The RSO will establish procedures for receiving and evaluating the suggestions of individual workers for improving health physics practices and encourage the use of those procedures.

#### D. Reviewing Instances of Deviation from Good ALARA Practices.

The RSO will investigate all known instances of deviation from good ALARA practices; and, if possible, determine the causes. When the cause is known, the RSO will require changes in the program to maintain exposures ALARA.

#### IV. AUTHORIZED USERS

##### A. New Procedures Involving Potential Radiation Exposures.

1. The authorized user will consult with and receive the approval of, the RSO and/or HIC during the planning stage before using radioactive materials for a new procedure.
2. The authorized user will evaluate all procedures before using radioactive materials to ensure that exposures will be kept ALARA. This may be enhanced through the application of trial runs.

##### B. Responsibility of the Authorized User to Those he Supervises.

1. The authorized user will explain the ALARA concept and his commitment to maintain exposures ALARA to all of those he supervises.
2. The authorized user will ensure that those under his supervision who are subject to occupational radiation exposure are trained and educated in good health physics practices and in maintaining exposures ALARA.

#### V. PERSONS WHO RECEIVE OCCUPATIONAL RADIATION EXPOSURE

- A. The worker will be instructed in the ALARA concept and its relationship to his working procedures and work conditions.
- B. The worker will know what recourses are available if he feels that ALARA is not being promoted on the job.

#### VI. ESTABLISHMENT OF INVESTIGATIONAL LEVELS IN ORDER TO MONITOR INDIVIDUAL OCCUPATIONAL EXTERNAL RADIATION EXPOSURES

This institution hereby establishes Investigational Levels for occupational external radiation exposure which, when exceeded, will initiate review or investigation by the Hospital Isotope Committee and/or the Radiation Safety Officer. The Investigational Levels that we have adopted are listed in Table 1 below. These levels apply to the exposure of individual workers.



Table 1

	Investigational Levels (mrems per calendar quarter)	
	<u>LEVEL I</u>	<u>LEVEL II</u>
1. Whole body; head and trunk; active blood-forming organs; lens of eyes; or gonads.	125	375
2. Hands and forearms; feet and ankles.	1875	5625
3. Skin of whole body*	750	2250

\*Not normally applicable to nuclear medicine operations except those using significant quantities of beta emitting isotopes.

The Radiation Safety Officer will review and record on Form NRC-5, Current Occupational External Radiation Exposures, or an equivalent form (e.g. dosimeter processor's report), results of personnel monitoring, not less than once in any calendar quarter, as is required by 10 CFR 20, para. 20.401. The following actions will be taken at the Investigational Levels as stated in Table 1:

1. Quarterly exposure of individuals to less than Investigational Level I.

Except when deemed appropriate by the RSO, no further action will be taken in those cases where an individual's exposure is less than Table 1 values for the Investigational Level I.

2. Personnel exposures equal to or greater than Investigational Level I, but less than Investigational Level II.

The RSO will review the exposure of each individual whose quarterly exposures equal or exceed Investigational Level I. He will report the results of his reviews at the first HIC meeting following the quarter when the exposure was recorded. If the exposure does not equal or exceed Investigational Level II, no action related specifically to the exposure is required unless deemed appropriate by the Committee. The Committee will, however, consider each such exposure in comparison with those of others performing similar tasks as an index of ALARA program quality and will record the review in the Committee minutes.

3. Exposure equal to or greater than Investigational Level II.

The RSO will investigate in a timely manner the cause(s) of all personnel exposures equaling or exceeding Investigational

Level II and, if warranted, take action. A report of the investigation, actions taken, if any, and a copy of the individual's Form NRC-5 or its equivalent will be presented to the HIC at the first HIC meeting following completion of the investigation. The details of these reports will be recorded in the Committee minutes. Committee minutes will be sent to the management of this institution for review. The minutes, containing details of the investigation, will be made available to NRC inspectors for review at the time of the next inspection.

4. Re-establishment of an individual occupational worker's Investigational Level II above that listed in Table 1.

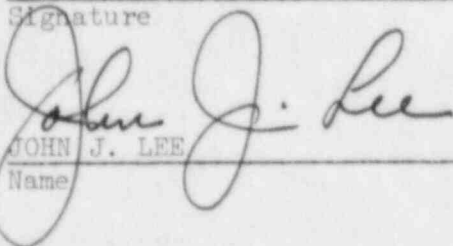
In cases where a worker's or a group of worker's exposures need to exceed Investigational Level II, a new, higher Investigational Level II may be established on the basis that it is consistent with good ALARA practices for that individual or group. Justification for a new Investigational Level II will be documented.

The Hospital Isotope Committee will review the justification for, and will approve, all revisions of Investigational Levels II. In such cases, when the exposure equals or exceeds the newly established Investigational Level II, those actions listed in paragraph 3. above will be followed.

#### VII. SIGNATURE OF CERTIFYING OFFICIAL

I hereby certify that this institution has implemented the ALARA Program set forth above.

Signature



JOHN J. LEE

Name

Medical Center Director

Title

Institution Name and Address:

Veterans Administration Medical Center  
5901 E. 7th Street  
Long Beach, California 90822

11494

Veterans  
Administration

2253

n/s

October 6, 1980

OCT 21 PM 12 US



Regional Director, Western Region (~~10846~~/115)  
Department of Medicine and Surgery  
Veterans Administration  
810 Vermont Avenue, N.W.  
Washington, D.C. 20420

SUBJ: Amendment of Nuclear Regulatory Commission (NRC) License  
No. 04-00689-07

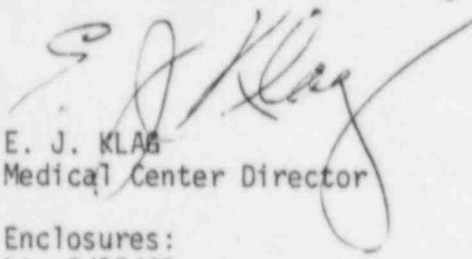
1. In response to letter (Control No. 04865) dated September 15, 1980, from Michael A. Lamastra, Material Licensing Branch, Division of Fuel Cycle and Material Safety, United States Nuclear Regulatory Commission, Washington, D.C., we submit the following information in support of our request to amend Material License No. 04-00689-07 to include the use of a J. L. Shepherds & Associates Model 28-6A calibrator.
2. The enclosed sketch shows the location of the calibrator in storage and in use. All adjacent areas are part of the Radiation Therapy Service and as such are under radiation control. Only scattered radiation will reach any occupied area. The operator of the calibrator, standing behind it, with a large scattering object in the beam 0.5 meter from the source, will receive no more than 2.4 mR/h. The "hottest" spot outside the calibration room will be outside door D where the maximum exposure rate will be no more than 0.2 mR/h. An actual radiation survey will be performed after receipt of the calibrator.
3. Calibration procedure:
  - a. Move the calibrator from storage to a position about 1 meter from the east wall of Room 56. Face the port toward the west wall. Plug in the power supply and check to be sure the green light is on, indicating that the source is fully off.
  - b. Position the instrument to be calibrated on the axis of the port at a measured distance from the source.
  - c. If needed, arrange a mirror and telescope so that the instrument meter can be read from a position behind the calibrator.
  - d. Remove the padlock from the calibrator. Expose the source while standing behind the calibrator by raising the black operating knob until the detent is engaged.

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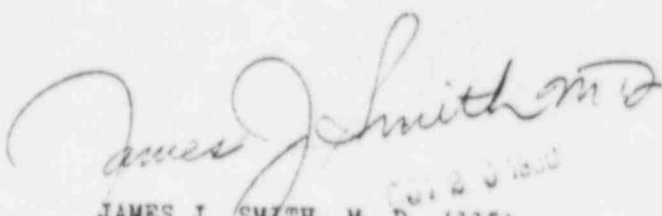
2.

Regional Director, Western Region (10BA6/115)

- e. Record the instrument reading.
  - f. Return the source to the off position by pushing down the operating knob until the pin on the shaft contacts the stop on the calibrator top and the green light goes off.
  - g. When the calibration session is completed, replace the padlock on the calibrator and return it to the storage room. Lock the room.
4. No training of other operators of the calibrator is planned for the foreseeable future. If other operators are trained, they will be trained through demonstrations by the Radiation Physicist followed by "hands-on" operating under his immediate supervision. Competency will be determined by requiring the trainee to calibrate at least three instruments of diverse types and comparing his or her results with those obtained by the physicist.
5. Emergency procedures:
- a. In case of an emergency requiring abandonment of the calibrator while it is in use, it will be turned off, padlocked, and, if time permits, returned to storage.
  - b. The storage room for the calibrator is probably as fire and earthquake resistant as any in the hospital, so no action would ordinarily be required in these situations.
  - c. There are drains in the floor of the storage room, so moderate external water flooding would not be a problem. If there is a threat of more severe flooding in this basement room, the calibrator will be moved to a higher floor, either the Radiology Service or the Nuclear Medicine Service, since these are under radiation control.
  - d. If at any time the operation of the source rod becomes difficult, the calibrator will be removed from service. The manufacturer will be contacted to make repairs.
6. We will appreciate prompt review of the above information so that our license can be appropriately amended and we can take delivery of the calibrator, which has already been ordered.

  
E. J. KLAG  
Medical Center Director

Enclosures:  
Ltr 9/15/80  
Sketch

  
JAMES J. SMITH, M. D. (115)  
Director, Nuclear Medicine Service  
VA Central Office  
Washington, D.C. 20420

Radiation Therapy  
Work Room

Patient  
Examining  
Room

Restricted  
Corridor

Wall N 6" concrete + 6 mm Pb  
 Wall NE 6" " + 12 mm Pb  
 Wall S 14" "  
 Wall W 14" "  
 Wall E 6" "  
 Door D 3" wood + 6 mm Pb

Restricted Corridor

Unexcavated Area

Room 56  
Superficial X-ray Therapy and  
Calibration Range

Calibrator  
in use

Superficial X-ray  
Therapy Table

Room 55  
Storage

Calibrator  
in storage

Radium  
Safe

S  
Unexcavated

SCALE 1/4" = 1 ft.



Veterans  
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1980 <sup>Sept</sup> AUG 2 AM 7 36

August 19, 1980

Regional Director, Western Region (100A07115)  
Department of Medicine and Surgery  
Veterans Administration  
810 Vermont Avenue, N.W.  
Washington, D.C. 20420



SUBJ: Amendment of Nuclear Regulatory Commission (NRC) License No. 04-00689-07

1. Please refer to our letter of August 1, 1980, on this subject. Since that date, we have received an amended version of that license which requires a rewording of our request as follows:

a. Subitem 8.E should be amended to read "2 Curies total for all sources authorized in Subsection 6.E".

b. Subitem 9.E should be amended to read "Any procedure listed in Group VI of Schedule A., Section 35.100 of Title 10, Code of Federal Regulations and Calibration of Instruments".

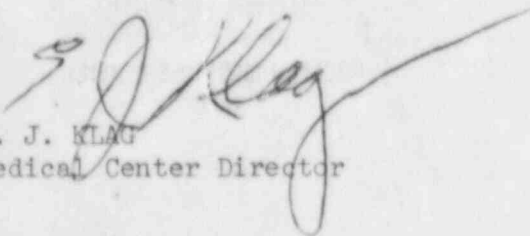
c. For proper calibration of radiation-measuring instruments to meet JCAH standards and NRC regulations, we intend to purchase a calibrator containing Cesium-137. The calibrator will be J. L. Shepherd and Associates Model 28-6A (or equivalent) which contains 1 to 1.5 Curie of Cesium-137 as a 3M source #4F6H.

d. The calibrator will be mounted on a rolling stand. It will be stored in the locked radium room which is accessed only through the Radiation Therapy Service.

e. Calibrations will be performed in shielded (12 mm Pb) radiation therapy rooms.

f. The calibrator will be wipe-tested at intervals of not more than six months.

2. Please review this request and forward it to the Nuclear Regulatory Commission so that we may take delivery of the calibrator.

  
E. J. KLAG  
Medical Center Director

AUG 27 1980

VOID 05057

In Reply Refer To: 600/114A

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FEE EXEMPT



**Veterans  
Administration**

October 6, 1980

OCT 22 PM 12 08

Regional Director, Western Region (~~10846~~/115)  
Department of Medicine and Surgery  
Veterans Administration  
810 Vermont Avenue, N.W.  
Washington, D.C. 20420



SUBJ: Amendment of Nuclear Regulatory Commission (NRC) License  
No. 04-00689-07

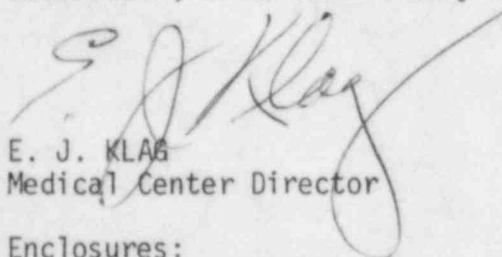
1. In response to letter (Control No. 04865) dated September 15, 1980, from Michael A. Lamastra, Material Licensing Branch, Division of Fuel Cycle and Material Safety, United States Nuclear Regulatory Commission, Washington, D.C., we submit the following information in support of our request to amend Material License No. 04-00689-07 to include the use of a J. L. Shepherds & Associates Model 28-6A calibrator.
2. The enclosed sketch shows the location of the calibrator in storage and in use. All adjacent areas are part of the Radiation Therapy Service and as such are under radiation control. Only scattered radiation will reach any occupied area. The operator of the calibrator, standing behind it, with a large scattering object in the beam 0.5 meter from the source, will receive no more than 2.4 mR/h. The "hottest" spot outside the calibration room will be outside door D, where the maximum exposure rate will be no more than 0.2 mR/h. An actual radiation survey will be performed after receipt of the calibrator.
3. Calibration procedure:
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  - b. Position the instrument to be calibrated on the axis of the port at a measured distance from the source.
  - c. If needed, arrange a mirror and telescope so that the instrument meter can be read from a position behind the calibrator.
  - d. Remove the padlock from the calibrator. Expose the source while standing behind the calibrator by raising the black operating knob until the detent is engaged.

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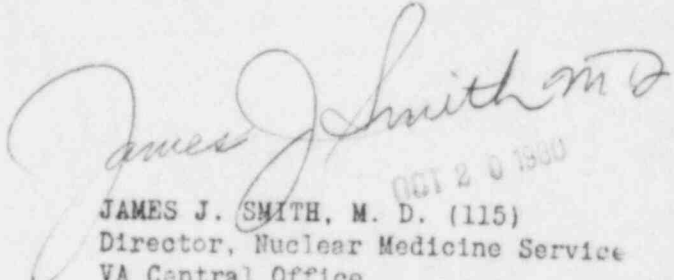
2.

Regional Director, Western Region (10BA6/115)

- e. Record the instrument reading.
  - f. Return the source to the off position by pushing down the operating knob until the pin on the shaft contacts the stop on the calibrator top and the green light goes off.
  - g. When the calibration session is completed, replace the padlock on the calibrator and return it to the storage room. Lock the room.
4. No training of other operators of the calibrator is planned for the foreseeable future. If other operators are trained, they will be trained through demonstrations by the Radiation Physicist followed by "hands-on" operating under his immediate supervision. Competency will be determined by requiring the trainee to calibrate at least three instruments of diverse types and comparing his or her results with those obtained by the physicist.
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6. We will appreciate prompt review of the above information so that our license can be appropriately amended and we can take delivery of the calibrator, which has already been ordered.

  
E. J. KLAG  
Medical Center Director

Enclosures:  
Ltr 9/15/80  
Sketch

  
OCT 2 0 1980  
JAMES J. SMITH, M. D. (115)  
Director, Nuclear Medicine Service  
VA Central Office  
Washington, D.C. 20420

Radiation Therapy  
Work Room

Patient  
Examining  
Room

Restricted  
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Wall N 6" concrete + 6 mm Pb  
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 Door D 3" wood + 6 mm Pb

Restricted Corridor

Unexcavated Area

Room 56  
Superficial X-ray Therapy and  
Calibration Range

Calibrator  
in use

Superficial X-ray  
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Room 55  
Storage

Calibrator  
in storage

Radium  
Safe

S  
Unexcavated

SCALE 1/4" = 1 ft.



Veterans  
Administration

Medical Center

5901 East Seventh Street  
Long Beach, CA 90822

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JUL 1 1980

NUCLEAR MEDICINE SERVICE  
(115)



June 20, 1980

Regional Director, Western Region (108A6/115)  
Department of Medicine and Surgery  
Veterans Administration  
810 Vermont Avenue, N.W.  
Washington, D.C. 20420

SUBJ: Application for Renewal of NRC Broad Medical License  
No. 04-00689-07, Control No. 98010, VA Medical Center,  
Long Beach, California

1. In response to the letter dated March 18, 1980, from the Nuclear  
Regulatory Commission with respect to application for renewal of License  
No. 04-00689-07, the following additional information is submitted.

- a. Dr. Vincent L. Gelezunas will act as the Radiation Safety  
Officer for this license.
- b. Equivalent procedures for the calibration of survey instruments  
are submitted.
- c. The description of our bioassay program for radiation workers  
exposed to iodine compounds is submitted.
- d. A revised description of our training program for personnel  
working with or in the vicinity of radioactive material is  
submitted and supercedes in toto Item No. 12 in our initial  
application.
- e. Instructions as outlined in the Appendices will be followed.  
The following instructions originally submitted with the renewal  
application are withdrawn:

- (1) "Guidelines for the Nursing Care of Patients  
Receiving Radiation Therapy," dated October 31, 1978.
- (2) "Instructions to Nursing Personnel Handling Radio-  
active Patients," dated October 1978.
- (3) "Radiation Safety Instructions to Research  
Laboratory Personnel," dated November 1978.
- (4) "Principles of Handling Radioactivity - Instructions  
to Laboratory Personnel," dated October 1978.

- f. Our procedures for insuring the security of animals who have  
received radioisotopes are included in Item 22.

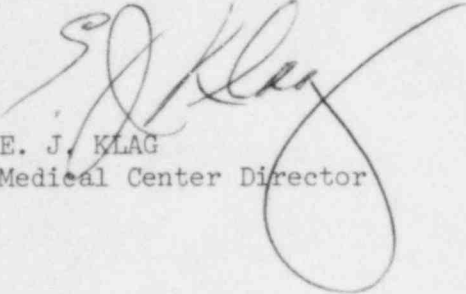
In Reply Refer To: 600/115

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Regional Director, Western Region (10BA6/115)

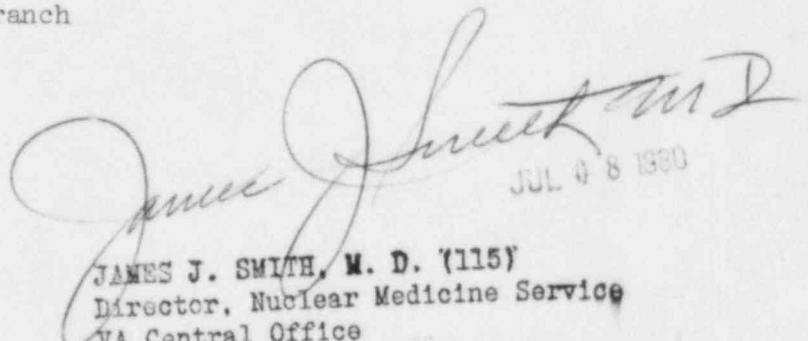
- g. The additional information that you requested with respect to Xe-133 use is included. The clinic is under negative pressure (See air flow information Fig. 1, Item 21).

2. Because revisions have been made throughout the renewal application, the entire application has been resubmitted in toto. With your approval and endorsement, it is requested that our license renewal application be forwarded to the Nuclear Regulatory Commission for their consideration.



E. J. KLAG  
Medical Center Director

cc: U.S. Nuclear Regulatory Commission  
c/o Document Management Branch  
Washington, D.C. 20555



JUL 8 1980  
JAMES J. SMITH, M. D. (115)  
Director, Nuclear Medicine Service  
VA Central Office  
Washington, D.C. 20420

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NRC - copy  
1427

FORM NRC-313M (8-78) 10 CFR 35	U.S. NUCLEAR REGULATORY COMMISSION <b>APPLICATION FOR MATERIALS LICENSE - MEDICAL</b>	Approved: GAO R0557
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**INSTRUCTIONS** - Complete Items 1 through 26 if this is an initial application or an application for renewal of a license. Use supplemental sheets where necessary. Item 26 must be completed on all applications and signed. Retain one copy. Submit original and one copy of entire application to: Director, Office of Nuclear Materials Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Upon approval of this application, the applicant will receive a Materials License. An NRC Materials License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Parts 19, 20 and 35 and the license fee provision of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 26 and the appropriate fee enclosed.

1.a. NAME AND MAILING ADDRESS OF APPLICANT (institution, firm, clinic, physician, etc.) INCLUDE ZIP CODE  VA Medical Center 5901 E. 7th Street Long Beach, CA 90822  TELEPHONE NO.: AREA CODE (213) 498 1313	1.b. STREET ADDRESS(ES) AT WHICH RADIOACTIVE MATERIAL WILL BE USED (If different from 1.a.) INCLUDE ZIP CODE  N/A
2. PERSON TO CONTACT REGARDING THIS APPLICATION Kenneth P. Lyons, M.D. Chief, Nuclear Medicine Service TELEPHONE NO.: AREA CODE (213) 498 6237	3. THIS IS AN APPLICATION FOR: (Check appropriate item) a. <input type="checkbox"/> NEW LICENSE b. <input type="checkbox"/> AMENDMENT TO LICENSE NO. _____ c. <input checked="" type="checkbox"/> RENEWAL OF LICENSE NO. 04-00689-07
4. INDIVIDUAL USERS (Name individuals who will use or directly supervise use of radioactive material. Complete Supplements A and B for each individual.)  N/A	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.)  Vincent L. Gelezunas, Ph.D. RSO, Nuclear Medicine Service

**6.a. RADIOACTIVE MATERIAL FOR MEDICAL USE**

RADIOACTIVE MATERIAL LISTED IN:	ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS (In millicuries)	ADDITIONAL ITEMS:	MARK ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS (In millicuries)
10 CFR 31.11 FOR IN VITRO STUDIES	X	50	IODINE-131 AS IODIDE FOR TREATMENT OF HYPERTHYROIDISM	X	100
10 CFR 35.100, SCHEDULE A, GROUP I		AS NEEDED	PHOSPHORUS-32 AS SOLUBLE PHOSPHATE FOR TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA AND BONE METASTASES	X	100
10 CFR 35.100, SCHEDULE A, GROUP II		AS NEEDED	PHOSPHORUS-32 AS COLLOIDAL CHROMIC PHOSPHATE FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.	X	100
10 CFR 35.100, SCHEDULE A, GROUP III	X	6000	GOLD-198 AS COLLOID FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.	X	100
10 CFR 35.100, SCHEDULE A, GROUP IV		AS NEEDED	IODINE-131 AS IODIDE FOR TREATMENT OF THYROID CARCINOMA	X	300
10 CFR 35.100, SCHEDULE A, GROUP V		AS NEEDED	XENON-133 AS GAS OR GAS IN SALINE FOR BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES.	X	3000
10 CFR 35.100, SCHEDULE A, GROUP VI	X	1000			

**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 Attachment.			8009040165 124PP



INFORMATION REQUIRED FOR ITEMS 7 THROUGH 23

1437

For Items 7 through 23, check the appropriate box(es) and submit a detailed description of all the requested information. Begin each item on a separate sheet. Identify the item number and the date of the application in the lower right corner of each page. If you indicate that an appendix to the medical licensing guide will be followed, do not submit the pages, but specify the revision number and date of the referenced guide: Regulatory Guide 10.8, Rev. \_\_\_\_\_ Date: \_\_\_\_\_

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

## 24. PERSONNEL MONITORING DEVICES

TYPE <small>(Check appropriate box)</small>	SUPPLIER	EXCHANGE FREQUENCY
a. WHOLE BODY	FILM	U. S. Testing Company, Richland, Wash.
	TLD	
	OTHER (Specify)	
b. FINGER	FILM	U. S. Testing Company, Richland, Wash.
	TLD	
	OTHER (Specify)	
c. WRIST	FILM	
	TLD	
	OTHER (Specify)	

### d. OTHER (Specify)

TLD's for special situations are issued by the Physicist (Radiotherapy), and read by him as required. He also maintains the TLD exposure log.

## 25. FOR PRIVATE PRACTICE APPLICANTS ONLY

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

## 26. CERTIFICATE

*(This item must be completed by applicant)*

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

a. LICENSE FEE REQUIRED <small>(See Section 170.31, 10 CFR 170)</small>	b. APPLICANT OR CERTIFYING OFFICIAL (Signature) 
(1) LICENSE FEE CATEGORY:	(1) NAME (Type of Print) KENNETH P. LYONS, M.D.
(2) LICENSE FEE ENCLOSED: \$	(2) TITLE Chief, Nuclear Medicine Service
	c. DATE June 19, 1980

6.b. Radioactive Material for Uses Not Listed in Item 6.a.

<u>Element &amp; Mass Num.</u>	<u>Chem. &amp;/or Phys. Form</u>	<u>Maximum Millicuries of Each Form</u>	<u>Purpose of Use</u>
1. Any Element, Atomic Number 3-83	Any	50 mCi each	Medical Research
2. Carbon-14	Any	200	Medical Research
3. Hydrogen-3	Any	1000	Medical Research
4. Iodine-125	Any	200	Medical Research
5. Ytterbium-169	Sealed Source, ICN Corp. Model #338 or Equivalent	60000	Radiation Source for Densitometry
6. Americium-241	Sealed Source Monsanto Model #MRC-2704 or Equivalent	60000	Radiation Source Clinical Research
7. Uranium - Depleted	Plated Metal	150 KG.	Shielding

Total Possession Limit = 140,000 millicuries

Item 6.b., 6/18/80  
VA Medical Center  
Long Beach, Calif.

Item 7. Medical Isotopes Committee

<u>NAME</u>	<u>SPECIALTY</u>
1. K. P. Lyons, M.D. (Committee Chairman) Chief, Nuclear Medicine Service	Nuclear Medicine
2. Hiroshi Nagaya, M.D. Chief, Allergy Section Medical Service	Immunology
3. W. Florsheim, Ph.D., RSO	Endocrine Biochemist Medical Research
4. V. L. Gelezunas, Ph.D., RSO	Physicist, Nuclear Medicine
5. K. Swingle, Ph.D., RSO	Physicist, Radiation Therapy

A total of three members present will constitute a quorum.

Item 7, 6/18/80  
VA Medical Center  
Long Beach, Calif.

APPENDIX B  
MEDICAL ISOTOPES COMMITTEE

Responsibility:

The Committee is responsible for:

1. Ensuring that all individuals who work with or in the vicinity of radioactive material have sufficient training and experience to enable them to perform their duties safely and in accordance with NRC regulations and the conditions of the license.
2. Ensuring that all use of radioactive material is conducted in a safe manner and in accordance with NRC regulations and the conditions of the license.

Duties:

The Committee shall:

1. Be familiar with all pertinent NRC regulations, the terms of the license, and information submitted in support of the request for the license and its amendments.
2. Review the training and experience of any individual who uses radioactive material (including physicians, technologists, physicists, and pharmacists) and determine that the qualifications are sufficient.



to enable them to perform their duties safely and in accordance with NRC regulations and the conditions of the license.

3. Establish a program to ensure that all individuals whose duties may require them to work in the vicinity of radioactive material (e.g., nursing, security and housekeeping personnel) are properly instructed as required by Section 19.12, of 10 CFR Part 19.
4. Review and approve all requests for use of radioactive material within the institution.
5. Prescribe special conditions that will be required during a proposed use of radioactive material such as requirements for bioassays, physical examinations of users and special monitoring procedures.
6. Review the entire radiation safety program at least annually to determine that all activities are being conducted safely and in accordance with NRC regulations and the conditions of the license. The review shall include an examination of all records, reports from the radiation safety officer, results of NRC inspection, written safety procedures and management control system.



7. Recommend remedial action to correct any deficiencies identified in the radiation safety program.
8. Maintain written records of all committee meetings, actions, recommendations, and decisions.
9. Ensure that the byproduct material license is amended, when necessary, prior to any changes in facilities, equipment, policies, procedures, and personnel.

Meeting Frequency:

The medical isotopes committee shall meet as often as necessary to conduct its business, but not less than once in each calendar quarter.

April 15, 1980

CURRICULUM VITAE

KENNETH PAUL LYONS, M.D.

Born: November 12, 1938  
Worcester, Mass.

Citizenship: U.S.

Sex: Male

Business Address: Nuclear Medicine Service  
Veterans Administration Hospital  
5901 E. 7th Street  
Long Beach, California 90822

Telephone: (213) 498-6237

Home Address: 29 Cayuse Lane  
Rancho Palos Verdes, California 90274

Telephone: (213) 833-7670

Marital Status: Married  
Wife's Name: Joanna  
Children: 4

EDUCATION:

High School: St. Anthony's High School, Long Beach, California.  
Graduated 1957.

College: University of Santa Clara, Santa Clara, California.  
1957-1959.

Loyola University, Los Angeles, California.  
B.S. Biology, 1961.

Medical: Creighton University Medical School, Omaha, Nebraska.  
M.D., 1965.

POST-GRADUATE EDUCATION:

Internship: Straight Medical, Creighton Memorial St. Joseph's  
Hospital, Omaha, Nebraska. 1965-66.

Item 7  
VAMC, Long Beach  
CA, 6/10/80

POST-GRADUATE EDUCATION: (Continued)

Residency: Internal Medicine, UCLA, Harbor General Hospital, Torrance, California. 1966-1966, 1968-1971.

Fellowship: Nuclear Medicine, UCLA Department of Radiological Sciences. July 1971-January 1973 (USPHS Traineeship).

Graduate Physics: Medical Physics, UCLA Department of Radiological Sciences. Full enrollment in Master Graduate Program, July 1971 to January 1973.

ADDITIONAL RESEARCH EXPERIENCE AND EDUCATION:

Public Health Student Research Fellow 1962-1966.  
Creighton Cardiopulmonary Research Laboratory.

BOARD CERTIFICATION:

American Board of Nuclear Medicine, 5-18-73.

National Board of Medical Examiners.

LICENSURE:

California 1967 (License No. G12843) Reciprocity with National Board of Medical Examiners.

Nebraska 1965 (License No. 11400) State Board of Medical Examiners.

MILITARY SERVICE:

Commissioned Officer, rank of Captain, USAF, assigned to Mather AFB, Sacramento, California. 1966-1968. Honorably Discharged 1968.

PROFESSIONAL ORGANIZATIONS:

American College of Radiology  
California Medical Association  
Society of Nuclear Medicine  
Los Angeles County Medical Association  
American Medical Association  
American College of Nuclear Physicians  
American Federation for Clinical Research

CIVIC ACTIVITIES:

Chairman, Student Body Legislature, Loyola University,  
Los Angeles, California, 1960.

Student Body Vice President, Loyola University,  
Los Angeles, California, 1961.

Chairman, Loyola Belles Service Organization, 1961.

Century Club, Loyola Marymount University.

OTHER ACTIVITIES:

Licensed Private Pilot. Instrument Rated.

PROFESSIONAL EXPERIENCE AND ACADEMIC APPOINTMENTS:

Attending Physician (Instructor) Department of Internal Medicine,  
Harbor General Hospital-UCLA, 1971 to June 1973.

Attending Staff, UCLA Hospital, Department of Radiological Sciences,  
July 1972 to December 1972.

Adjunct Instructor in Nuclear Medicine, UCLA Medical Center, July  
1972 to July 1973.

Acting Chief, Nuclear Medicine Service, Veterans Administration  
Hospital, Long Beach, California, January 1973 to July 1973.

PROFESSIONAL EXPERIENCE AND ACADEMIC APPOINTMENTS: (Continued)

Chief, Nuclear Medicine Service, Veterans Administration Medical Center, Long Beach, California, August 1973 to present.

Assistant Professor-in-Residence, Department of Radiological Sciences, University of California, Irvine, January 1973 to present.

Administrator for the Broad Form Medical Radioisotope License for the Long Beach VA Medical Center. All clinical and research activities involving the use of radioactive sources at the Long Beach VA Medical Center are under the aegis of this license. June 1973 to present.

Alternate California Representative to the American College of Nuclear Physician. 1979-1981.

PRESENT POSITION:

Chief, Nuclear Medicine Service, Veterans Administration Medical Center, Long Beach, California.

This is an autonomous, free standing service occupying 4250 sq. ft. of floor space with an operating budget of \$92,000 annually.

The staff consists of:

- 5 Staff Physicians
- 1 Ph.D. Radiation Physicist
- 1 M.S. Radiopharmacist
- 2 Nuclear Medicine Fellows
- 1 Administrative Officer
- 2 Secretaries
- 5 Technicians
- 2 Technician Trainees
- 2 Part-time Clerks



COMMITTEE ACTIVITIES:

Member Hospital Isotope Committee, Long Beach VA Hospital,  
January 1973 to January 1974.

Member Research and Education Committee, Long Beach VA Hospital,  
August 1973 to August 1974.

Chairman, Hospital Isotope Committee, Long Beach VA Hospital,  
January 1974 to present.

Member and rotating Chairman, Professional Standards Board,  
Long Beach VA Hospital, April 1974 to present.

Chairman, Human Studies Subcommittee, Long Beach VA Hospital,  
August 1974 to July 1975.

Chairman-Elect, Research and Education Committee, Long Beach VA  
Hospital, August 1974 to July 1975.

Member, Human Subjects Review Committee-Medical, University of  
California, Irvine, October 1974 to September 1977.

Ex-Officio Member, Human Studies Subcommittee, Long Beach VA  
Hospital, July 1975 to present.

Chairman, Research and Development Committee, Long Beach VA  
Hospital, July 1975 to June 1976.

Ex-Officio Member, Resources Committee for Medical Research,  
Long Beach VA Hospital, August 1975 to present.

Nominating Committee, Southern Chapter, Society of Nuclear Medicine,  
1976-77.

Committee on Allied Health Professions, University of California,  
Irvine, December 1977 to 1978.

Member Cancer Committee, Long Beach VAMC, August 1978 to present.



CONSULTANT EXPERIENCE:

Consultant in Nuclear Medicine to Western Tumor Medical Group, Van Nuys, California, January 1973 to present.

Consultant and Lecturer in Nuclear Medicine at University of California Medical Center, Orange, California, January 1973 to present.

Consultant in Nuclear Medicine, Harbor Kaiser Permanente Hospital, June 1973 to June 1974.

Nuclear Medicine Consultant to Ridgecrest Community Hospital, Ridgecrest, California, September 1973 to present.

HOSPITAL STAFF MEMBERSHIP:

Medical Attending Staff, University of California Medical Center, Orange, California, January 1973 to present.

Long Beach Veterans Administration Hospital, January 1973 to present.

Ridgecrest Community Hospital, Ridgecrest, California, September 1973 to present.

EDITORIAL AND ADVISORY POSITIONS:

UCI Representative to the Advisory Panel on Nuclear Medicine for the California Medical Association, January 1975 to present.

Reviewer for CMA Accreditation toward Continuing Medical Education for all Northern California Programs in Nuclear Medicine, April 1975 to present.

Associate Editor, Journal of Clinical Nuclear Medicine, J. B. Lippincott Publishers, October 1975 to present.

Editorial Advisory Panel on Nuclear Medicine to the Western Journal of Medicine.

Technical advisor for Nuclear Medicine to the Southern California VA Regional RIA Laboratory.

TEACHING ACTIVITIES:

Research advisor for a graduate student from Long Beach State. His Master's thesis was completed on August 1976 concerning the production of a new radioimmunoglobulin.

Director of the Nuclear Medicine Residency Training Program, Long Beach VA Hospital affiliated with the University of California, Irvine. AMA approved. December, 1974 to present.

Guest lecturer, Los Angeles City College, on Clinical Nuclear Medicine.

Bi-monthly lecture series on Clinical Nuclear Medicine at University of California Medical Center.

Invited lecturer, University of California, Irvine, Continuing Medical Education.

Director of the Nuclear Medicine Technician Training Program, Long Beach VA Hospital.

RESEARCH ACTIVITIES:

Radio-labeling of 2,3 DPG with  $^{99m}\text{Tc}$  Pertechnetate.

This new radiopharmaceutical has been successfully labeled and when sufficiently purified will provide a useful tool for rapidly measuring 2,3 DPG concentrations in banked blood for simple determination of hemoglobin oxygen affinity. Additional goals will be to tag red cells for a much needed in-vivo vascular compartment radionuclide.

External Measurement of Organ Volume by Compton Scattering.

We are designing a collimator to use with a semiconductor detector, pulse height analyzer, and pin point source device to assess the dimensions of the internal organs by Compton Scattering. Initial efforts will be directed toward determination of the thyroid volume to allow a more accurate computation for an I-131 treatment of thyroid disease. This procedure will then be applied to other organs of larger dimension lying deeper within the body.

RESEARCH ACTIVITIES: (Continued)The Use of Radioxenon in the Measurement of Air Exchange in Sinus Cavities of the Head.

Using semiconductor detectors with extremely high resolution electronics, the radioactivity within small sinus spaces can be separated from surrounding structures and when these spaces are filled with radioxenon, the rate of air exchange can be determined by analysis of the wash out curve. This information is not known and to date there is no means for measuring it.

Production and Purification of Antithyroglobulin Antibody with Radiolabeling.

The development of this new radiopharmaceutical for the imaging and treatment of thyroid disease is an entirely new concept in the field of imaging agents. It is a tissue specific radiopharmaceutical independent of common variables such as iodide contamination. Using newly developed techniques of affinity chromatography with antigen impregnated sephorose columns, a highly purified radiolabeled immunoglobulin can be produced. We have been successful in harvesting large amounts of antithyroglobulin antibody from the burro to rabbit thyroglobulin. The thyroglobulin antigen has been isolated and when sufficiently purified will be tagged to the column. These production and purification techniques can then be used as a prototype for the production of other tissue specific imaging and therapeutic agents.

Multiple Gated Cardiac Function Studies.

Comparison of first pass versus equilibration methods of measuring cardiac ejection fraction compared to contrast angiography. A new method of red cell labeling is also being evaluated as an ancillary project.

RESEARCH ACTIVITIES: (Continued)

Regional Pulmonary Blood Flow.

Intravenous radioxenon is being used to measure regional pulmonary blood flow in dogs during induced pulmonary edema. This is correlated with V/Q ratios, pH, PCO<sub>2</sub>, PO<sub>2</sub> and pulmonary compliance.

BIBLIOGRAPHY:

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2. AW Brody, TC Connolly, KP Lyons, JJ McGill, and R Johnson, "Bolus-Augmented Continuous Injection of Indicators for Cardiac Output." J. Appl. Physiol. 31:117-125, 1971.
3. AW Brody, JH Kurowski, TC Connolly, JJ McGill, KP Lyons, MJ Weaver, and JJ Wagner, "The Preparation, Solubility, and (Non) Toxicity of Dimethyl Ether Solutions." J. New Drugs 6:121, 1966. Abst.
4. J Woodbury, KP Lyons, JF Sullivan, "Cerebrospinal Fluid and Serum Levels of Magnesium, Zinc, and Calcium in Man." Neurology 18:700, 1968.
5. KP Lyons, L Guze. "Australia Antigen Associated Hepatitis: Radioimmunoassay in Mother and Infant." JAMA 215:981, 1971.
6. VL Gelezunas and KP Lyons, "Measurement of the Radiation Exposure Resulting from Using an Automated, Solvent Extraction Type, Technetium Generator." J. Nuc. Med. Tech. 3:204-207, 1975.
7. KP Lyons, "The Role of Inhalation Lung Scans in the Diagnosis of Pulmonary Embolus." Western J. Med., 123:389-390, 1975.
8. KP Lyons, HG Olson, WS Aronow, WT Brown, J Kuperus, "Interpretation of <sup>99m</sup>Tc Pyrophosphate Myocardial Scintigrams in Patients with Previous Myocardial Infarction." Western Regional Meeting, H9, 1976. Abst.
9. HG Olson, KP Lyons, WS Aronow, WT Brown, and R Greenfield, "Follow-Up <sup>99</sup>Tc Pyrophosphate Myocardial Scintigrams in Patients with Acute Myocardial Infarction." Clinical Research 25:93, 1977. Abst.
10. HG Olson, KP Lyons, WS Aronow, and EA Stemmer, "Pre-Operative and Post-Operative <sup>99</sup>Tc Pyrophosphate Myocardial Scintigrams in Severe Coronary Artery Disease." Clinical Research 25:93, 1977. Abst.

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11. KP Lyons, HG Olson, WS Aronow, WT Brown, and JH Kuperus, "Persistence of an Abnormal Pattern on Technetium-99m Pyrophosphate Myocardial Scintigraphy Following Acute Myocardial Infarction." *Clinical Nuc. Med.* 1:253-257, 1976.
12. J Leeb, W Baumgartner, KP Lyons and A Lorber, "Uptake, Distribution and Excretion of Sodium Selenite in Rheumatoid Subjects: Energy Research and Development Administration Symposium Series 42, CONF-750929, Richland, Washington, 1975.
13. HG Olson, KP Lyons, WS Aronow, WT Brown, and R Greenfield, "Follow-Up <sup>99</sup>Tc Pyrophosphate Myocardial Scintigrams in Acute Myocardial Infarction." (Abst.) *The Am. J. Card.* 39:308, 1977.
14. J Kuperus, KP Lyons, "Chromatography of Tc-99m Labeled Radiopharmaceuticals." *J. Nuc. Med.* 18:494-495, May 1977.
15. KP Lyons, HG Olson, JH Kuperus, WS Aronow, and EA Stemmer, "Preoperative, Postoperative, and Late Follow-up Tc-99m Pyrophosphate Myocardial Scintigraphy and Coronary Artery Bypass Surgery." (Abst.) *J. Nuc. Med.* 18:612, June 1977.
16. KP Lyons, JH Kuperus, HW Green, "Localization of <sup>99m</sup>Tc-Pyrophosphate in the Liver Due to Massive Liver Necrosis." *J. Nuc. Med.* 18:550-552, June 1977.
17. HG Olson, KP Lyons, WS Aronow, WT Brown, and RS Greenfield, "Follow-Up Technetium-99m Stannous Pyrophosphate Myocardial Scintigrams after Acute Myocardial Infarction." *Cir. Vol.* 56, No. 2, August 1977.
18. PK Sansi, KP Lyons, "Radionuclide Techniques for Detection of Occult Abscesses." *Western J. of Medicine* 126:486, June 1977.
19. KP Lyons, "Oral Contraceptives, Hepatic Adenomas and Liver Scans." *Western J. of Medicine* 126:485, June 1977.
20. H Olson, K Lyons, W Aronow, H Waters, "Identification of High Risk Unstable Angina Patients for Mortality and Myocardial Infarction." *Circulation* 55: Suppl. No. 3, 173, 1977.
21. H Olson, K Lyons, W Aronow, and L Cooper, "Technetium-99m-Pyrophosphate Myocardial Scintigraphy and Pericardial Disease." *Circulation* 55: Suppl. No. 3, 62, 1977.
22. K Lyons, "Benign Hepatic Adenoma," Editorial, *Clinical Nuclear Medicine*, Vol. 1, No. 3, August 1976.



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23. KP Lyons, HG Olson, JH Kuperus, WS Aronow, and EA Stemmer, "Significance of Positive Tc-99m Pyrophosphate Scintigraphy in Severe Coronary Artery Disease Without Acute Myocardial Infarction." (Abst.) Western Regional Meeting, Soc. of Nuc. Med., C2, October 1977.
24. JH Kuperus and KP Lyons, "An Easily Constructed Automatic Chromographic System: Comparison with a Commercial Chromatography Kit (MAC) and Manually Counted Segments of ITCL-SG Strips." (Abst.) Western Regional Meeting, Soc. of Nuc. Med., B5, October 1977.
25. JH Kuperus, K Crowley, and KP Lyons, "Localization of Tc-99m Pyrophosphate in Rat Liver in Association with Tissue Necrosis." (Abst.) Western Regional Meeting, Soc. of Nuc. Med., H4, October 1977.
26. V Gelezunas and KP Lyons, "Densitometry of Low Z Material Based on Compton Scattering and High Resolution Gamma Ray Spectrometry." AAPM, Cincinnati, 1977.
27. KP Lyons, JH Kuperus, RM Conroy, and HF Pribram, "Localization of Tc-99m Labeled Gelfoam Emboli Injected for Obliteration of Esophageal Varices." (Abst.) Western Regional Meeting, Soc. of Nuc. Med., H6, October 1977.
28. WT Brown, KP Lyons, and RL Winer, "Changing Manifestations of Brown Tumors on Bone Scan: Case Report." J. Nuc. Med., Vol. 19(10): 1146-1148, October 1978.
29. H Olson, K Lyons, W Aronow, J Orlando, J Kuperus, and D Hughes, "Prognostic Implications of a Persistently Positive Technetium-99m-Pyrophosphate Myocardial Scintigram after Acute Myocardial Infarction." (Abst.) The Am. J. Card. 41:440, February 1978.
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31. KP Lyons, HG Olson, JH Kuperus, EA Stemmer, and WS Aronow, "Correlations of <sup>99m</sup>Tc-Pyrophosphate Myocardial Scintigraphy and the Results of Coronary Artery Bypass Surgery." J. Nuc. Med., Vol. 19:1116-1120, October 1978.
32. H Olson, K Lyons, WS Aronow, J Orlando, and J Kuperus, "Technetium-99m-Pyrophosphate Myocardial Scintigraphy in Patients Resuscitated from Sudden Lethal Arrhythmias." (Abst.) Clin Res, Vol 26, No. 2, February 1978.



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33. H Olson, K Lyons, WS Aronow, J Orlando, and J Kuperus, "Prognostic Implications of a Persistently Positive Technetium-99m-Pyrophosphate Myocardial Scintigram after Acute Myocardial Infarction." (Abst.) Clin Res, Vol. 26, No. 2, February 1978.
34. VL Gelezunas and KP Lyons, "High Spatial Resolution Compton Densitometry Based on High Energy Resolution Gamma Ray Spectrometry." Physics in Medicine and Biology. (In press)
35. H Olson, K Lyons, W Aronow, and L Cooper, "Technetium-99m-Pyrophosphate Myocardial Scintigraphy and Pericardial Disease." Am Heart J. 99, No. 4:459-467, April 1980.
36. KP Lyons, H Olson, W Aronow, "Sensitivity and Specificity of  $^{99m}\text{Tc}$  Pyrophosphate Myocardial Scintigraphy for the Detection of Acute Myocardial Infarction." Clinical Nuc Med. 5:8-12, January 1980.
37. HG Olson, KP Lyons, WS Aronow, JR Orlando, J Kuperus, and P Troop, "Scintigraphic Assessment of Left Ventricular Function During Acute Myocardial Infarction and at Follow-up." (Abst.) Clin Res 27:9A, 1979.
38. RP Karlsberg, Norah Milne, KP Lyons, and WS Aronow, " $^{99m}\text{Tc}$ -DMSA Localization of Acute Myocardial Infarction." (Abst.) Clin Res, 27: 178A, April 1979.
39. SY Wu, A Wiechmann, LJ Chopra, DH Solomon, and KP Lyons, "Effect of Ethanol on Peripheral Thyroid Hormone Metabolism in Rats." (Abst.) Clin Res 27:25A, 1979.
40. HG Olson, KP Lyons, WS Aronow, JR Orlando and J Kuperus. "Improved Localization of Acute Myocardial Infarction by Combining Technetium-99m-Pyrophosphate Myocardial Scintigraphy with Electrocardiography." (Abst.) Clin Res Vol. 27:9A, 1979.
41. KP Lyons and JL Jensen. "Dental Lesions Causing Abnormalities on Skeletal Scintigraphy." Clin Nuc Med 12:440-443, 1979.
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43. KP Lyons and ME Morton. "Phosphate Myocardial Infarct Imaging: Are the New Bone-Seeking Agents Better?" Clin Nuc Med, Vol 4(3):132-133, March 1979.

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45. KP Lyons, HG Olson, and WS Aronow. "Significance of Radionuclide Left Ventricular Ejection Fraction (LVEF) Measurements During Acute Myocardial Infarction (AMI)." Abst, J8, 4th Ann. West. Reg. Mtg., Society of Nuc. Med., Monterey, CA, Oct. 1979.
46. RP Karlsberg, KP Lyons, VL Gelezunas, JH Kuperus, DA Friscia, and WS Aronow. "Precise Localization of Regional Myocardial Blood Flow Using a New Radiation Detector." Abst. Clin Res 28, No. 2:185A, April 1980.
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49. HG Olson, KP Lyons, WS Aronow, and P. Troop. "Prognostic Value of Multiple Gated Equilibrium Scintigraphic Left Ventricular Ejection Fraction During Acute Myocardial Infarction." Abst., Clin Res 28:11A, 1980.
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1. Atlas of Nuclear Medicine Imaging. Associate Author, Appleton-Century-Croft, NY. (In press)
2. Scintigraphy of Migrating Pulmonary Emboli.
3. "Current Status of Infarct Avid Imaging." Chapter in Cardiovascular Nuclear Medicine. Leonard Freeman, Editor, Grune & Stratton, NY. (In press)
4. HG Olson, KP Lyons. "Clinical Application of Technetium-99m Pyrophosphate Myocardial Scintigraphy in Patients with Coronary Artery Disease." Prim. Card. (In press)

EXHIBITS:

1. H Olson, KP Lyons, W Aronow, H Waters. "Identification of High Risk Unstable Angina Patients for Mortality and Myocardial Infarction." Abstr., Cir., Oct. 1977.

INVITED LECTURER:

SUBJECT/TOPIC

1. Palm Harbor General Hospital  
Garden Grove, CA  
January 20, 1976  
"Examination of the Heart by  
Nuclear Medicine Techniques"
2. University of California Extension  
Riverside, CA  
January 28, 1976  
"Nuclear Medicine: What is it?"
3. Los Angeles City College  
Nuclear Medicine Technology Prog.  
March 2, 1976  
"Lung Scans"
4. Studebaker Hospital  
Norwalk, CA  
August 27, 1976  
"Use of the Scintillation Camera"
5. UCI Medical Center  
Orange, CA  
November 2 & 9, 1976  
(Medical Students in Radiological Sciences under Prof. Dure-Smith -  
Course entitled "1976 Mechanisms of Disease")  
"Nuclear Medicine"
6. UCLA  
November 8, 1976  
"Clinical Uses of the Tc-Pyro-  
phosphate Myocardial Scan"
7. Los Angeles City College  
Nuclear Medicine Technology Prog.  
March 21, 1977  
"Lung Scans"
8. Los Angeles County-USC Medical  
Center  
May 17, 1977  
"Pyrophosphate Imaging of the  
Heart"
9. UCI Medical Center  
Orange, CA  
November 8, 1977  
(Medical Students in Radiological Sciences under Prof. Dure-Smith,  
Course entitled "1977 Mechanisms of Disease")  
"Nuclear Medicine"
10. UCLA  
March 20, 1978  
"Evaluation of Coronary Artery Disease  
by Multiple Radionuclides"
11. AMA Regional Meeting, Newport Beach  
March 12, 1978  
"Recent Advances in Nuclear Cardiology"
12. Olive View Medical Center  
Van Nuys, Ca.  
December 4, 1978  
"Technetium-99m Pyrophosphate Myocardia  
Imaging"

INVITED LECTURER:

SUBJECT/TOPIC

- |   |  |
|---|--|
| 13. Cardiovascular Nuclear Medicine<br>Conference, Disneyland Hotel,<br>Anaheim, CA<br>April 28, 1979 | "Myocardial Infarct Imaging"                                     |
| 14. Encino Hospital<br>Encino, CA<br>July 9, 1979   | "Gallium Scanning"   |
| 15. Orange County Radiological Society<br>on Nuclear Cardiology<br>Santa Ana, CA<br>10/23/79          | "Pyrophosphate Heart Scintigraphy<br>in Coronary Artery Disease" |
| 16. Dept. of Nuclear Medicine<br>USC, School of Medicine<br>Los Angeles, CA<br>10/25/79               | "Clinical Use of Pyrophosphate<br>Myocardial Scintigraphy"       |
| 17. Encino Hospital<br>Encino, CA<br>1/28/80  | "Cardiac Imaging"  |



PRESENTATIONS:

1. "Significance of Positive Tc-99m Pyrophosphate Scintigraphy in Severe Coronary Artery Disease Without Acute Myocardial Infarction." KP Lyons, HG Olson, JH Kuperus, WS Aronow, and EA Stemmer. Western Regional Meeting, Society of Nuclear Medicine, C2, October 1977.
2. "Interpretation of  $^{99m}\text{Tc}$  Pyrophosphate Myocardial Scintigrams in Patients with Previous Myocardial Infarction." KP Lyons, HG Olson, WS Aronow, WT Brown, JH Kuperus. Western Regional Meeting, Society of Nuclear Medicine, October 1976.
3. "Preoperative, Postoperative, and Late Follow-up Tc-99m Pyrophosphate Myocardial Scintigraphy and Coronary Artery Bypass Surgery." KP Lyons, HG Olson, JH Kuperus, WS Aronow, and EA Stemmer. Society of Nuclear Medicine 24th Annual Meeting, June 1977.
4. "Localization of Tc-99m Labeled Gelfoam Emboli Injected for Obliteration of Esophageal Varices." KP Lyons, JH Kuperus, RM Conroy, and HF Pribram. Western Regional Meeting, Society of Nuclear Medicine, H6, October 1977.
5. "Studies of the Cardiovascular System", Refresher Course C, Panel of Experts. 2nd Annual Western Regional Meeting, Society of Nuclear Medicine, October 1977.
6. Radiopharmaceutical/RIA Session, Moderator. 2nd Annual Western Regional Meeting, Society of Nuclear Medicine, October 1977.
7. "Results of Tc-99m Pyrophosphate Myocardial Scintigraphy Compared to Angiography, ECG, Chest Pain, and Previous Infarction in Coronary Artery Disease." World Federation of Nuclear Medicine and Biology. September 1978.
8. "Weighted Background Subtraction of Routine Gamma Camera Images Based on the Distribution of Compton Scatter." 3rd Annual Western Regional Meeting of the Society of Nuclear Medicine, October, 1978.
9. "Localized Versus Diffuse Pattern of Tc-99m Pyrophosphate Myocardial Scintigraphy for the Diagnosis of Acute Myocardial Infarction." 3rd Annual Western Regional Meeting of the Society of Nuclear Medicine. October 1978.
10. "Sensitivity and Improved Specificity of a Localized Pattern of  $^{99m}\text{Tc}$  Pyrophosphate Myocardial Scintigraphy for the Diagnosis of Acute Myocardial Infarction." 26th Annual Meeting, Society of Nuclear Medicine, Atlanta, Georgia, June 1979.

PRESENTATIONS:

11. "Significance of Radionuclide Left Ventricular Ejection Fraction (LVEF) Measurements During Acute Myocardial Infarction (AMI)." 4th Annual Western Regional Mtg., Society of Nuclear Medicine, Monterey, CA, October 1979.

## RESUME

VINCENT L. GELEZUNAS

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La Habra Heights, California 90631

Phone: (213) 697-7889

Business Address: Nuclear Medicine Service  
VA Hospital  
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Phone: (213) 498-1313  
Ext. 2176

PERSONAL HISTORY

Birthdate and Place:	January 7, 1929, Naugatuck, Conn.
Marital Status:	Married, Three children
Citizenship:	United States
Military Service:	July 1946-July 1949 Air Force Medical Lab

EDUCATIONAL SUMMARY

BS Chem. Eng. (with distinction)	Purdue University	(1953)
MS Chem. Eng.	Purdue University	(1955)
Ph.D. Nuc. Eng.	University of Cincinnati	(1962)
Diploma	Oak Ridge School of Reactor Technology (AEC-operated)	(1957)

HONORS AND SOCIETIES

American Society of Metals  
American Association for the Advancement of Science  
American Society for Engineering Education  
Tau Beta Pi  
Sigma Xi  
General Electric Fellowship with Industry  
American Association of Physicists in Medicine  
Society of Nuclear Medicine  
Health Physics Society

EXPERIENCE SUMMARY

In depth experience in the fields of nucleonics, nuclear materials and nuclear engineering. Established an excellent record in solving or illuminating a broad spectrum of problems in industrial, biological and medical areas. Managed and led efforts in generating novel nuclear radiation detection systems based on semiconductor technology. Responsibilities ranged from initial concept to reduction to practice.

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EXPERIENCE SUMMARY - Continued.

Other management experience includes planning and establishing of a Biological Physics Laboratory. This laboratory provided technological support for planetary exploration and quarantine programs, the Biosatellite Program and Departmental programs in air and water pollution control.

Other contributions include the development of exotic nuclear materials, the measurement of physical properties, the assessment of radiation effects, the determination of performance of materials combinations such as fuel elements, solid moderators and control rods in nuclear reactor environments, research in the production of radiosotopes, the development of sophisticated radioisotope tracer techniques especially for use in biology, and the conception and development of new radiation sensing systems based on semiconductor technology for use in biology, health physics, and medicine.

WORK EXPERIENCE SUMMARY

September 1974 to Present      Radiation Medical Physicist, Nuclear Medicine Service, Long Beach VA Hospital

October 1976 to Present      Associated Research Medical Physicist, University of California, Irvine, CA

October 1974 to October 1976      Laboratory of Nuclear Medicine of Radiation Biology, (UCLA)

Responsible for the adaption, development and reduction to practice of new and novel nuclear instrumentation concepts to be used in nuclear medicine. Provide instruction and education to physicians and technicians in nuclear medical instrumentation principals and radiation safety. Serve as the Radiation Safety Officer for unsealed sources and provide quality control methodology for all nuclear medical instruments. Provide consultation as needed in radiation dosimetry and review all new patient procedures which use radioisotopes.

January 1969 to September 1974      Product Manager-Nuclear Detection Research Space Technology Products, General Electric

Responsible for nuclear product research which is pointed toward the application of radiation detection technology to the solution of problems in biology, medicine, and industry. Advanced the development and applied contoured silicon avalanche technology to the sensitive detection of low energy electrons, beta emitters and x-ray externally and in vivo with special emphasis on the isotopes of plutonium. Led efforts which resulted in the design, fabrication and test of a prototype model of a wide range neutron-gamma-beta dosimeter based on silicon avalanche detection technology. Conceived and developed a new ultra sensitive radiation detection system and established the methodology for this extremely low background radiation detection system. Currently leading efforts directed toward

VINCENT L. GELEZUNAS

WORK EXPERIENCE SUMMARY - Continued.

bringing uncompensated germanium to practical use in radiation detection systems. Major detection systems conceived and developed included a gamma densitometer for determination of cardiac function based on silicon technology, a brain blood flow analyzer based on a germanium detector array, and adaptation of closed cycle refrigeration technology to high performance gamma spectrometers.

August 1964 to January 1969     Manager, Principal Engineer-Biological Physics  
Re-entry and Environmental Systems, General  
Electric Co., KING OF PRUSSIA, PA.

Generated a roadmap, established and managed a biological physics laboratory which provided technological support for interplanetary and Biosatellite programs. The laboratory grew to ten professionals. Senior investigator in programs which established the use of radioisotopically labeled bacteria in studies of cleanability, permeability and surface sampling. Conceived and developed in the laboratory a unique, highly sensitive, wide range water vapor detector intended for use in extraterrestrial environments. Principal contributor to the development of high dynamic capacity ion exchange resins for use in high performance water purification systems. Developed automated chemical analysis systems intended for biomedical use.

August 1962 to August 1964     Senior Engineer - Fuels Design  
Hanford Laboratories, General Electric Co. *Richland, WA*

Designed, selected and oversaw fabrication and in-reactor testing of nuclear reactor fuel elements and nuclear targets. Established post reactor test procedures and evaluations of in-reactor performances. Developed novel techniques for the remote mensuration of highly radioactive fuel elements.

September 1959 to August 1962     Graduate Student, University of Cincinnati, sponsored by the General Electric Company Aircraft Nuclear Propulsion Department. Thesis: "Diffusion Coefficients for Hydrogen in Beta-Zirconium." Consulted with groups developing solid moderators and studying diffusion of fission fragments in ceramic fuel elements. This work resulted in establishing satisfactory diffusion cycles for hydrides of zirconium and yttrium, and an understanding of the mass transport phenomena of these systems.

February 1959 to September 1959     Senior Engineer, ANPD, General Electric, Cincinnati, Ohio. Planned and evaluated in reactor tests of high temperature reactor components. Provided design and materials evaluation assistance to insure meaningful and timely tests. Generated methods for correlating the operating life of test fuel elements with test and reactor parameters.



VINCENT L. GELEZUNAS

WORK EXPERIENCE SUMMARY - Continued.

September 1957 to February 1959 Junior Engineer, ANPD, General Electric, Cincinnati, Ohio. Led materials selection and evaluation resulting in the development of manufacturing specifications for high temperature gas cooled control rods. Similar responsibilities for shield materials. Liaison with design and manufacturing groups associated with these areas. Pioneered the use of rare earth oxides as cermets in high performance control rods.

September 1956 to September 1957 Student, Oak Ridge School of Reactor Technology. Selected and sponsored by the General Electric Company. Part time consultant in nuclear reactor technology to the materials development group. Responsible for the first in reactor tests of hydrided zirconium.

PUBLICATIONS:

1. "Diffusion Coefficients for Hydrogen in Beta-Zirconium," J. Electrochem. Soc. 110, 799 (1963).
2. "Study of the Biological Cleanability of Surfaces Using Radiosotope Tracer Techniques," Aerospace Medicine 39, 856 (1968).
3. "Wide Range, High Sensitivity Water Vapor Detection Based on Chemical Radiological Techniques," Anal. Chem. 41, 1900 (1969).
4. "Response of the Silicon Avalanche Detector in Beta, Gamma, X-ray and Neutron Dosimetry," Phys. Med. Biol. 17, 381 (1972).
5. "Development of Six Element High Purity Germanium Detector Array for Cerebral Blood Flow Studies," IEEE TRANS. NUCLEAR SCI., No. 1, 411 (1973) NS-20
6. "Operational Characteristics of a High Purity Germanium Photon Detector Cooled by a Closed Cycle Cryogenic Refrigerator," IEEE TRANS. NUC. SCI., NS-20, No. 1, 522 (1973).
7. "The Effect of Exposure to Various Gaseous Environments on the Subsequent Performance of High Purity Germanium Gamma Ray Detectors," IEEE TRANS. NUC. SCI. NS-21, No. 1 (1974).
8. "Measurement of Radiation Exposure Resulting from Using an Automated, Solvent-Extraction-Type, Technetium Generator," J. of Nuclear Med. Technology, 3, 204 (1975).
9. "Uniform Large-Area High Gain Silicon Avalanche Radiation Detectors from Transmutation Doped Silicon," Appld Phys. Letters, 30, 118, (1977).

PATENTS:

1. "Apparatus for Water Detection Using a Radioactive Tritium Labelled Reactant," Ser. No. 3, 655, 982, April 11, 1972.
2. "Enhanced Beta Particle Detection of Thin Nuclear Detectors," S.N. 17, 403, filed March 9, 1970.
3. "Non-Contoured, Glasses Large Area Silicon Avalanche Radiation Detectors," Docket #39-SS-2278, disclosed March 9, 1973.
4. "Exposure of High Purity Germanium Gamma Ray Detectors to a Gas Environment," Docket #39-SS-2324, disclosed June 22, 1973.

SIGNIFICANT REPORTS:

1. "The Determination of the Diffusion Coefficient of Gas-Metal System," (Secret) Report # Apex 409, General Electric Co., Cincinnati, Ohio, September, 1957.
2. "Rare Earth Oxide Dispersions for Control Rods" (Secret) Report #XDC-59-5-18, General Electric Co., Cincinnati, Ohio, April 1959.
3. "Measurement of Dimensional Change Observed As a Result of Irradiation of Prototype N-Reactor Fuel Element" (Secret) Hanford Laboratory Report, General Electric Co., Richland, Washington, (1964).
4. "Urine Freeze Dry Experimental Study for Automated Analysis", Project Biosatellite - Contract #2-2150P, General Electric Co., Philadelphia, Pa. (1965)
5. "Evaluation of the Effectiveness of Cleaning Techniques on Bio-Road Reduction Through the Use of Radioactive Tracers" PIR-8122-625, General Electric Co., Philadelphia, Pa. (May, 1965).
6. "The Detection of Small Holes Using Tracer Gases", PIR-8122-612, General Electric Co., Missile and Space Division, (February 1965).
7. "The Determination of the Response of a Shaped Semiconductor Radiation Detector to Tritium Gas" PIR-8122-832, General Electric Co., Philadelphia, Pa. (December 1966)
8. "Sensitive, Wide Range Water Detector for a Mars Lander", PIR-9512-163, General Electric Co., Philadelphia, Pa. (October 1968).
9. "Research on Avalanche Type Semiconductor Radiation Detectors", Semiannual Reports, Atomic Energy Commission, NYO-3246TA-5, General Electric Co., Valley Forge, Pa. (July 1969).
10. "Exploratory Development of Large Area Avalanche Solid-State Detectors For Nuclear and Infra-Red Radiation" Semiannual Reports, ECCM-0291-1, ECOM-0291-2, ECOM-0291-3, General Electric Co., Space Division, Valley Forge, Pa. (August 1971).
11. "Research on Avalanche Type Semiconductor Radiation Detectors", Semiannual Report, USAEC COO-3081TA-2, General Electric Co., Valley Forge, Pa. (1972).

## CURRICULUM VITAE

Full Name: Hiroshi Nagaya, M. D.  
 Birth Date: February 3, 1931  
 Birth Place: Yokosuka, Japan  
 College: University of Tokyo, pre-medical course  
 Medical School: University of Tokyo School of Medicine  
 Tokyo, Japan, 1956, M. D.

Hospital Training and Medical School Positions:

1956 - 57 Rotating Intern, 6407th USAF Hospital, Tokyo, Japan  
 1957 - 58 Rotating Intern, Atlantic City Hospital, Atlantic City, N.J.  
 1958 - 59 Assistant Resident in Medicine, Maryland General Hospital,  
 Baltimore, Md.  
 1959 - 60 Fellow in Medicine, Duke University Medical Center,  
 Durham, N.C.  
 1960 - 61 Clinical Fellow in Medicine, University of Tokyo Hospital,  
 Tokyo, Japan  
 1961 - 62 Chief Resident in Medicine, St. Francis Hospital,  
 Honolulu, Hawaii  
 1962 - 66 Instructor in Medicine and Research Fellow in Allergy and  
 Pulmonary Diseases, Duke University Medical Center,  
 Durham, N.C.  
 1966 - 67 Associate in Medicine, Duke University Medical Center,  
 Durham, N.C.  
 1968 - 73 Assistant Professor of Medicine, Duke University Medical  
 Center, Durham, N.C.  
 1973 - 74 Associate Clinical Professor of Medicine, Duke University  
 Medical Center, Durham, N.C.  
 1974 - Chief, Allergy-Immunology Section, Veterans Administration  
 Hospital, Long Beach, Ca., Associate Professor of Medicine  
 in-Residence, University of California at Irvine School of  
 Medicine

Memberships: American Federation for Clinical Research  
 Fellow, American Academy of Allergy  
 Southern Society for Clinical Investigation  
 Transplantation Society  
 Diplomate of the American Board of Internal Medicine  
 Fellow, American College of Physicians  
 American Rheumatism Association  
 Diplomate of the American Board of Allergy and Immunology  
 American Association of Immunologists

Medical License: North Carolina # 15510  
 Japan # 162622  
 California #A-29624

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# BIBLIOGRAPHY

Hiroshi Nagaya, M. D.

1. Oshima, Y., Shimizu, T., Yokohari, R., Matsumoto, T., Kano, K., Kagami, T., and Nagaya, H.: Clinical Studies on Behcet's Syndrome. *Ann. Rheum. Dis.*, 22: 36, 1963.
2. Nagaya, H.: Some Aspects of Arthritis in Hawaii, Evaluation of a Slide Latex Test as a Screening Method. *Hawaii Med. J.*, 22: 281, 1963.
3. Nagaya, H. and Sieker, H.O. Histochemical Study of Aminopeptidase, Acid and Alkaline Phosphatase in the Tuberculin Reaction. *Amer. Rev. Resp. Dis.*, 91: 245, 1965.
4. Nagaya, H., Schauble, M.K. and Sieker, H.O.: Experimental Hypersensitivity Pneumonitis. *Amer. Rev. Resp. Dis.*, 91: 375, 1965.
5. Nagaya, H. and Sieker, H.O.: Allograft Survival: Effect of Antiserums to Thymus Glands and Lymphocyte. *Science*, 150: 1181, 1965.
6. Nagaya, H. and Sieker, H.O.: Lymphopenic Effect of Antilymphocyte Serum. *Proc. Soc. Exp. Biol. & Med.*, 121: 722, 1966.
7. Buckley, C.E., III, Nagaya, H. and Sieker, H.O.: Altered Immunologic Activity in Sarcoidosis. *Ann. Int. Med.*, 64: 508, 1966.
8. Nagaya, H. and Sieker, H.O.: Effects of Antithymus and Antilymphocyte Sera on Allograft Survival. *Trans. Assn. Amer. Physicians*, 79: 205, 1966.
9. Whitehouse, A.C., Buckley, C.E., III, Nagaya, H. and McCarter, J.: Macroglobulinemia and Vasculitis in Sjogren's Syndrome: Experimental Observations Relating to Pathogenesis. *Amer. J. Med.*, 43: 609, 1967.
10. Kremer, W.B., Mengel, C.E., Nowlin, J.B. and Nagaya, H.: Recurrent Ecchymoses and Cutaneous Hyperreactivity to Hemoglobin. *Blood*, 30: 62, 1967.
11. Nagaya, H. and Sieker, H.O.: Feedback Mechanisms of Thymic Lymphocyte Production. *Proc. Soc. Exp. Biol. & Med.*, 126: 131, 1967.
12. Nagaya, H. and Sieker, H.O.: Biological Effects of Antithymus Serum and Antilymphocyte Serum. *Proceedings of XI International Congress of Microbiological Standardization, Milan, Italy, 1968: Progr. Immunobiol. Standard*, 4: 225-229, 1970, Karger, Basel.

13. Nagaya, H., Buckley, C.E., III, and Sieker, H.O.: Positive Antinuclear Factor in Patients with Unexplained Pulmonary Fibrosis. *Ann. Int. Med.*, 70: 1135, 1969.
14. Nagaya, H. and Sieker, H.O.: Effects of Antithymus Serum and Antilymphocyte Serum on the Incidence of Lymphoid Leukemia. *Proc. Soc. Exp. Biol. & Med.*, 131: 891, 1969.
15. Nagaya, H. and Sieker, H.O.: Effects of Antithymus Serum on Thymic Lymphopoiesis: A Radioautographic Study. *J. Immunol.*, 103: 778, 1969.
16. Nagaya, H., McKenzie, W.N., Kilburn, K.H. and Sieker, H.O.: Immunosuppressive potency of antiserum to thymus glands prepared with ribosomal fraction. *J. Immunol.*, 104: 511, 1970.
17. Nagaya, H.: Antilymphocyte serum or antithymus serum. *Arch. Intern. Med.*, 125: 499, 1970.
18. Iwahashi, H., Nagaya, H., Sealy, W. and Sieker, H.O.: Immunosuppressive Effects of Antilymphocyte Serum on the Canine Lung Allograft as a Single Immunosuppressive Agent. *Transplantation*, 9: 558, 1970.
19. Nagaya, H., McKenzie, W.N., Kilburn, K.H. and Sieker, H.O.: Immunosuppressive effects of antisera prepared with subcellular fractions of thymus, spleen and lymph nodes. *Transplantation*, 12: 384, 1971.
20. Nagaya, H. and Sieker, H.O.: Pathogenetic mechanisms of interstitial pulmonary fibrosis in patients with serum antinuclear factor: a histologic and clinical correlation. *Amer. J. Med.*, 52: 51, 1972.
21. Nagaya, H.: Relative sensitivity of non-immunocompetent thymus cells to the action of antiserum to thymus ribosomal fraction. *Transplantation*, 13: 92, 1972.
22. Iwahashi, H., Nagaya, H. and Sealy, W.O.: Effect of in situ perfusion of donor lung on the survival of canine lung allograft. *Transplantation*, 13: 183, 1972.
23. Nagaya, H., Elmore, H. and Ford, C.D.: Idiopathic interstitial pulmonary fibrosis -- an immune complex disease? *Amer. Rev. Resp. Dis.* 107: 826, 1973.

24. Nagaya, H.: Thymus function in spontaneous lymphoid leukemia.  
I. Premature leukemogenesis in "young" thymectomized mice bearing  
"old" thymus grafts. J. Immunol. 111: 1048, 1973.
25. Nagaya, H.: Thymus function in spontaneous lymphoid leukemia.  
II. In vitro response of "preleukemic" and leukemic thymus cells  
to mitogens. J. Immunol. 111: 1052, 1973.
26. Nagaya, H.: Differential suppressive effects of antiserum to thymus  
ribosomal fraction on mitogen responsiveness of thymus cells.  
Cell. Immunol. 9: 324, 1973.
27. Nagaya, H.: Diseases of autoimmunity in Annual Review of Allergy, 1973,  
ed. C.A. Frazier, Medical Examination Publishing Co., Inc., Flushing,  
N.Y., pp. 128-152, 1974.
28. Nagaya, H.: Diseases of autoimmunity in Annual Review of Allergy, 1974,  
ed. C.A. Frazier, Medical Examination Publishing Co., Inc., Flushing,  
N.Y., pp. 138-170, 1975.
29. Walter, H. and Nagaya, H.: Separation of human rosette- and  
non-rosette-forming lymphoid cells by countercurrent distribution in  
an aqueous two-phase system. Cell. Immunol. 19: 158, 1975.

# CURRICULUM VITAE

Warner H. Florsheim

Born: December 11, 1922  
Hamburg, Germany

Naturalized U.S. Citizen: 1943

Married: Eva Herzberg, 8-1-52

<u>EDUCATION:</u>	B.A. (Chemistry)	University of California Los Angeles, California	1943
	M.A.	University of California Los Angeles, California	1944
	Ph.D.	University of California Los Angeles, California	1948

## PROFESSIONAL EXPERIENCE:

O.S.R.D., Research Assistant	University of California Los Angeles, California	1943-1946
Research Associate (Zoology)	University of California Los Angeles, California	1948-1951
Research Fellow	E. C. Kendall's Laboratory Mayo Clinic, Rochester, Minn.	1949
Assistant Research Anatomist with H. W. Nagoun, J.D. French and M.E. Morton	University of California Los Angeles, California	1951-1953
Research Biochemist	Veterans Administration Hospital, Long Beach, CA	1953-Present
Assistant Chief, Radioisotope Service	VA Hospital, Long Beach, California	1955-1970
Assistant Clinical Professor (Biological Chemistry)	UCLA Medical School Los Angeles, California	1956-1970
Lecturer in Physiology	California College of Medicine Irvine, California	1967-1970
Associate Clinical Professor (Physiology)	California College of Medicine Irvine, California	1970-Present
USPHS Special Research Fellow	Oxford University, Dept. of Human Anatomy	1963-1964



Member, Editorial Board, Neuroendocrinology

1965-Present

Member:           American Thyroid Association  
                  American Physiological Society  
                  Endocrine Society  
                  Soc. Exper. Biol. & Med.  
                  American Fed. for Clinical Research  
                  Int. Soc. Neuroendocrinology

Publications: See attached.

1. Jacobs, T.L., Winstein, S., Ralls, J.W., Robson, J.H., Henderson, R.B., Akawie, R.I., Florsheim, W.H., Seymour, D., and Seil, C.A., "Substituted  $\alpha$ -Dialkylaminoalkyl-1-naphthalenemethanols. I. Amino Ketone Method", J. Organic Chemistry, 11:21, 1946.
2. Winstein, S., Jacobs, T.L., Henderson, R.B., and Florsheim, W.H.,  $\alpha$ -Dialkylaminoalkyl-1-naphthalenemethanols. III. Reduction of Substituted Naphthyl Halomethyl Ketones to Halohydrine. Derived Amino Alcohols", J. Organic Chemistry, 11:150, 1946.
3. Jacobs, T.L., Winstein, S., Henderson, R.B., Bond, J., Ralls, J.W., Seymour, D., and Florsheim, W.H., "Substituted  $\alpha$ -Dialkylaminoalkyl-1-naphthalenemethanols. VIII. 5-, 6-, and 7-Chloro Derivatives", J. Organic Chemistry, 11:229, 1946.
4. Brown, R.F., Jacobs, T.L., Winstein, S., Kloetzel, M.D., Spaeth, E.C., Florsheim, W.H., Robson, J.H., Levy, E.F., Byran, G.M., Mahnusson, A.B., Miller, S.J., Ott, Melvin L., and Terek, J.A., "Alpha-(2-Piperidyl)-2-aryl-4-quinoline-methanols", J. American Chemical Society, 68:2705, 1946.
5. Winstein, S., Jacobs, T.L., Linden, G.B., Seymour, D., Levy, E.F., Day, B.F., Robson, J.H., Henderson, R.B., and Florsheim, W.H., "Alpha-Dialkylaminomethyl-4-quinoline-methanols Substituted in the 2-Position", J. American Chemical Society, 68:1931, 1946.
6. Jacobs, T.L., and Florsheim, W.H., "2,5-Dimethylcyclopentanecarboxylic Acids", J. American Chemical Society, 72:256, 1950.
7. Jacobs, T.L., and Florsheim, W.H., "Hindrane in the Stereoisomeric 2,5-Dimethylcyclopentanecarboxylic Acids and their Esters", J. American Chemical Society, 72:261, 1950.
8. Florsheim, W.H., and Krichesky, B., "Characterization of a Fluorescent Lipid Fraction from Cancer-bearing Animals", Proc. Soc. Exper. Biol. and Med., 75:693, 1950.
9. Florsheim, W.H., Doernbach, C., and Morton, M.E., "Effect of X-ray on Radioactive Phosphorus Turnover and Oxygen Consumption of Brain", Proc. Soc. Exper. Biol. and Med., 81:121, 1952.
10. Florsheim, W.H., and Morton, M. E., "Brain and Liver Phosphorus Metabolism in the Acute Irradiation Syndrome", Am. Journal of Physiology, 176:15, 1954.
11. Goodman, J.R., Florsheim, W.H., and Tempereau, C.E., "Reserpine and Thyroid Function", Proc. Soc. Exper. Biol. and Med., 90:196, 1955.
12. Florsheim, W.H., Dimick, B., and Morton, M.E., "The Influence of Albumin on the Electrophoretic Mobility of Serum Lipids", Experientia, 12:343, 1956.
13. Florsheim, W.H., and Morton, M.E., "The Stability of Human Serum Lipoproteins as Measured with Radiophosphorus", Proc. 1st Conference Peaceful Uses of Atomic Energy, 10:496, 1956.
14. Florsheim, W.H., Moskowitz, N., and Morton, M.E., "An *in vitro* Assay for Thyrotropin" (abstract), J. Clin. Endocrinol. and Metab., 16:927, 1956.



15. Florsheim, W. H., Morton, M. E., and Goodman, J. R. "The Effect of Thyroid Ablation upon Serum Cholesterol and b-lipoprotein Spectrum." *Am. J. Med. Sciences*, 233:16, 1957.
16. Shintani, J., Florsheim, W. H., and Wilson, J. W. "Radioautographic Study of Experimental Sporotrichosis after the Administration of Radioactive Iodine." *J. Investigative Dermatology*, 26:137, 1956.
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CURRICULUM VITAE

SWINGLE, KARL F.

Born: Bozeman, Montana, 7 January 1915; Married 1940; Five children

Education

Montana State College, Bozeman, 1933-1937

B. S. Chemistry (Physics minor) 1937

University of Chicago, 1937-1940

Graduate study in Biochemistry and Physiology

University of Wisconsin, 1940-1942

Ph.D. Biochemistry (Physiology minor) 1942

International Summer School of Biophysics, Squaw Valley, California, 1964

Professional Experience

1970 - present: Physicist/General, Radiology Service, Veterans Administration Hospital, Long Beach, California. Practice of radiation physics; teaching of radiological physics and radiation safety; research in radiotherapy and chemotherapy of neoplasms.

1969 - present: Assistant Research Radiobiologist, Department of Radiological Sciences, California College of Medicine, University of California, Irvine. Teaching undergraduate and graduate courses in Radiological Physics and Radiobiology. Supervision of radiobiological research.

1969 - 1970: Research Chemist, Medical Research Programs, VA Hospital, Long Beach, California. Radiobiological research.

1961 - 1969: Chemist(Biochemist), Experimental Pathology Branch, Biomedical Division, Naval Radiological Defense Laboratory, San Francisco, California. Research in biochemical aspects of radiation damage to mammalian cells.

1960 - 1961: Postdoctoral Fellow, Department of Clinical Pathology, School of Veterinary Medicine, University of California, Davis. Research in urinary colloids.

1945 - 1960: Associate Professor and Professor of Biochemistry, Veterinary Research Laboratory, Montana State College, Bozeman. Research in the biochemistry of infectious, nutritional, and toxicological diseases of animals.

1944 - 1945: Assistant Professor of Research Chemistry, University of Wyoming, Laramie. Research in livestock poisoning.

1942 - 1944: Biochemist, Institute of Pathology, Western Pennsylvania Hospital, Pittsburgh. Research in burn healing.

Honors and Awards

Election to the Society of the Sigma Xi, 1940.

Silver Medal for Scientific Achievement, Naval Radiological Defense Laboratory, 1968.

Karl F. Swingle  
Publications

1. Nicotinamide and related compounds as essential growth substances for dysentery bacilli. Albert Dorfman, Stewart A. Koser, Harold R. Reames, Karl F. Swingle, and Felix Saunders. J. Infectious Diseases. 65:163(1939).
2. The stimulatory effect of calcium upon the succinoxidase system. A. E. Axelrod, Karl F. Swingle, and C. A. Elvehjem. J. Biol. Chem. 140:931(1941).
3. The mechanism of the effect of calcium salts on the succinoxidase system. Karl F. Swingle, A. E. Axelrod, and C. A. Elvehjem. J. Biol. Chem. 145:581-91 (1942).
4. Studies on the succinoxidase system of rat liver in riboflavin deficiency. A. E. Axelrod, Karl F. Swingle, and C. A. Elvehjem. J. Biol. Chem. 145:237(1942).
5. Treatment of leucopenia and granulopenia in rats receiving sulfaguanidine in purified diets. A. E. Axelrod, Paul Gross, M. D. Bosse, and K. F. Swingle. J. Biol. Chem. 148:721(1943).
6. The enzyme nature of the lethal toxin of *Clostridium hemolyticum*. Karl F. Swingle. Proc. Mont. Acad. Sci. 6:33-38(1946).
7. Carotene in range feeding. Karl F. Swingle. Proc. first Ann. Mont. Nutr. Conf. 44-47 (1950).
8. Laboratory diagnosis of nutritional deficiencies. K. F. Swingle. Proc. third Ann. Nutr. Conf. (1952).
9. The relation of limited water consumption to the development of urinary calculi in steers. K. F. Swingle and H. Marsh. Am. J. Vet. Res. 14:122-123(1953).
10. The chemical composition of urinary calculi from range steers. K. F. Swingle. Am. J. Vet. Res. 14:123-125(1953).
11. Experimental white muscle in calves. J. W. Safford and K. F. Swingle. Mont. Stockgrower. 25(5):68-69(1953).
12. Experimental muscular dystrophy in young calves. J. W. Safford and K. F. Swingle. Proc. fourth Ann. Mont. Nutr. Conf. 57-60 (1953).
13. Experimental tocopherol deficiency in young calves. J. W. Safford, K. F. Swingle, and H. Marsh. Am. J. vet. Res. 15:373-381(1954).
14. Plasma and milk tocopherol levels of cows compared with the plasma tocopherol levels of their foster calves. J. W. Safford, K. F. Swingle, and H. Marsh. Am. J. Vet. Res. 16:64-68 (1955).
15. Blood phosphorus, calcium, and Vitamin A in range sheep. H. Marsh and Karl F. Swingle. Am. J. vet. Res. 16:122-124(1955).
16. Tocopherol levels in the early milk of semi-range cattle. K. F. Swingle, J. W. Safford, and D. E. McRoberts. Am. J. vet. Res. 17:23-35(1956).
17. Vitamin A deficiency and urolithiasis in range cattle. K. F. Swingle and H. Marsh. Am. J. vet. Res. 17:125-127(1956).



- 18 Muscular dystrophy in lambs as related to the tocopherol levels in the plasma and milk of ewes and to various feeds. J. W. Safford, K. F. Swingle, and D. E. McRoberts. Am. J. vet. Res. 17:503-509 (1956).
- 19 White muscle disease in Montana. K. F. Swingle. New England Shepherd. 2(4):7,10,15 (1957).
- 20 The relationship of serum glutamic oxaloacetic transaminase to nutritional muscular dystrophy in lambs. K. F. Swingle, S. Young, and H. C. Dang. Am. J. Vet. Res. 20:75-77(1959).
- 21 A partial chemical analysis of the mucoprotein of siliceous urinary calculi of bovine origin. Richard F. Keeler and Karl F. Swingle. Am. J. Vet. Res. 20:249-254(1959).
- 22 A succinoxidase inhibitor in feeds associated with muscular dystrophy in lambs and calves. Gloria M. Curtan and Karl F. Swingle. Am. J. Vet. Res. 20:235-238 (1959).
- 23 Nutrition of cattle on an eastern Montana range, as related to weather, soil, and forage. H. Marsh, K. F. Swingle, R. H. Redmond, R. F. Jones, E. K. Smith, L. E. Johnson, and J. G. Hild. Vol. 299, Montana Agric. Exp. Sta. (1961).
- 24 The calcium, phosphorus, magnesium, potassium, and sodium in a sample of the blood of range cattle in eastern Montana. H. Marsh and Karl F. Swingle. Am. J. Vet. Res. 21: 218-21 (1960).
- 25 Nutritional muscular dystrophy in lambs. Administration of sodium to affected and unaffected lambs. Stuart Young, W. H. Hopkins, and K. F. Swingle. Vet. Rec. 22: 115-16 (1961).
- 26 Nutritional muscular dystrophy in lambs - preliminary analysis of maternal, fetal, and juvenile tissues. William Burton, Richard F. Keeler, Karl F. Swingle, Stuart Young. Am. J. Vet. Res. 23: 211-5 (1962).
- 27 Ruminant urolithiasis. V. Excretion of certain urinary biocolloid fractions by sheep on alfalfa and grain rations. Karl F. Swingle and Charles E. Cornelius. Am. J. Vet. Res. 21: 372-6 (1960).
- 28 Acid deoxyribonucleic acid in sheep liver. Preliminary studies in the presence of calcium ions. Karl F. Swingle and Leonard J. Cole. J. Histochem. Cytochem. 13, 444-447 (1964).
- 29 Acid deoxyribonucleic acid (DNA) in sheep liver with special isolation in the presence of Ca<sup>++</sup>. K. F. Swingle and L. J. Cole. USNRDL-TR-498 1 November 1963.
- 30 A DNA-RNA COMPLEX ISOLATED FROM SHEEP LIVER. K. F. Swingle and L. J. Cole. USNRDL-TR-600 7 December 1964.
- 31 Sulfonamide concentrations in milk and plasma from normal and diseased ewes treated with sulfadiazine. J. A. Ternouth and Karl F. Swingle. Am. J. Vet. Res. 26, 530-537 (1965).

- 22 A DNA-RNA-Protein complex isolated from rat liver. Karl F. Swingle and Leonard J. Cole. J. Mol. Biol. 15:573-586 (1966).
- 23 Radiation-induced free polydeoxyribonucleotides in lymphoid tissues: A product of the action of deoxyribonuclease I. Karl F. Swingle and Leonard J. Cole. USNRDL-TR-983 (1966)
- 24 Radiation-induced free polydeoxyribonucleotides in lymphoid tissues: a product of the action of neutral deoxyribonuclease (DNase I). Karl F. Swingle and Leonard J. Cole. Radiation Res. 30, 71-95 (1967).
- 25 Urinary excretion of deoxycytidine: a potential biochemical radiation dosimeter. C. D. Guri, K. F. Swingle, and L. J. Cole. USNRDL-TR-67-30 (1967).
- 26 Association of neutral deoxyribonuclease with chromatin isolated from mammalian cells. K. F. Swingle, L. J. Cole, and J. S. Bailey. USNRDL-TR-67-62. (1967).
- 27 Postirradiation anoxia: Effect on marrow colony forming units and on lymphoid tissue DNA degradation. L. J. Cole and K. F. Swingle. Abstracts of papers for the fifteenth Annual Meeting of the Radiation Research Society, San Juan, Puerto Rico, 1967, p. 76.
- 28 Association of neutral deoxyribonuclease with chromatin isolated from mammalian cells. Karl F. Swingle, Leonard J. Cole, and J. Stanley Bailey. Biochim. Biophys. Acta 149:467-475 (1967)
- 29 Early effects of ionizing radiations on nucleic acids. Karl F. Swingle and Leonard J. Cole. Current Topics in Radiation Research, M. Ebert and A. Howard, eds., North Holland Pub. Co., Amsterdam, pp. 191-250 (1968).
- 30 Urinary excretion of deoxycytidine in rats after x-irradiation: dose-response and effect of age. Charles D. Guri, Karl F. Swingle, and Leonard J. Cole. Int. J. Radiat. Biol. 12:391-395 (1967).
- 31 Elevated plasma deoxycytidine levels in rats: a biological dosimeter of x radiation. C. D. Guri, K. F. Swingle, L. J. Cole, and J. S. Bailey. USNRDL-TR-67-153 (1967).
- 32 Plasma deoxycytidine: increased levels after x-irradiation. C. D. Guri, K. F. Swingle, and L. J. Cole. Proc. Soc. Exptl. Biol. Med. 129, 31-34 (1968).
- 33 X-irradiation effects in thymus: Relevance of differential cellular distribution of neutral deoxyribonuclease. Karl F. Swingle and Edward L. Alven. Fed. Proc. 27, 507 (1968)
- 34 Intracellular release of histones in lymphoid tissues after x-irradiation. Karl F. Swingle and Leonard J. Cole. Aba. 17th Ann. Meeting of the Radiation Res. Soc. p. 32 (1969).

Karl F. Swingle  
Publications

Early increase in the miscible deoxyribonucleic acid pool in rats after X-irradiation. Charles D. Guri, Henry Minot, Karl F. Swingle, and Leonard J. Cole. Radiation Research 30, 155-63 (1968).

Intracellular release of histones in lymphoid tissues after X-irradiation. Karl F. Swingle and Leonard J. Cole. NBL-T2-69-46 (1969)

Differential neutral deoxyribonuclease activity in thymocytes versus stromal cells. Relevance to radiosensitivity. Karl F. Swingle and Leonard J. Cole. NBL-T2-69-92 (1969).

Membrane surface properties of red blood cells from x-irradiated rats as measured by partition in two-polymer aqueous phase systems. Harry Walter, Rita Tung, Eugene J. Krob, and Karl F. Swingle. Radiation Res. 59, 614-628 (1974).

Cellular response to hyperthermia and bleomycin: Effect of time sequencing and possible mechanisms. S. Rablani, C. A. Swenson, and K. F. Swingle, in Cancer Therapy by Hyperthermia and Radiation. C. Streffer, ed. Urban and Schwarzenberg, Baltimore, 1973.

**TRAINING AND EXPERIENCE  
AUTHORIZED USER OR RADIATION SAFETY OFFICER**

1. NAME OF AUTHORIZED USER OR RADIATION SAFETY OFFICER Vincent L. Gelezunas, Ph.D., RSO, Nuclear Medicine Service	2. STATE OR TERRITORY IN WHICH LICENSED TO PRACTICE MEDICINE N/A
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**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	Purdue University 1952-54 Orsort, Oak Ridge, Tenn. 1956-57	150 500	100
b. RADIATION PROTECTION	Orsort, Oak Ridge, Tenn. 1957-57 Nuclear Propulsion, G.E. Cincinnati, Ohio 1955-1962	150 100	50
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	Purdue University 1952-54 Orsort, Oak Ridge, Tenn. 1956-57 U. Cincinnati 1959-62	100 300 150	
d. RADIATION BIOLOGY	Purdue University 1952-54 Orsort, Oak Ridge, Tenn. 1956-57	50 50	
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
U-235	KG's	GE-ANPD, Cincinnati, Ohio Hanford LABS, Richland, WA	1955-1962 1962-1964	Reactor Fuel Elements
U-238	KG's	GE-ANPD, Cincinnati, Ohio	1959-1962	H <sub>2</sub> Purifier
Fission Prod	Curies	GE-ANPD, Cincinnati, Ohio Hanford LABS, Richland, WA	1955-1962 1962-1964	Irradiation of Fuel Elements
H-3	Curies	Hanford LABS, Richland, WA GE-ANPD, Cincinnati, Ohio	1955-1962 1962-1964	Tritium Prod. Instrumentation
C-14, Ca-45	Millicuries	Space Systems, GE, Valley Forge, PA	1964-1974	Biol. Labeling & Tracing

TRAINING AND EXPERIENCE  
AUTHORIZED USER OR RADIATION SAFETY OFFICER

1. NAME OF AUTHORIZED USER OR RADIATION SAFETY OFFICER Vincent L. Gelezunas, Ph.D., RSO, Nuclear Medicine Service	2. STATE OR TERRITORY IN WHICH LICENSED TO PRACTICE MEDICINE N/A
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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			
b. RADIATION PROTECTION			
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY			
d. RADIATION BIOLOGY			
e. RADIOPHARMACEUTICAL CHEMISTRY			

CONTINUATION

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

CONTINUATION

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
Am-241	Curies	Space Systems, GE, Valley Forge, PA	1964-1974	Sealed Source
I-131	Millicuries	VA Med. Ctr., Long Beach, Calif.	1974-Present	Bio-Medical
Tc-99m	-Curies	VA Med. Ctr., Long Beach Calif.	1974-Present	Bio-Medical



APPENDIX C

INSTRUMENTATION

1. Survey meters

- a. Manufacturer's name: Nuclear Chicago  
Manufacturer's model number: 2508 with chamber 2520  
Number of instruments available: 1

Ranges:                     

Minimum range: 0 mr/hr to 2500 mr/hr

Maximum range: 0 mr/hr to 250,000 mr/hr

Ranges 3

- b. Manufacturer's name: Nuclear Chicago  
Manufacturer's model number: 2508 with chamber 2526  
Number of instruments available: 1

ranges: 3

Minimum range 0 mr/hr to 25 mr/hr

Maximum range 0 mr/hr to 2500 mr/hr

Item C (a)  
Nov. 1978 W. Medical Ctr  
Long Beach, CA



APPENDIX C

INSTRUMENTATION

1. Survey meters

a. Manufacturer's name: Victoreen

Manufacturer's model number: Model #444

Number of instruments available: 1

Ranges:                     

Minimum range: 0 mr/hr to 3 mr/hr

Maximum range: 0 mr/hr to 300,000 mr/hr

b. Manufacturer's name: Victoreen

Manufacturer's model number: Model #440

Number of instruments available: 2

ranges:                     

Minimum range 0 mr/hr to 3 mr/hr

Maximum range 0 mr/hr to 300 mr/hr

Item 9 (b)  
Nov 1978 VA Medical Ctr  
Long Beach, CA

APPENDIX C

INSTRUMENTATION

1. Survey meters

a. Manufacturer's name: Jordan Electronics

Manufacturer's model number: AGB-10KG-SR

Number of instruments available: 1

Ranges: 3

Minimum range: 0.01 mr/hr to 10 mr/hr

Maximum range:  $10^3$  mr/hr to  $10^7$  mr/hr

b. Manufacturer's name: MDH Industries

Manufacturer's model number: 1015

Number of instruments available: 1

ranges: 6

Minimum range 1 mr/hr to 650,000 mr/hr

Maximum range 60 mr/hr to  $3.9 \times 10^7$  mr/hr

Item 9 (c)  
Nov 1978 VA Medical Ctr  
Long Beach, CA

# APPENDIX C

## 2. Dose calibrator

Manufacturer's name: Capintec (Squibb)

Manufacturer's model number: CRC-6

Number of instruments available: 1

## 3. Diagnostic instruments

<u>Type of Instrument</u>	<u>Manufacturer's Name</u>	<u>Model No.</u>
Scanner 3-inch Single Probe	Pickar Nuclear	Magnascanner 611-500
Scintillation Camera	Searle Radiographics	Pho/Gamma 6406
Scintillation Camera	Searle Radiographics	Pho/Gamma 6426
Scintillation Camera	Searle Radiographics	Pho/Gamma 76006A
Well Counter	Nuclear Chicago	8725
Scanner 5-inch Dual Probe	Raytheon	625
Scintillation Camera	Ohio-Nuclear	Mobile 420
Well Counter	Ortec	778
Automatic Gamma System	Searle Analytical	1185
Liquid Scintillation System	Searle Analytical	IFOCAP 300/6868
Automatic Gamma System	Searle Analytical	1180

## 4. Other

<u>Type of Instrument</u>	<u>Manufacturer's Name</u>	<u>Model No.</u>
Survey Meter	Victoreen	440
Survey Meter	Nuclear Chicago	2510
Counting System	Ortec	550
Modular System	Ortec	406A
" "	Tracor-Northern	TN-1700-8
Gamma Tech Detector	Princeton	IC-305

(Continued)

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November 1978

# APPENDIX C

## 4. OTHER (Continued)

<u>Type of Instrument</u>	<u>Manufacturer's Name</u>	<u>Model No.</u>
Germanium Gamma Ray Spectrometer	Ortec	1113-25360
Survey Meter	Anton Electronic	10.5
Condenser R Meter(5-Chamber)	Victoreen	570
Automatic Sample Changer, Gamma Counter	Searle	1195
Liquid Scintillation Counter	Beckman	LS 200
Liquid Scintillation Counter	Nuclear Chicago	ISOCAP 300
Survey Meter	Victoreen	6A
Intercomparison Std.	Victoreen	415
Intercomparison Std.	Victoreen	415A
Isotope Calibrator	Nuclear Associates	34-035
Liquid Scintillation Counter	Packard	2450
Gamma System	Searle	1085
Unilux	Nuclear Chicago	IIA
Free-air Ionization, Chamber System	Victoreen	900 358
with Chambers		480 & 481
Well Counter System	Nuclear Supplies Inc.	
Shield		EA-14
Probe		PS-400
Timer		TM-12
Scaler		SA-250
Survey Meter, QTPi	Nuclear Chicago	2588
Chamber		2526
Chamber		2520
Survey Meter, Log	Jordan Electronics (Victoreen)	AGB-10KG-SR
Survey Meter	Victoreen	444
Spectrometer, Well Counter	Baird Atomic	530
Pocket Dosimeter System Charger	Victoreen	2000A
Dosimeters	Victoreen	541A
Dosimeter System, Charger/reader	Victoreen	887C
Chargers	Victoreen	362, 239A, 239-1, and 208-1
Well Counter	Abbott Laboratories	Logic 101B
Survey Meter G-M	Nuclear Associates	
Rate Meter	Victoreen	620
Chamber		603
Scaler	Technical Associates	FD-8C,
Used with Shield and		EA-14
Probe		PS-400
Water Phantom System	Antronix	3302

(Continued)

# APPENDIX C

## 4. OTHER (Continued)

<u>Type of Instrument</u>	<u>Manufacturer's Name</u>	<u>Model No.</u>
TLD System	Harshaw	3000
Beam Monitor	Lawrence Soft Ray, Inc.	Monitrex-100
X-ray Monitor	MDH, Inc.	1015
Probe		10X5-6
Probe		10X5-180

Item 9  
VAMC, Long Beach, CA  
Nov 1978

## APPENDIX D

### Section 1

#### METHODS FOR CALIBRATION OF SURVEY METERS, INCLUDING PROCEDURES, STANDARDS AND FREQUENCY

- A. Calibration of survey meters shall be performed with radionuclide sources.
1. The sources shall be approximate point sources.
  2. The source activities shall be traceable within 5% accuracy to the U.S. National Bureau of Standards (NBS) calibrations.
  3. The frequency shall be at least annually.
  4. Each scale of the instrument shall be calibrated at approximately 1/3 and 2/3 of full scale.
  5. The exposure rate measured by the instrument shall differ from the true exposure rate by less than 10% of full scale (read appropriate section of the instrument manual to determine how to make necessary adjustments to bring instrument into calibration). Readings within  $\pm 20\%$  will be considered acceptable if a calibration chart or graph is prepared and attached to the instrument.

NOTE: Sources of Cs-137, Ra-226, or Co-60 are appropriate for the performance of calibration. The activity of the calibration standard should be sufficient to calibrate the survey meters on all ranges, or at least up to 1 R/hour.



B. A reference check source of long half-life, e.g. Cs-137 or Ra D and E, shall also be read at the time of the above calibration. The readings shall be taken with the check source placed in specific geometry relative to the detector. A reading of this reference check source should be taken:

1. Before each use.
2. After each maintenance and/or battery change.
3. At least quarterly.

If any reading with the same geometry is not within  $\pm 20\%$  of the reading measured immediately after calibration. The instrument should be recalibrated (see Step A).

C. The instrument must be calibrated at lower energies if its response is energy dependent and it is to be used to measure in the I-125, Xe-133, or Tc-99m energy ranges.

This calibration may be done either:

1. As in A. above with calibrated standards of radionuclides at or near the desired energies, or
2. As a relative intercomparison with an energy independent instrument and uncalibrated radionuclides.

D. Records of the above, A, B-2, B-3, and C must be maintained.

E. Use of Inverse Square Law and Radioactive Decay Law

1. A calibrated source will have a calibration certificate giving its output at a given distance measured on a specified date by the manufacturer or NBS.

- a. The Inverse Square Law may be used with any point source to calculate the exposure rate at other distance.
- b. The Radioactive Decay Law may be used to calculate the output at other times after the specified date.

2. INVERSE SQUARE LAW

$$\begin{array}{rcl}
 S & (R_1) & (R_2) \\
 * & - & - P_1 \\
 - & - & - - P_2
 \end{array}$$

Exposure rate at  $P_2$ :

$$R_2 = \frac{(P_1)^2}{(P_2)^2} \times R_1$$

where (a) S is the point source

(b)  $R_1$  and  $R_2$  are in the same units (mR/h or R/h)

(c)  $P_1$  and  $P_2$  are in the same units (cm, meter, feet etc.)

3. RADIOACTIVE DECAY LAW:

Exposure rate  $t$  units of time after specified calibration date:

$$R_t = R_o \times e^{-\left[\frac{0.693}{T_{1/2}} \times t\right]}$$

where (a)  $R_o$  and  $R_t$  are in the units (mR/h or R/h):

(b)  $R_o$  is exposure rate on specified calibration date

(c)  $R_t$  is exposure rate  $t$  unit of time later

(d)  $T_{1/2}$  and  $t$  are in the same units (years, months, days, etc.)

(e)  $T_{1/2}$  is radionuclide half-life

(d)  $t$  is number of units of time elapsed between calibration and present time

4. Example: Source output is given by calibration certificate as 100 mR/h at 1 foot on 10 March 1975. Radionuclide half-life is 5.27 years.

Question: What is the output at 3 feet on 10 March 1977 (2.0 years)?

- a. Output at 1 foot, 2.0 years after calibration date:

$$R = 100 \text{ mR/hr} \times e^{-\frac{(0.693 \times 2.0)}{5.3}} = 100 \times 0.77 = 77 \text{ mR/hr}$$

at 1 foot on 10 March 1977.

- b. Output at 3 feet, 2.0 years after calibration date:

$$R_3 \text{ feet} = \left(\frac{1 \text{ foot}}{3 \text{ feet}}\right)^2 \times 77 \text{ mR/hr} = \frac{1}{9} \times 77 = 8.6 \text{ mR/hr at}$$

3 feet, 2.0 years after calibration.

## CALIBRATION OF SURVEY INSTRUMENTS

Check appropriate items

- ☒ 1. Survey instruments will be calibrated at least annually and following repair.
- ☒ 2. Calibration will be performed at two points on each scale. The two points will be approximately 1/3 and 2/3 of full scale. A survey instrument may be considered properly calibrated when the instrument readings are within  $\pm 10\%$  of the calculated or known values for each point checked. Readings within  $\pm 20\%$  are considered acceptable if a calibration chart or graph is prepared and attached to the instrument.
- ☒ 3. Survey instruments will be calibrated
- a. By the manufacturer
- ☒ b. At the licensee's facility
- (i) Calibration sources
- Manufacturer's name Radium Chemical Co., Inc.
- Model no. \_\_\_\_\_
- Activity in millicuries 9.76 each
- Accuracy  $\pm 1\%$
- Traceability to primary standard Yes
- ☒ (ii) The calibration procedures in Appendix D, Section I will be used.
- or
- (iii) The step-by-step procedures, including radiation safety procedures are attached.
- \_\_\_\_\_ c. By a consultant or outside firm
- (i) Name \_\_\_\_\_
- (ii) Location \_\_\_\_\_
- (iii) Procedures and sources
- \_\_\_\_\_ have been approved by NRC and are on file in License No. \_\_\_\_\_
- \_\_\_\_\_ are attached



Item 10a. Calibration of Survey Instruments

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

3. Survey instruments will be calibrated at the licensee's facility.

a. Calibration sources

(i) For higher energies

Manufacturer: Radium Chemical Company, Inc.

Type: Calibrated 10 mg 226-Ra capsules

Activity: 9.76 mCi each

Accuracy:  $\pm 1\%$

Traceable to NBS standard.

(ii) For lower energies

Calibration by substitution in an x-ray beam calibrated with an NBS-traceable ion-chamber. Victoreen model 651 chamber used with Victoreen model 570 electrometer.

4. The calibration procedures in Appendix D, Section 1 will be used at the higher energies.

For the lower energies a beam from a Picker Zephyr therapeutic x-ray machine will be calibrated with the NBS traceable ion chamber at tube potentials and filtrations to give an HVL of approximately 3 mm Al. Alternate exposures of the calibrated ion chamber and the survey meter will be made until a statistically acceptable comparison has been accomplished. When necessary, because of the scale range of the survey meter, it will be exposed at a distance greater than the distance used with the ion chamber, and the inverse square law applied. At long distances a correction for air attenuation will also be applied.

## APPENDIX D

## Section 2

METHODS FOR CALIBRATION OF DOSE CALIBRATOR

All radiopharmaceuticals must be assayed for activity to an accuracy of 10%. The most common instrument for accomplishing this is an ionization type dose calibrator. The instrument must be checked for accurate operation at the time of installation and periodically thereafter.

## A. Test for the following:

1. Instrument linearity (at installation and quarterly).
2. Geometrical variation (at installation).
3. Instrument accuracy (at installation and annually).

B. After repair or adjustment of the dose calibrator, repeat all of the appropriate tests listed above (dependent upon the nature of the repairs).

## C. Daily or before each use of the instrument:

1. Measure and record the activity of a Cobalt-57 source (1 mCi). This check should be repeated during the day whenever sample readings are not within 10% of the anticipated assay. Variation greater than 5% in this test will indicate the need for instrument repair, adjustment or recalibration.

2. Measure and record the apparent activity of a long-lived standard, Cs-137, at all of the commonly used radionuclide settings (when the unit was first calibrated against NBS-traceable standards). The source will have an activity in the 100  $\mu$ Ci range.

- D. Inspect the instrument on a quarterly basis to ascertain that the measurement chamber liner is in place and that instrument zero is properly set (see manufacturer's instructions).

E. Test of Instrument Linearity

The linearity of a dose calibrator should be ascertained over the entire range of activities employed. This test will utilize a vial of Tc-99m whose activity is equivalent to the maximum anticipated activity to be assayed (e.g., drawn 6 hours after the first elution from a new generator).

1. Assay the Tc-99m vial in the dose calibrator and subtract background level to obtain net activity in millicuries. Record the starting time to the nearest minute.
2. Repeat step 1 at time intervals of approximately 6, 24, 30, and 48 hours after the initial assay. Record all times to the nearest minute.

3. The activity measured at the 30 hour mark,  $A(o)$ , is taken as the reference activity. Other activities are calculated from the following equation:

$$A(t) = A(o) * \text{EXP}(-\lambda(t-t_o))$$

where  $A(t)$  = calculated activity at time  $t$

$\lambda$  = disintegration constant for Tc-99m =  $0.11495 \text{ hr}^{-1}$

$t$  = time lapse from initial measurement, hrs

$t_o$  = time interval from the initial measurement to the reference measurement, hr.

4. The measured activities are compared to the calculated activities for each time by the calculation

$$\% \text{ deviation} = \frac{A_{\text{calc}}(t) - A_{\text{meas}}(t)}{A_{\text{calc}}(t)} * 100$$

5. Deviations within  $\pm 5\%$  would indicate that the instrument is linear and functioning properly. Errors greater than  $\pm 5\%$  would indicate the need for repair or adjustment of the instrument.

6. If instrument linearity cannot be corrected, it will be necessary in routine assays to assay an aliquot of the eluate that can be accurately measured.

G. Test for Geometrical Variation

There may be significant geometrical variation in activity measured as a function of sample volume or configuration, depending on the volume and size of the ionization chamber used in the dose calibrator. The extent of geometrical variation should be ascertained for commonly used radionuclides and appropriate correction factors computed if variations are significant, i.e., greater than  $\pm 2\%$  (even though correction factors may be provided by the manufacturer, the accuracy of these should be checked).

To measure variation with volume of liquid, a 30 cc vial containing approximately 2 mCi of tc-99m or other appropriate radionuclide in a volume of 1 ml will be used.

1. Assay vial at the appropriate instrument setting and subtract background level to obtain net activity.



2. Increase the volume of liquid in the vial in steps to 2, 4, 8, 10, 20 and 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 1.
3. Select one volume as a standard (such as the volume of reference standard used in performing the test for instrument accuracy) and calculate the ratio of measured activities for each volume to the reference volume activity. This represents the volume correction factor.

Example: If activities of 2.04, 2.02, and 2.00 mC are measured for 4, 8, and 10 ml volumes and 10 ml is the reference volume selected, then

$$4 \text{ ml Volume CF} = \frac{2.00}{2.04} = 0.98$$

4. In the event that the correction factors exceed  $\pm 2\%$ , plot the correction factors against the volume on linear graph paper. Use this graph to select the proper volume correction factors for routine assay of that radionuclide.

5. The true activity of a sample is calculated as follows:

True Activity = Measured Activity x CF.

Where the CF used is for the same volume and geometrical configuration as the sample measured.

6. Similarly, the same activity of Co-57 in a syringe may be compared with that of 10 ml in a 30 cc vial and a correction factor calculated.
7. It should be noted that differences of 200% in dose calibrator readings between glass and plastic syringes have been observed for lower energy radionuclides such as I-125. Hence adequate correction factors must be established for this type of syringe.

An alternate to providing syringe calibration factors is to simply assay the stock vial before and after filling the syringe. The activity in the syringe is then the difference in the two readings (with a volume correction if significant).

#### H. Test for Instrument Accuracy

The accuracy of the dose calibrator will be checked using Cs-137 and Co-57. These reference standards will be traceable to the NBS.

The activity levels of the reference sources will be as high as possible to yield accurate results, giving adequate attention to source configuration. The lower energy reference standards (Tc-99m, Xe-133, I-125) will be in vials with the same thickness of glass as the actual samples to be measured for best accuracy.

1. Assay one reference standard in the dose calibrator at the appropriate setting and subtract the background level to obtain the net activity.
2. Repeat step 1 for a total of 3 determinations and average results.
3. The average activity determined in step 2 should agree with the certified activity of the reference source within  $\pm 5\%$  after decay corrections.
4. Repeat the above steps for the other standard.
5. Keep a log of these calibration checks.
6. If the calibration checks do not agree within  $\pm 5\%$ , the instrument would be repaired or adjusted. If this

is not possible a calibration factor should be calculated for use during routine assays of radionuclides.

7. At the same time the instrument is being initially calibrated with the NBS traceable standards, place a long-lived source in the calibrator, set the instrument, in turn, at the various radionuclide settings used (Cs-137, I-131, Tc-99m, I-125, etc.) and record the readings. These values may later be used to check instrument calibration at each setting (after correcting for decay of the long lived source), without requiring more NBS traceable standards. Keep a log of these initial and subsequent readings.

I. Test for Instrument Constancy

Two reference sources such as Cs-137 and Co-57 should be assayed using a reproducible geometry before each daily use of the instrument.

1. Assay the Co-57 reference source using the appropriate instrument setting (i.e., Cs-137 setting for Cs-137).
2. Measure background level at same instrument setting.

3. Calculate net activity of each source subtracting out background level.
4. Correct the activity for delay back to the time of the original calibration date.
5. Log the background levels.
6. Compare the decay corrected value of the activity to the calibration value and calculate the percent deviation.
7. Repeat the procedure for the Cs-137 source for all of the commonly used radionuclide settings.
8. Variations greater than  $\pm 5\%$  from the predicted activity indicate the need for instrument repair or adjustment.
9. Higher than normal background levels should be investigated to determine their origin and eliminated if possible by decontamination, relocation, etc.



CALIBRATION OF DOSE CALIBRATOR

A. Sources used for linearity test:

Check as appropriate:

\_\_\_\_\_ First elution from new Mo-99/Tc-99m generator

94

X other\* (specify) Elution approximately 6 hours  
after first elution.

B. Sources used for instrument accuracy and constancy tests:

Radionuclide	Activity (mCi)	Accuracy
57 Co	<u>2</u>	<u>± 5%</u>
133 Ba	<u>          </u>	<u>          </u>
137 Cs	<u>0.100</u>	<u>± 5%</u>
Other	<u>          </u>	<u>          </u>

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

or

\_\_\_\_\_ Equivalent procedures are attached.

\*Must be equivalent to the highest activity used.

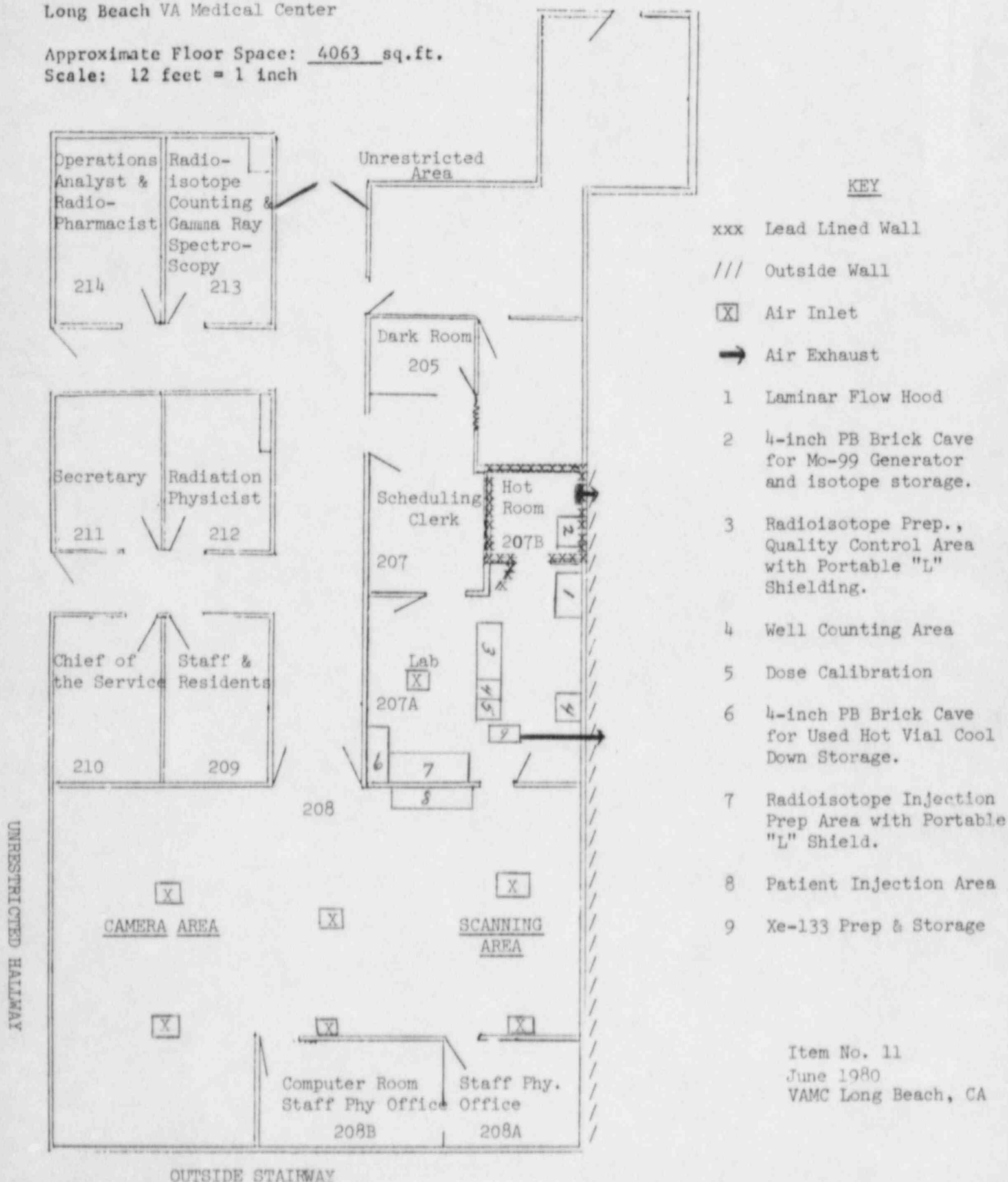
## FACILITIES AND EQUIPMENT

### MEDICAL RESEARCH

A facility drawing of each radionuclide laboratory is depicted, indicating location, nature of the work, the name of the Chief Investigator, and the facilities for storage of radioactive materials. Where pertinent, the presence of fume hoods, counting equipment, surgical facilities, etc. is shown.

SKETCH OF NUCLEAR MEDICINE SERVICE  
Building 1, Second Floor  
Long Beach VA Medical Center

Approximate Floor Space: 4063 sq.ft.  
Scale: 12 feet = 1 inch



LEGEND



LABORATORY OK FOR LOW-LEVEL  
ISOTOPE WORK



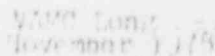
ISOTOPE STORAGE AND INTERMEDIATE  
LEVEL WORK AND DECAY HUT



ANIMAL QUARTERS WITH PROVISION  
FOR RADIOACTIVE ANIMALS

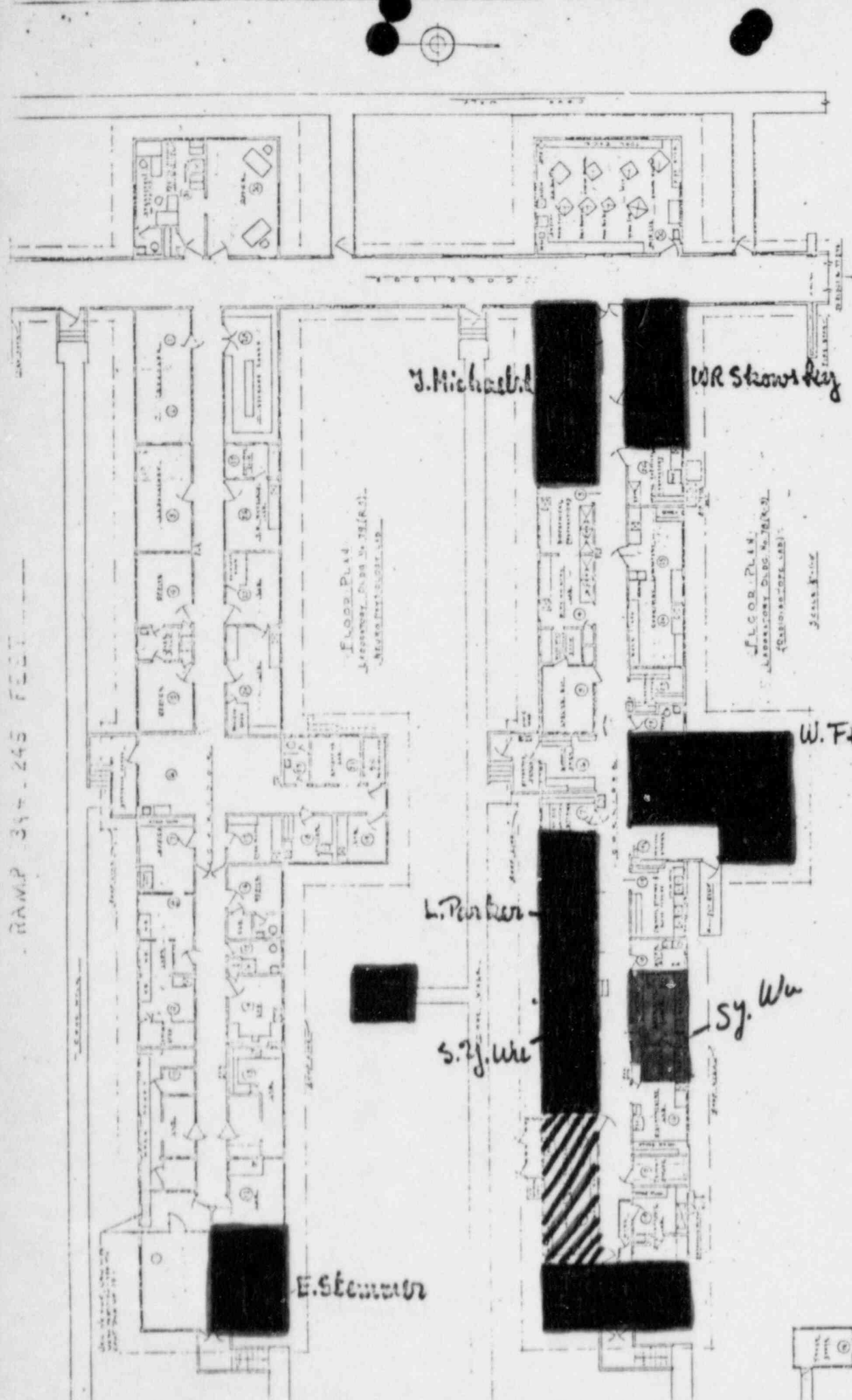


COUNTING ROOM





2000



FL000 PLANS 06019 A-70372

RECEIVED BY THE COMMISSIONER

Long Beach - California

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8-81

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	BY	_____

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STAINLESS BUILT

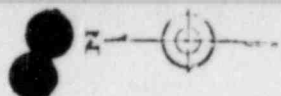
78-2

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WAMC, Long Beach  
November 1971  
11

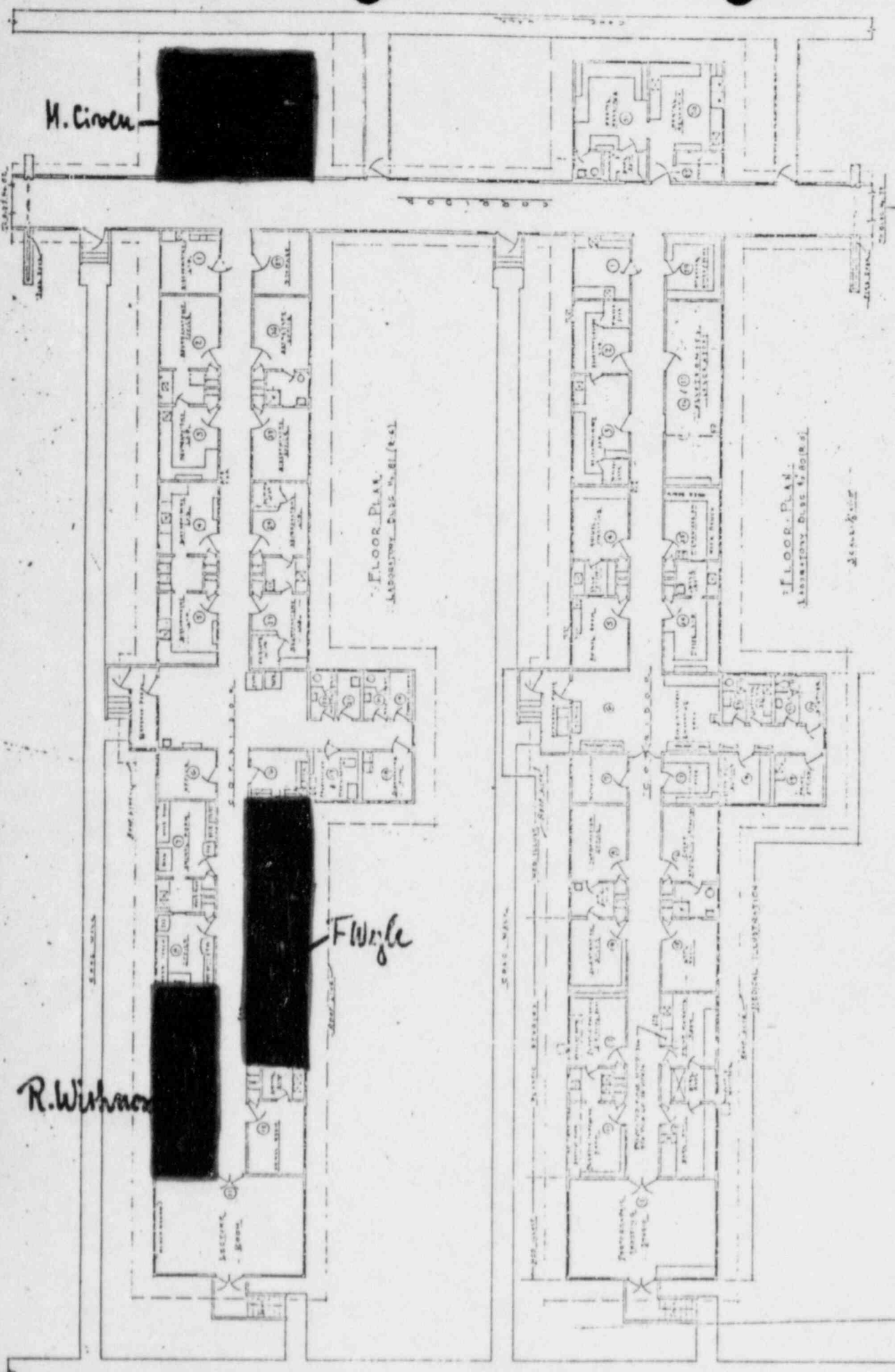
1857 11



RECORD INFORMATION

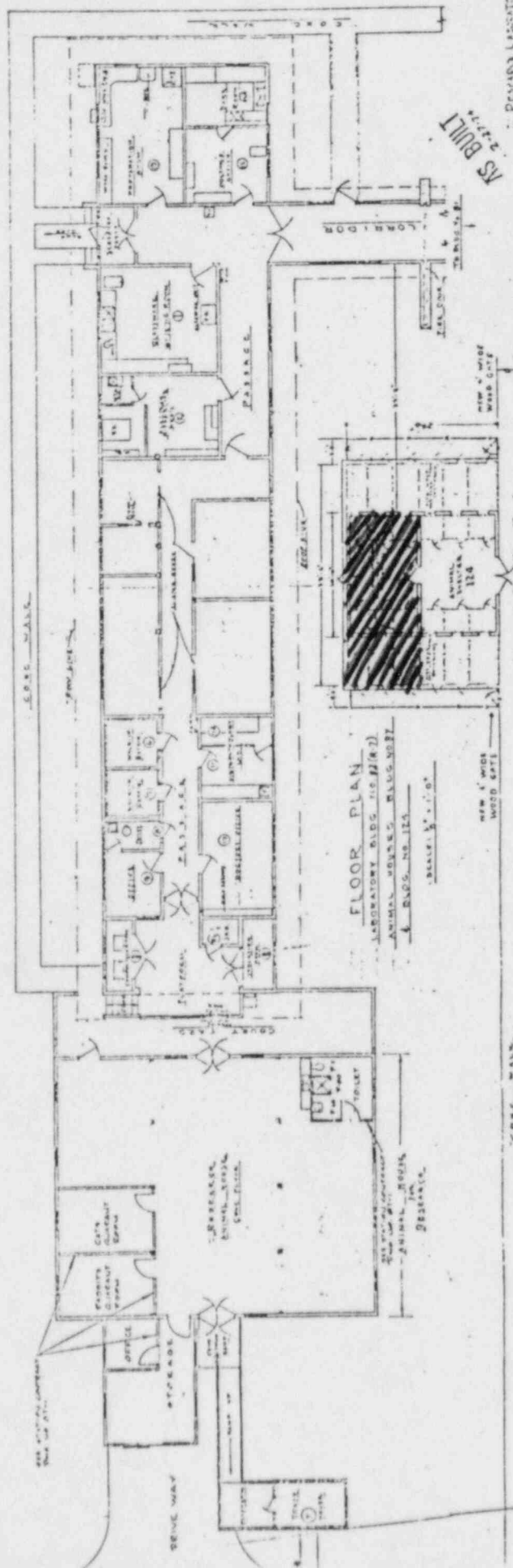
PLANNING	DESIGN	CONSTRUCTION	OPERATION
1	2	3	4

8



RECORD INFORMATION  
PLANNING  
DESIGN  
CONSTRUCTION  
OPERATION

VAMC Long Beach, CA  
Nov 1978  
Item #1

[illegible]

NOTE:  
PATRICK AUMAL, 1901A,  
FLOO. 107, WEST OF CRO.  
(C. 10) animal skeleton  
FLOO. 107, 107, 107, 107  
OF FLOO. 107, 107, 107  
SUNO. 107, 107, 107  
WEST OF CRO. 107, 107

## PERSONNEL TRAINING PROGRAM

All personnel working with or near radioactive materials will receive specific instructions and/or training before they can assume their assigned duties. At that time the radiation worker will:

- a. Be shown where radioactive material is used or stored.
- b. Be instructed in the potential hazards associated with the use of radioactive material.
- c. Be informed of radiological safety procedures appropriate to their duties.
- d. Be informed of pertinent NRC regulations and their responsibilities under the ALARA concept.
- e. Be informed of additional hospital rules and regulations applicable to radiation workers.
- f. Be informed of applicable requirements of the license.
- g. Be informed of their obligation to report unsafe conditions.
- h. Be instructed in the appropriate response to an emergency or unsafe condition.
- i. Be informed of their right to the access to their radiation exposure and bioassay results.
- j. Be shown the location where notices, copies of pertinent regulations and copies of our license including conditions, applications, and applicable correspondence are posted or stored.

In the case of a new employee, the initial indoctrination will be done at the time the individual is issued a radiation badge. The instructions will be issued at this time by the RSO or the RSO's designee. In addition, dependent

on the nature of the duties, the employee will receive written information which will outline the policies and acceptable practices with respect to radioisotope handling at this institution.

Similar action will be taken in the case of a radiation worker assuming significantly different responsibilities.

Some aspects of radiation safety are reviewed at every monthly staff meeting in Nuclear Medicine. All radiation workers are required to attend an annual meeting held in the first quarter of each calendar year where Items a-j are reviewed, and aspects of radiation safety and worker responsibilities are covered.

Significant changes in regulations and terms of the license are published and disseminated as soon as possible.

Individuals who come into contact only with patients receiving radioisotope treatment are given special instructions when temporary monitoring badges are issued on a case by case basis. Applicable regulations and procedures are also covered at this time. This is repeated whenever a new patient undergoes treatment. A set of written instructions is also issued at that time.

A five-hour lecture series on radiation safety and instrumentation is held annually by the RSO and offered to Nuclear Medicine residents, technicians, and other interested workers.



MEMORANDUM FOR: Pete Basone, Chief, Medical Administration

FROM: Kenneth P. Lyons, M.D., Chief, Nuclear Medicine Service

SUBJECT: RECEIPT OF PACKAGES CONTAINING RADIOACTIVE MATERIAL

Any packages containing radioactive material that arrive between 4:30 P.M. and 7 A.M. or on Sundays or legal holidays shall be signed for by the Medical Administrative Assistant on duty and taken immediately to the Nuclear Medicine Department. Unlock the door, place the package on top of the cart immediately to the right of the door, and relock the door.

If the package is wet or appears to be damaged, immediately contact the hospital Radiation Safety Officer. Ask the carrier to remain at the hospital until it can be determined that neither he nor the delivery vehicle is contaminated.

RADIATION SAFETY OFFICER: Vince Golezunas, Ph.D.

OFFICE PHONE: X2176

HOME PHONE: (213) 697-7889

Item No. 11  
Date: Nov 1978  
Lab: Dr. Lyons, Chief



PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL

1. The Nuclear Medicine staff will place all orders for radioactive material through the Operations Analyst or designee who will ensure that the requested materials and quantities are authorized by the licensee and that possession limits are not exceeded.
2. During normal working hours carriers will be instructed to deliver radioactive packages directly to the Nuclear Medicine Service.
3. During off-duty hours, the Medical Administrative Assistant will accept delivery of radioactive packages in accordance with the procedures outlined in the memorandum to the Medical Administration Service.

PROCEDURES FOR OPENING PACKAGES CONTAINING  
RADIOACTIVE MATERIAL

1. Visually inspect package for any sign of damage (e.g., wetness, crushed).  
If damage is noted, stop procedure and notify Radiation Safety Officer.
2. Measure exposure rate at 3 feet from package surface. If  $> 10\text{mR/hr}$ --stop procedure and notify Radiation Safety Officer.
3. Measure surface exposure rate and record. If  $> 200\text{ mR/hr}$ --stop procedure and notify Radiation Safety Officer.
4. Put on gloves.
5. Open the outer package (following manufacturer's directions, if supplied) and remove packing slip. Open inner package to verify contents (compare requisition, packing slips, and label on bottle), check integrity of final source container (inspect for breakage of seals or vials, loss of liquid, discoloration of packing material). Check also that shipment does not exceed possession limits.
6. Monitor the packing material and packages for contamination before discarding:
  - a. If contaminated, treat as radioactive waste.
  - b. If not, obliterate radiation labels before discarding in regular trash.
7. Monitor hands at the conclusion of the procedure.

APPENDIX G  
LABORATORY RULES FOR THE USE OF  
RADIOACTIVE MATERIAL

1. Wear laboratory coats, or other protective clothing at all times in areas where radioactive materials are used.
2. Wear disposable gloves at all times while handling radioactive materials.
3. Monitor hands and clothing for contamination after each procedure or before leaving the area.
4. Use syringe shields for preparation of patient doses and administration to patients except in circumstances, such as pediatric cases, where their use would compromise the patient's well-being.
5. Do not eat, drink, smoke or apply cosmetics in any area where radioactive material is stored or used.
6. Assay each patient dose in the dose calibrator prior to administration. Do not use any doses that differ from the prescribed dose by more than 10%.

Item No. 16  
Date: NOV 1978  
VAMC, Long Beach, CA

7. Wear personnel monitoring devices (Film badge or TLD) at all times while in areas where radioactive materials are used or stored. These should be worn at chest or waist level.
8. Wear TLD finger badges during elution of generator and preparation, assay, and injection of radiopharmaceuticals.
9. Dispose of radioactive waste only in specially designated receptacles.
10. Never pipette by mouth.
11. Survey generator, kit preparation, and injection areas for contamination after each procedure or at the end of the day. Decontaminate if necessary.
12. Confine radioactive solutions in covered containers plainly identified and labelled with name of compound, radionuclide, date, activity, and radiation level if applicable.
13. Always transport radioactive material in shielded containers.

Item No. 15

Date: NOV 1976

APPENDIX H  
EMERGENCY PROCEDURES

Minor Spills:

1. NOTIFY: Notify persons in the area that a spill has occurred.
2. PREVENT THE SPREAD: Cover the spill with absorbent paper.
3. CLEAN UP: Use disposable gloves and remote handling tongs.  
Carefully fold the absorbent paper and pad. Insert into a plastic bag and dispose of in the radioactive waste container. Include all other contaminated materials such as disposable gloves.
4. SURVEY: With a G.M. Survey Meter, check the area around the spill, your hands and clothing for contamination.
5. REPORT: Report incident to the Radiation Safety Officer.

Major Spills:

1. CLEAR THE AREA: Notify all persons not involved in the spill to vacate the room.
2. PREVENT THE SPREAD. Cover the spill with absorbent pads, but do not attempt to clean it up. Confine the movement of all personnel potentially contaminated to prevent the spread.

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3. SHIELD THE SOURCE. If possible, the spill should be shielded, but only if it can be done without further contamination or without significantly increasing your radiation exposure.
4. CLOSE THE ROOM. Leave the room and lock the door(s) to prevent entry.
5. CALL FOR HELP. Notify the Radiation Safety Officer immediately.
6. PERSONNEL DECONTAMINATION. Contaminated clothing should be removed and stored for further evaluation by the Radiation Safety Officer. If the spill is on the skin, flush thoroughly and then wash with mild soap and lukewarm water.

RADIATION SAFETY OFFICER: Vincent Gelezunas, Ph.D.  
OFFICE PHONE: Ext. 2176  
HOME PHONE: (213) 697-7889

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Date: NOV 1978



## APPENDIX I

### SURVEY PROCEDURES

- A. All elution, preparation and injection areas will be surveyed daily with survey meter and decontaminated if necessary.
- B. Laboratory areas where only small quantities of radioactive material are used (less than 100  $\mu\text{Ci}$ ) will be surveyed monthly.
- C. All other laboratory areas will be surveyed weekly.
- D. The weekly and monthly survey will consist of:
  - 1. A measurement of radiation levels with a survey meter sufficiently sensitive to detect 0.1 mR/hr.
  - 2. A series of wipe tests to measure contamination levels. The method for performing wipe tests will be sufficiently sensitive to detect 100 dpm.
- E. A permanent record will be kept of all survey results, including negative results. The record will include:

1. Location, date, and type of equipment used.
2. Name of person conducting the survey.
3. Drawing of area surveyed, identifying relevant features such as active storage areas, active waste areas, etc.
4. Measured exposure rates, keyed to location on drawing (point out rates that require corrective action).
5. Detected contamination levels, keyed to locations on drawing.
6. 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.

F. Area will be cleaned if the contamination level exceeds 100 dpm/100 cm<sup>2</sup>.

NOTE: For daily surveys where no abnormal exposures are found, only the date, the identification of the person performing the survey, and the survey reports will be recorded.

APPENDIX J

WASTE DISPOSAL PROCEDURES

1. Liquid waste will be disposed of:

Check as appropriate:

- X   By commercial waste disposal service.(See also no. 4 below.)
- X   In the sanitary sewer system in accordance with Section 20.303  
of 10 CFR Part 10.
- Other (specify): \_\_\_\_\_

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

Check as appropriate:

- Returned to the manufacturer for disposal.
- Held for decay until radiation levels as measured with a low-level  
survey meter and with all shielding removed, have reached background  
levels. All radiation labels will be removed or obliterated and the  
generators disposed of as normal trash. (Note: This method of dis-  
posal may not be practical for generators containing long-lived  
radioactive contaminants.)
- X   Disposed of by commercial waste disposal service.(See also no. 4  
below.)
- Other (specify): \_\_\_\_\_
- \_\_\_\_\_

3. Other solid waste will be:

Check as appropriate:

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

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

Other (Specify): \_\_\_\_\_  
\_\_\_\_\_

4. The commercial waste disposal service used will be: \_\_\_\_\_  
Thomas Gray & Associates, Orange, California  
(Name) (City, State)

NRC/Agreement State License No. 704-00689-07

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Date: Nov 1978  
VA Medical Center  
Long Beach, CA

APPENDIX K

PROCEDURES FOR USE OF GROUPS IV AND V RADIOPHARMACEUTICALS  
FOR TREATMENT OF PATIENTS

1. All patients treated with Iodine-131 or Gold-198 will be placed in a private room with a toilet.
2. The patient's room will be properly posted in accordance with Section 20.203, 10 CFR Part 20.
3. Surveys of the patient's room and surrounding areas will be conducted as soon as practicable after administration of the treatment dose. Exposure rates will be measured at the patient's bedside, three feet away and the entrance to the room. The Radiation Safety Officer or his designate will then determine how long a person may remain at these positions and will post these times in the patient's chart. The results of daily surveys will be used to recalculate permitted times which will be posted on the patient's chart.
4. The form, Nursing Instructions for Patients Treated with Phosphorus-32, Gold-198, or Iodine-131, will be completed immediately after administration of the treatment dose. A copy will be posted in the patient's chart.

5. Radiation levels in unrestricted areas will be maintained less than the limits specified in Section 20.105(b), 10 CFR Part 20:
6. All linens will be surveyed for contamination before being removed from the patient's room and will, if necessary, be held for decay.
7. Disposable plates, cups, eating utensils, tissue, surgical dressings, and other similar waste items will be placed in a specially designated container. The material will be collected daily by the Radiation Safety Officer (or his designate) checked for contamination, and disposed of as normal or radioactive waste, as appropriate.
8. Non-disposable items used for these patients will be held in plastic bags in the patient's room, and checked for contamination by the Radiation Safety Officer or his designate. Items may be returned for normal use, held for decay or decontaminated, as appropriate.
9. When deemed necessary by the Radiation Safety Officer or his designate, urine and vomitus from iodine-<sup>131</sup> therapy patients will be stored for decay in our radioactive waste storage area. When it has reached background levels as measured with a low-level survey meter, it will be released to the sanitary sewer system.



10. Before a therapy patient's room is reassigned to another patient, the room will be surveyed for contamination (and decontaminated if necessary) and all radioactive waste and waste containers will be removed.

11. Nursing Instructions

- a. Nurses should spend only that amount of time near the patient required for ordinary nursing care. Special restrictions may be noted on the precaution sheet in the patient's chart. Nurses should read these instructions before administering to the patients. Call the Nuclear Medicine Department if you have any questions about the care of these patients.
- b. Visitors will be limited to those 18 years of age or over, unless other instructions are noted on the precautions sheet in the patient's chart.
- c. Patients must remain in bed while visitors are in the room and visitors should remain at least three feet from the patient.
- d. Radioactive patients are to be confined to their rooms except for special medical or nursing purposes approved by the Nuclear Medicine Department.

- e. No nurse, visitor or attendant who is pregnant should be admitted in the room of a patient who has received a therapeutic amount of radioactivity until the patient no longer presents a radiation hazard. Female visitors should be asked whether they are pregnant.
- f. Attending personnel must wear rubber or disposable plastic gloves when handling urinals, bedpans, emesis basins or other containers having any material obtained from the body of the patient. Wash gloves before removing, and then wash hands. The gloves must be left in the patient's room in the designated waste container. These gloves need not be sterile or surgical in type.
- g. Disposable items should be used in the care of these patients, whenever possible. These items should be placed in the designated waste container. Contact the Nuclear Medicine Department for proper disposal of the contents of the designated waste container.
- h. All clothes and bed linens used by the patient should be placed in the laundry bag provided and left in the patient's room to be checked by a member of the Nuclear Medicine Department.

i. All non-disposable items should be placed in a plastic bag and left in the patient's room to be checked by a member of the Nuclear Medicine Department.

j. Surgical dressings should be changed only as directed by physician.

Gold-198 leaking from a puncture wound will stain the dressings dark red or purple. Such dressings should not be discarded but should be collected in plastic bags and turned over to the Nuclear Medicine Department. Handle these dressings only with tongs or tweezers. Wear disposable gloves.

k. For Iodine-131 patients:

(1) When deemed necessary by the Radiation Safety Officer, urine from Iodine-131 patients will be collected in special containers provided by the Nuclear Medicine Department. The patient should be encouraged to collect his own urine in the container. If the patient is bedridden, a separate urinal or bed pan should be provided. The urinal or bed pan should be flushed several times with hot soapy water after use.

(2) If the nurse helps to collect the excreta, she should wear disposable gloves. Afterwards she should wash her

hands with the gloves on and again after the gloves are removed. The gloves should be placed in the designated waste container for disposal by the Nuclear Medicine Department.

- (3) Disposable plates, cups, and eating utensils will be used by patients who are treated with iodine-131.
- (4) Vomiting within 24 hours after oral administration, urinary incontinence, or excessive sweating within the first 48 hours may result in contamination of linen and/or floor. In any such situations or if radioactive urine and/or feces is spilled during collection, call the Nuclear Medicine Department, Ext. 2176. Meanwhile, handle all contaminated material with disposable gloves and avoid spreading contamination.
- (5) All vomitus must also be kept in the patient's room for disposal by the Nuclear Medicine Department. Feces need not be routinely saved, unless ordered on the chart. The same toilet should be used by the patient at all times and it should be well flushed (3 times).

1. Utmost precautions must be taken to see that no urine or vomitus, is spilled on the floor or the bed. If any part of the patient's room is suspected to be contaminated, notify the Nuclear Medicine Department.
- m. If a nurse, attendant or anyone else knows or suspects that his skin, or clothing, including shoes, is contaminated, notify the Nuclear Medicine Department immediately. This person should remain in the patient's room and not walk about the hospital. If the hands become contaminated, wash immediately with soap and water.
- n. If a therapy patient should need emergency surgery or should die, notify the Nuclear Medicine Department immediately.
- o. Nuclear Medicine will release a patient from radiation isolation and will survey the room for contamination before releasing the room for normal use.

NURSING INSTRUCTIONS FOR PATIENTS TREATED WITH  
PHOSPHORUS-32, GOLD-198, or IODINE-131

Patient's Name: \_\_\_\_\_

Room No: \_\_\_\_\_ Physician's Name: \_\_\_\_\_

Radioisotope Administered: \_\_\_\_\_

Dose Received: \_\_\_\_\_ Method of Administration: \_\_\_\_\_

Exposure Rates in MR/hr

Date \_\_\_\_\_ 3 Feet From Bed \_\_\_\_\_ 10 Feet From Bed \_\_\_\_\_

(Comply with all Checked Items)

\_\_\_\_ 1. Visiting time permitted: \_\_\_\_\_

\_\_\_\_ 2. Visitors must remain \_\_\_\_\_ from the patient.

\_\_\_\_ 3. Patient may not leave room.

\_\_\_\_ 4. Visitors under 18 not permitted.

\_\_\_\_ 5. Pregnant visitors not permitted.

\_\_\_\_ 6. Film badges must be worn.

\_\_\_\_ 7. Use and complete the following tags:

\_\_\_\_ door

\_\_\_\_ bed

\_\_\_\_ chart

\_\_\_\_ wrist

\_\_\_\_ 8. Gloves must be worn while attending patient.



- \_\_\_ 9. Patient must use disposable utensils.
- \_\_\_ 10. All items must remain in the room until OK'd by Radiation Safety.
- \_\_\_ 11. Smoking is not permitted.
- \_\_\_ 12. Do not release room to admitting until OK'd by Radiation Safety.
- \_\_\_ 13. Other instructions.

In case of an emergency contact:

RSO

(Name)

/\_\_\_\_\_  
(On/Off Duty Telephone No.)

## APPENDIX L

PROCEDURES FOR USE OF GROUP VI SOURCES FOR  
TREATMENT OF PATIENTS

1. All patients treated with brachytherapy sources will be placed in a private room with toilet.
2. The patient's room will be properly posted in accordance with Section 20.203, 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 the patient's bedside, three feet away and at the entrance to the room. The Radiation Safety Officer or his designate will then determine how long a person may remain at these positions and will post these times in the patient's chart.
4. The form, Nursing instructions for Patients Treated with Brachytherapy Sources, will be completed immediately after sources are implanted and placed in the patient's chart.

5. Radiation levels in unrestricted areas will be maintained less than the limits specified in Section 20.105(b), 10 CFR Part 20.
6. Nurses caring for brachytherapy patients will be assigned film badges. TLD finger badges will also be assigned to nurses who must provide extended personal care to the patient.
7. At the conclusion of treatment, a survey will be performed to ensure that all sources have been removed from the patient and that no sources remain in the patient's room or 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.
8. Instructions to Nurses
  - a. Special restrictions may be noted on the precaution sheet in the patient's chart. Nurses should read these instructions before administering to the patient. Call the Nuclear Medicine Department if you have any questions about the care of these patients.

- b. Nurses should spend only the minimum necessary time near a patient for routine nursing care, but must obtain and wear a film badge.
- c. When a nurse receives an assignment to a therapy patient, a film or TLD badge should be obtained immediately from the Nuclear Medicine Department. The badge shall be worn only by the nurse to whom it is issued and shall not be exchanged between 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 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 or radiologist, and MAY NOT BE DISCARDED until directed by the radiologist. Dressings should be kept in a basin until checked by the radiologist or member of the Nuclear Medicine Department.

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, utensils or bedding unless specifically ordered.
- j. These patients must stay in bed unless orders to the contrary are written.
- k. Visitors will be limited to those 18 years of age or over, unless other instructions are noted on the precaution sheet in the patient's chart.



- l. Visitors should sit at least three feet from the patient and should remain no longer than the times specified on the form posted on the patient's door and in his chart.
- m. 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.
- n. 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 Karl Swingle, Ph.D. . Phone No. (days) Ext. 2474, (nights) (714)968-8514 .
- o. At the conclusion of treatment, call the Radiation Safety Officer and request that the patient and room be surveyed to be sure all radioactive sources have been removed.



NURSING INSTRUCTIONS FOR PATIENTS TREATED  
WITH BRACHYTHERAPY SOURCES

Patient's Name: \_\_\_\_\_

Room Number: \_\_\_\_\_ Physician's Name: \_\_\_\_\_

Isotope 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 \_\_\_\_\_

(Complete checked items)

- \_\_\_\_\_ 1. Wear film badge.
- \_\_\_\_\_ 2. Wear rubber gloves
- \_\_\_\_\_ 3. Place laundry in linen bag and save.
- \_\_\_\_\_ 4. Housekeeping may not enter the room.
- \_\_\_\_\_ 5. Patient may not have visitors.
- \_\_\_\_\_ 6. No pregnant visitors.
- \_\_\_\_\_ 7. No visitors under 18 years of age.
- \_\_\_\_\_ 8. A dismissal survey must be performed before patient is discharged.
- \_\_\_\_\_ 9. Patient must have a private room.
- \_\_\_\_\_ 10. Other Instructions

RSO \_\_\_\_\_ name \_\_\_\_\_ on duty/off duty telephone  
number

## Item 20. Therapeutic Use of Sealed Sources

### a. Storage

All therapeutic sealed sources are stored in Building 126, Room 55. 226-Ra, 124-I, 192-Ir, and 137-Cs are stored in the radium safe, which has lead walls 6 inches thick. The 90-Sr ophthalmic applicator is kept in its box on top of the radium safe behind a 2-inch thick lead wall. The door to room 55 is remote from hospital traffic other than personnel in Radiation Therapy. It is locked at night and generally under observation of Radiation Therapy personnel during the day. The nearest unrestricted area is directly overhead, with 14 inches of concrete in the ceiling of room 55.

### b. Handling

Preparation of 126-Ra or 137-Cs needles for implantation or afterloading, loading of 125-I seeds into applicators, and preparation of 192-Ir ribbon for afterloading is done behind a lead shield in room 55. Such preparation is done by a radiation physicist or a radiation therapy technician trained in these procedures. Instruments with as long handles as practical are used.

### c. Nursing Care of Patients Being Treated with Sealed Sources

(Described in instruction entitled, "Guidelines for the Nursing Care of Patients Receiving Radiation Therapy" dated October 31, 1978.)

### d. Measurement of Radiation Dose to Hands of Individuals Handling Sealed Sources

Four glass-encapsulated TLD's are taped around each forefinger during the preparation of the sources and again during the cleaning and return of the sources to storage after treatment of the patient. These TLD's are read and the data recorded in the TLD log book.

### e. Equipment for Transporting Sources

- (i) Heyman Carrier and Cart, Model 500, Radium Chemical Company.
- (ii) Two shielded carrying pots (1/2 inch lead) on long handles. Radium Chemical Company.
- (iii) Three shielded carriers for cartridges containing 131-I seeds. Mick. Radionuclear Instruments.

### f. Source Accountability

A single log book is used to record all source movements. Any source moved into or out of the storage area is recorded in the log. When sources are returned to storage, the physicist notes in the log whether or not all sources are accounted for. In the case of 125-I seeds, any unused seeds are returned to the vials in which they were shipped and a notation made in the log of the number of seeds implanted and the number returned to storage. At

the time of the Quarterly Radionuclide Inventory all sources are counted, their activity corrected for decay, and the inventory recorded in the log.

g. Surveys at Time of Treatment

At the completion of each implantation (except 125-I), exposure rates are measured at 1 meter from the center of the implant and recorded in the Radiation Therapy Chart for that patient.

After the sources have been removed and counted and the count reconciled with the number of sources implanted, this fact is recorded in the patient's record. After the removed sources have been taken from the patient's room, a survey of the room and patient is made with a G-M meter to detect any overlooked source in the patient or elsewhere in the room. The result of this survey is recorded in the patient's record.

In the case of 125-I implants, at completion of the implantation, instruments, sponges, towels, drapes, and the suction trap are surveyed with a G-M meter for loose seeds. If any are found they are cleaned and returned to storage. The results of this survey are recorded in the sealed-source log book.

## APPENDIX M

## Information Provided in Support of the Use of Xenon-133

1. Quantities Used

Ten studies per week are expected with an average of 20 mCi administered per study.

Expected Quantity of Xe-133 Used

$$= 10 \frac{\text{studies}}{\text{week}} \times 20 \frac{\text{mCi}}{\text{study}} \times 1000 \frac{\text{uCi}}{\text{mCi}} = 2 \times 10^5 \text{ uCi } \frac{\text{Xe-133}}{\text{week}}$$

2. Possession Limit

3000 millicuries Xe-133

3. Description of Storage and Use Areas

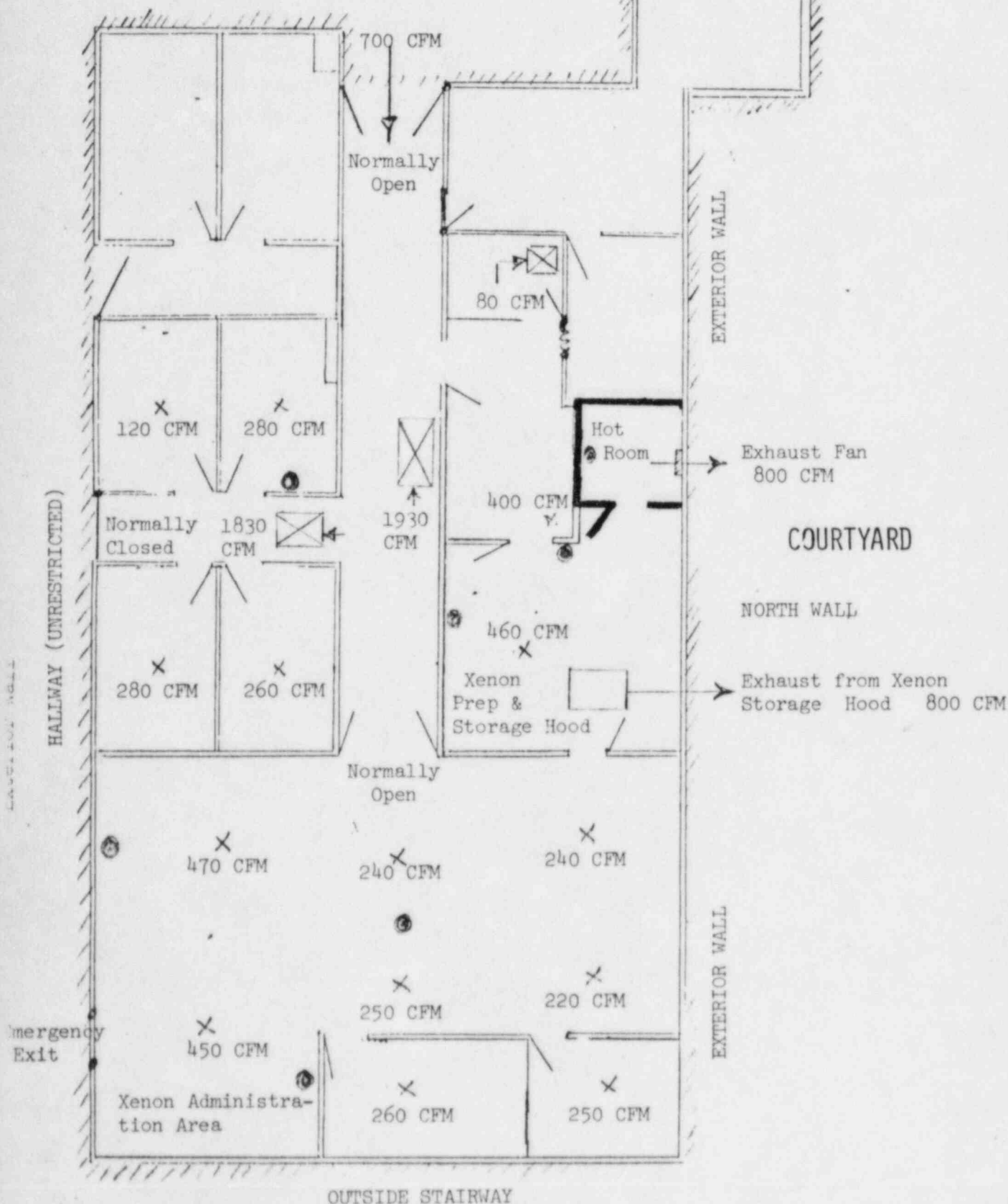
Air flows in the Nuclear Medicine Clinic were measured in March 1980. The results are shown on the clinic floor plan, which also shows the restricted area boundaries. (Fig. 1) The clinic is under negative pressure as indicated by the flow of air into the clinic from the main corridor (700 CFM). The total air supply to the clinic is 4900 CFM. The system is single pass, and the exhaust air is ducted directly to the roof where it is vented to the atmosphere. The nearest air inlet to this exhaust duct is located approximately fifty feet away.

Xe-133 is stored in a standard fume hood with a rated air flow of greater than 800 CFM. The exhaust is ducted directly outdoors into a courtyard. (Fig. 2) (Also see Section 7) The floors immediately above and below the exhaust are occupied by Radiology and Psychology clinics respectively, and all of the windows are normally closed.

FIG. 1  
Nuclear Medicine Floor Plan  
Building 1, Second Floor  
Long Beach VA Medical Center

Approximate Floor Space: 4063 sq.ft.  
Scale: Approx. 1 inch = 12 ft

- ☒ Air Returns (3840 CFM)
- ✕ Air Inlets (Total: 4900 CFM)
- Film Badge Radiation Monitor
- ▨ Restricted Area Boundary





KEY

APPROXIMATE SCALE: 1/4" = 1 FT

||||| = RESTRICTED AREA BOUNDARY

⊠ = AIR OUTLETS TO COURTYARD

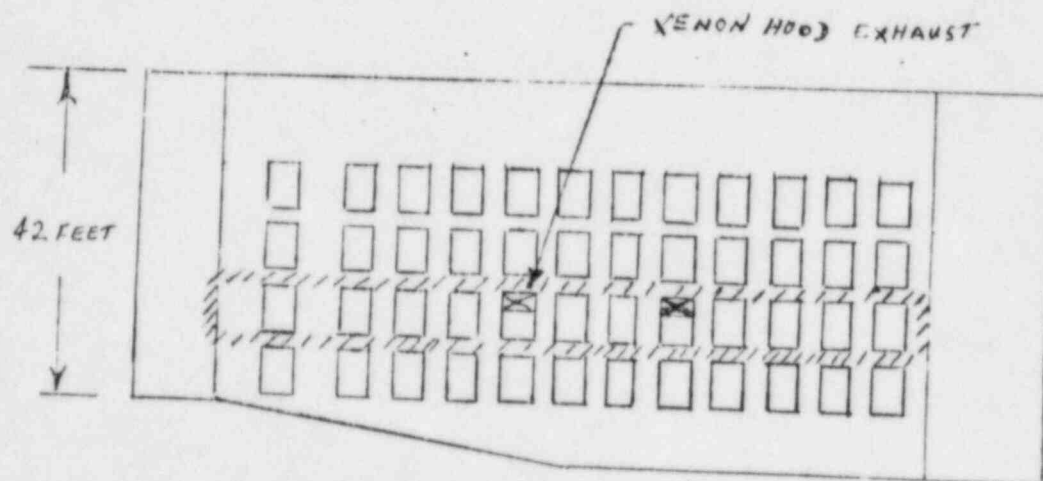
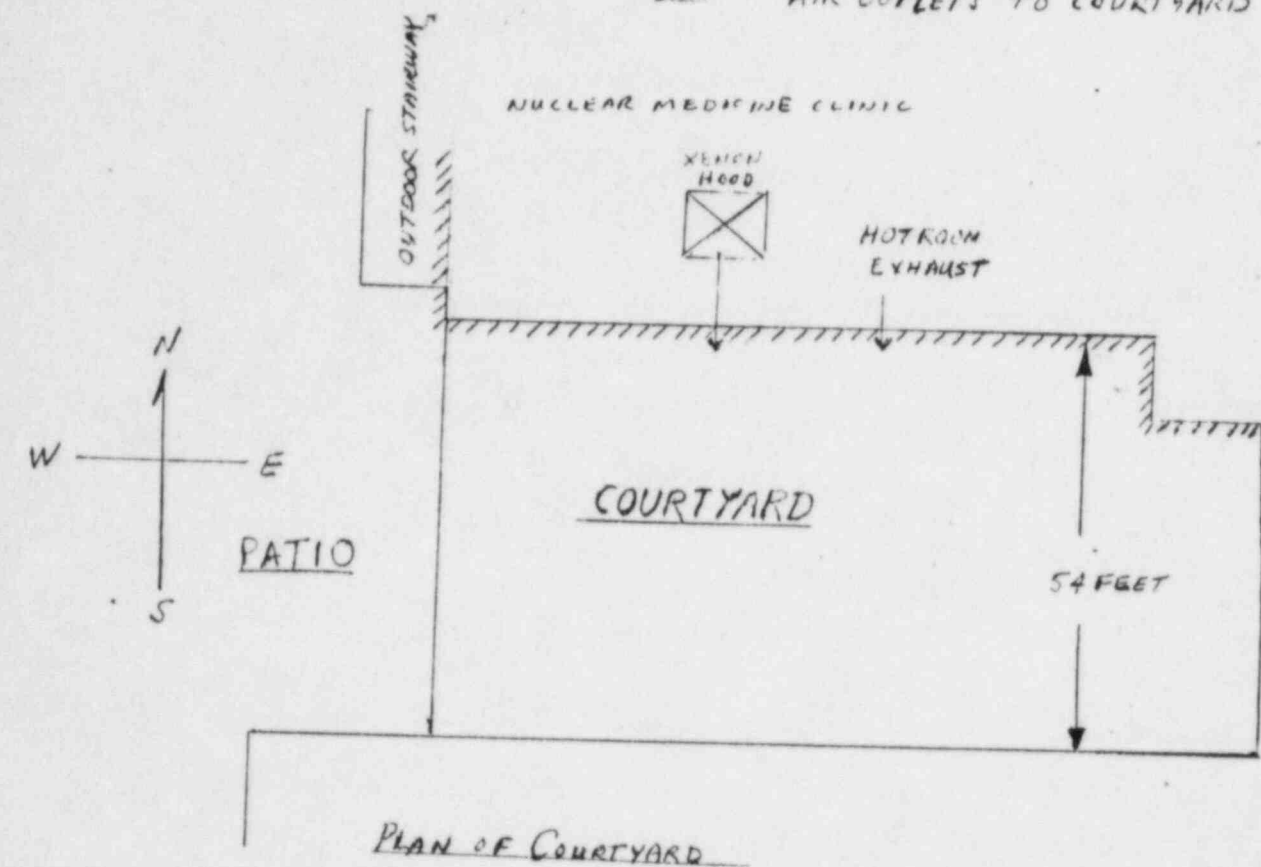


FIG. 2 LAYOUT OF COURTYARD & LOCATION OF EXHAUSTS TO COURTYARD



(Appendix M-continued)

The Xe-133 intended for patient use is stored in the hood in the original shielding provided by the manufacturer. Expended activated charcoal traps containing Xe-133 are also stored in the hood during "cooling". Shielding is provided as required so that the radiation reading outside the hood is less than 0.5 mR/hr.

Air flow into the clinic is maintained by the automated hospital air conditioning system. In the event of a system failure, which is readily detectable by the sudden drop in the noise level, all in-vitro transfer operations of Xe-133 would stop until air circulation was restored to the clinic.

4. Procedures for Routine Use

All in-vitro transfers of Xe-133 would be carried out in a fumehood. The isotope is administered to patients by means of a "Pulmonex Xenon System" which has an integrated gas trap (Atomic Products Corp.). The expelled isotope from in-vivo procedures would be trapped in the integrated charcoal trap of the system. The clinic will be monitored for Xe-133 concentration by means of a Xenon-133 gas monitor (Johnston Labs., Model 133B). Care will be taken to minimize Xe-133 loss to the environment. Devices such as nose clamps will be used on a routine basis.

5. Emergency Procedures

The clinic will be monitored by a Xe-133 gas monitor (Johnston Labs, Model 133B). All incidents in which the MPC exceeded 0.3 would be investigated to determine cause. If the MPC exceeded 0.5, the use of Xe-133 in any in-vitro procedure would immediately stop. If the MPC exceeded 1.0 for a period of 10 minutes, the clinic would be evacuated of all non-essential personnel until the Xenon-133 concentration returned to normal background. If any of these events occurred,

(Appendix M-continued)

the RSO or designee would be notified and appropriate action taken under his direction. All incidents would be reviewed before Xe-133 operation would again be permitted.

## 6. Air Concentrations of Xenon-133 in Restricted Areas

a. Maximum Amount of Activity to be Used Per Week.

$$A = \frac{20 \text{ mCi}}{\text{patient}} \times \frac{10 \text{ patients}}{\text{week}} \times \frac{1000 \text{ uCi}}{\text{mCi}} = 2 \times 10^5 \frac{\text{uCi}}{\text{week}}$$

b. For this Calculation, Assume all of This Xe-133 is Lost During Use.

$$f = 1.0$$

$$c. \quad V = \frac{A \times f}{C/\text{ml}} = \frac{2 \times 10^5 \times 1.0}{1 \times 10^{-5}}$$

$$V = 2 \times 10^{10} \text{ ml/week}$$

Required ventilation rate:

$$\frac{2 \times 10^{10} \text{ ml/week}}{40 \text{ hrs/week}} \times \frac{\text{CFM}}{1.7 \times 10^6 \text{ ml/hr}} = 294 \text{ CFM}$$

The measured air flow into the clinic was 4900 CPM.

Therefore:  $\frac{4900}{294} = 16.7$  times the maximum requirement with the conservative assumption that all the Xenon-133 used is exhausted through the roof duct and none of it is trapped.

## 7. Methods of Xenon-133 Disposal.

Conscientious efforts to minimize losses of Xe-133 to the environment will always be made. As previously noted, the Xe-133 expended in the in-vivo nuclear medicine procedures will be exhausted through activated charcoal

(Appendix M-continued)

whenever possible.

Untrapped Xe-133 is released outdoors in two ways. In one pathway, the Xe-133 lost during patient studies is ultimately exhausted through a roof vent which is described in Section 3. Access to the roof is controlled by means of a locked door. In the other loss route, Xe-133 lost during transfer operations in the hood is directed out directly into a courtyard. Each route will be considered separately.

a. Roof Exhaust

The quantity of Xe-133 that can be exhausted and not exceed the maximum permissible concentration for an unrestricted area is for a clinic flow rate of 4900 CFM given by:

$$A = 4900 \text{ CFM} \times \frac{1.484 \times 10^{10} \text{ ml/yr}}{\text{CFM}} \times \frac{\text{yr}}{52 \text{ week}} \times 3 \times 10^{-7} \text{ uCi/ml} \times \frac{1 \text{ mCi}}{1000 \text{ uCi}} =$$

420 mCi/week

This is  $\frac{420}{200} = 2.1$  times the maximum quantity of Xe-133 used for the period conservatively assuming that none of the Xe-133 is trapped.

b. Hood Exhaust into Outdoor Courtyard

The location of the exhaust with respect to the courtyard is shown in Fig. 2. The courtyard below is never occupied, except for occasional lawn mowing, weeding, and pruning of shrubbery. Beyond the open west end of the courtyard is an open-air patio with tables and chairs where patients and employees can relax in good weather. The patio is unenclosed and almost constantly swept by westerly breezes or winds. The prevailing wind is across the patio, into the courtyard, and up over the top of the courtyard walls.

(Appendix M - Continued)

The hood has a flow rate which exceeds 800 CFM.

The quantity of Xe-133 which can be exhausted is:

$$A = 800 \text{ CFM} \times 2.854 \times 10^8 \text{ ml/week} \times 3 \times 10^{-7} \frac{\text{uCi}}{\text{ml}} \times \frac{1 \text{ mCi}}{1000 \text{ uCi}} = 68 \text{ mCi/week}$$

This represents  $\frac{68}{200} = .34$  times the maximum quantity used in the patient studies. Losses in drawing up samples are expected to be much less than 5% (10 mCi/week). An additional safety factor is provided by the wind sweeping the courtyard. The flow rate (CFM) through the courtyard with the frontal area taken as 52 ft X 42 ft (See Fig. 2) for a 1 mph wind is:

$$\frac{1 \text{ mile}}{\text{hour}} \times \frac{5280 \text{ ft}}{\text{mile}} \times \frac{\text{hour}}{60 \text{ min.}} \times (52 \times 42) \text{ ft}^2 = 192000 \text{ CFM}$$

Assuming perfect mixing each 1 mph of wind velocity increment then provides an additional dilution factor of  $192000 \text{ CFM} / 800 \text{ CFM} = 240$ . The average wind velocity in our area is well in excess of 1 mph.

#### 8. Operation of Charcoal Traps.

The effectiveness of trap operation would be verified through the use of an area concentration monitor with a sniffer attachment (Johnston Labs., Model 133B). The air outlet of the trap will be monitored on a regular basis and, if the Xe-133 concentration in the exhaust exceeds the manufacturer's specifications, the unit would be replaced. Otherwise, traps would be replaced on a regular cycle as specified by the manufacturer. Exhausted traps would be stored for a period of 20 half lives, starting from the last use, and would be stored in the fumehood (800 CFM) during this time. (See Fig. 1) Shielding would be provided to reduce the radiation dose rate outside the hood to less than 0.5 mR/hr. No significant leakage of Xe-133 is anticipated from an expended trap.

## RULES FOR HANDLING RADIOACTIVITY IN ANIMAL QUARTERS

November 1978

### A. Responsibility of Investigator:

The Investigator whose work requires administration of radioactive materials to animals is responsible for:

1. Clearly identifying the cages or quarters of radioactive animals.
2. Informing the animal technician of safety precautions required for routine maintenance of animals and disposal of contaminated litter and excreta.
3. Leaving accessible records regarding radioactive animals in the animal room radioactivity log book so that proper and safe care can be given animals in case of absence of the investigator and the animal technician in charge.
4. Prevention of contamination of animal quarters or animal surgery rooms, and decontamination of radioactive cages and other equipment used in the experiment.
5. Safe disposal of radioactive carcasses and contaminated excreta.

### B. Responsibility of Animal Technician:

1. The animal technician trained in radioactivity safety procedures shall feed and water animals in accordance with the directions given by the investigator in charge of the experiment.
2. All excreta and contaminated litter from radioactive animals shall be segregated from non-radioactive excreta unless permission for routine disposal is given by the Radiation Safety Officer. They will be checked for intensity of radioactive emission when applicable and stored in clearly marked plastic bags in the Dec. du prior to disposal by methods agreed to between the investigator and the Radiation Safety Officer.
3. All cages used in radioactive experiments must be boiled in the R-7 tank before re-use in other experiments and must be checked for radioactivity at that time before being returned to use.
4. If radioactive animals should die in the absence of the investigator, they should be kept adequately wrapped and completely identified in the freezer.
5. Only trained animal technicians or the investigator may handle radioactive animals or their excreta. However, the weekend caretaker



or other animal caretakers not experienced in the handling of radioactive activity may feed and water such animals unless warned away by a "Danger, High Intensity Radiation" sign on the cage. Weekend caretakers shall be notified of Rule 4 above.

6. If the animal technician is unable to carry out the instructions of the investigator with regard to the care of radioactive animals, he shall inform the investigator of this without delay.

7. Film badges must be worn by the animal technician while servicing radioactive animals. Other protective devices as needed will be supplied under rules enforced by the Radiation Safety Officer.

C. Identification of Radioactive Animals:

1. The cage containing radioactive animals shall be clearly identified by a radioactivity warning sign placed in a prominent position on the cage so that it cannot be chewed off or otherwise removed accidentally. Three signs are to be used:

a. A RED metal plate stating "Danger - High Intensity Radiation" and bearing, besides the Radiation Symbol, the investigator's name, the nuclide administered, date of administration, and amount given. This sign is to be used only when the radiation activity at any cage surface is in excess of 40 mr/hr, and it is to be used only with the knowledge of the Radiation Safety Officer. The investigator and the Radiation Safety Officer have direct responsibility for the care of such animals and the disposal of their excreta. Such animals must be kept as far away as possible from other cages and all safety precautions are to be applied as stringently as possible.

b. The regular red-on-yellow radiation tag bearing information as to the investigator's name, nuclide, date of administration, and amount shall be placed prominently on all cages containing animals to which intermediate amounts of radionuclides have been administered, such that no external radiation hazard exists, but requiring precautions in the disposal of excreta and carcasses as well as safeguards against spread of contamination.

c. Red-on-white tags or labels shall be placed on all cages containing animals to which only tracer amounts of short-lived nuclides have been administered. This tag means that excreta can be disposed of without hazard through the regular channels, and the only special requirement in these cases is that the cages be thoroughly decontaminated after use. Carcasses shall be kept frozen, however, until disposed of as stipulated by the investigator.

d. Besides the information indicated on the cage front, quantities of radionuclides used in animals shall be entered in a log book displayed prominently in the animal area. The information given in each entry shall include the date of administration, number and species of animals involved, nuclide and its chemical form, as well



as instructions for the disposal of excreta, and name of responsible investigator. The experiment will continue in an in progress status, with the investigator fully responsible, until all carcasses and excreta have been properly disposed of. Only then will the experiment be terminated by the Radiation Safety Officer.

D. Security of the Animals Who Have Received Radioisotopes:

a. Experimental animals receiving less than 5 uCi of radioisotope that are not readily excreted (intradermal injection of tritiated thymidine) are kept in locked rooms. The key is held by the Chief Animal Technician.

b. All other surviving experimental animals are housed directly off of the animal surgical suite. The suite is locked at all times. The key is maintained by the investigator who is also responsible for the care of the animal.

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Item 23 Procedures and Precautions For Use of Radioactive Material  
Specified in Item 6.b.

In addition to the radiation safety procedures outlined in Item 12, the following protocol is also observed for materials specified in Item 6.b.

1. In the case of tritium handling, all workers who use this isotope are subjected to urine assays for tritium on a routine basis.
2. Workers who contact millicuries quantities of radioactive iodine are required to have thyroid counting done as specified by the Hospital Isotope Committee.
3. All sealed sources are wipe tested on a regular basis as required by CFR-10 - 35.14.
4. Sealed sources when not in use are stored in the same room with the Mo99-Tc99m generators which is always locked during nonclinic hours.

PERSONNEL DOSIMETRY

Film badge service is currently provided by the U. S. Testing Company, Richland, Washington. Badges are issued and read monthly. Badges are read for "whole body dose" and "skin dose." Finger rings are routinely supplied only to certain individuals in Nuclear Medicine Service and to some fluoroscopists. The monthly reports from the badge service are reviewed by the RSO or his designee. A running log of the results is also maintained.

## APPENDIX N

BIOASSAY PROGRAM FOR IODINE COMPOUNDS

1. The bioassay will be made by in-vivo counting.
2. All personnel who handle or are exposed to I-125 or I-131 under conditions as outlined in regulatory positions 1.a through 1.c and 2 of Regulatory Guide 8.20, Rev. 1, September 1979, "Application of Bioassay for I-125 and I-131 will be bioassayed."
3. Bioassays will be obtained within 72 hours for a new radiation worker falling under the requirements of Section b. above. All other exposed workers will be assayed every two weeks in accord with regulatory position 4.a. This frequency will be adjusted in accordance with regulatory position 4.a. if conditions permit.
4. Response to Positive Bioassays.

The response to positive results as defined in regulatory positions 5.a(1) and 5.a(2) will be in accordance with the actions set forth in regulatory position 5.