NRC FORM 313M (9-81) 10 CFR 35	U.S. NUCLEAR REGULATORY COMMISSION APPLICATION FOR MATERIALS LICENSE – MEDICAL	Approved by OMB 3150-0041 Expires 9-30-83

INSTRUCTIONS *Complete Items 1 through 26 if this is an initial application or an application for renewal of a license. Use supplemental sheets where necessary. Item 26 must be completed on all applications and signed. Retain one copy. Submit original and one copy of entire application to: Director, Office of Nuclear Materials Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Upon approval of this application, the applicant will receive a Materials License. An NRC Materials License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Parts 19, 20 and 35 and the license fee provision of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 26 and the appropriate fee enclosed.*

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

C. N. Wilcox Memorial Hospital
3420 Kuhio Highway
Lihue, Hawaii 96766

TELEPHONE NO.: AREA CODE (808) 245 ~~4811~~ 1100

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

2. PERSON TO CONTACT REGARDING THIS APPLICATION

Philip J. Manly

TELEPHONE NO.: AREA CODE (808) 621 8892

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

a. ☐ NEW LICENSE
b. ☐ AMENDMENT TO LICENSE NO.
c. ☒ RENEWAL OF LICENSE NO. 53-15737-01

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

C. Funaki, M.D. T. Crane, M.D.
P. Claremont, M.D.
Q. Belles, Ph.D.
H. Nakemura, M.D.

5. RADIATION SAFETY OFFICER (RSO) *(Name of person designated as radiation safety officer. If other than individual user, complete resume of training and experience as in Supplement A.)*

C. Funaki, M.D.

6.a. RADIOACTIVE MATERIAL FOR MEDICAL USE

RADIOACTIVE MATERIAL LISTED IN:	ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS *(In millicuries)*
10 CFR 31.11 FOR IN VITRO STUDIES	X	
10 CFR 35.100, SCHEDULE A, GROUP I	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP II	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP III	X	2,000
10 CFR 35.100, SCHEDULE A, GROUP IV	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP V	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP VI		

ADDITIONAL ITEMS:	MARK ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS *(In millicuries)*
IODINE-131 AS IODIDE FOR TREATMENT OF HYPERTHYROIDISM		
PHOSPHORUS-32 AS SOLUBLE PHOSPHATE FOR TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA AND BONE METASTASES		
PHOSPHORUS-32 AS COLLOIDAL CHROMIC PHOSPHATE FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.		
GOLD-198 AS COLLOID FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.		
IODINE-131 AS IODIDE FOR TREATMENT OF THYROID CARCINOMA		
XENON-133 AS GAS OR GAS IN SALINE FOR BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES.	X	300

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
Sr-90	sealed source (Nuclear Associates 67-850 eye therapy system)	125	superficial treatment of eye disease

License Fee Information on Next Page 7/2/84 70097

NRC FORM 313M

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NMS LIC30
53-15737-01 PDR

MAY 15 1984
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INFORMATION REQUIRED FOR ITEMS 7 THROUGH 23

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

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

15. GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL *(Check One)*	
	Appendix G Rules Followed; or
X	Equivalent Rules Attached
16. EMERGENCY PROCEDURES *(Check One)*	
	Appendix H Procedures Followed; or
X	Equivalent Procedures Attached
17. AREA SURVEY PROCEDURES *(Check One)*	
	Appendix I Procedures Followed; or
X	Equivalent Procedures Attached
18. WASTE DISPOSAL *(Check One)*	
	Appendix J Form Attached; or
X	Equivalent Information Attached
19. THERAPEUTIC USE OF RADIOPHARMACEUTICALS *(Check One)*	
	Appendix K Procedures Followed; or
X	Equivalent Procedures Attached
20. THERAPEUTIC USE OF SEALED SOURCES	
	Detailed Information Attached; and
	Appendix L Procedures Followed; or *(Check One)*
	Equivalent Procedures Attached
21. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE GASES (e.g., Xenon – 133)	
X	Detailed Information Attached
22. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL IN ANIMALS	
X	Detailed Information Attached
23. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL SPECIFIED IN ITEM 6.b	
	Detailed Information Attached 70097

24. PERSONNEL MONITORING DEVICES

TYPE (Check appropriate box)			SUPPLIER	EXCHANGE FREQUENCY
a. WHOLE BODY	X	FILM	Radiation Detection Co. or	monthly
	X	TLD	R.S. Landauer	
		OTHER (Specify)		
b. FINGER		FILM	Radiation Detection Co. or	
	X	TLD	R.S. Landauer	monthly
		OTHER (Specify)		
c. WRIST		FILM		
		TLD		
		OTHER (Specify)		

d. OTHER (Specify)

25. FOR PRIVATE PRACTICE APPLICANTS ONLY

a. HOSPITAL AGREEING TO ACCEPT PATIENTS CONTAINING RADIOACTIVE MATERIAL

NAME OF HOSPITAL

MAILING ADDRESS

CITY | STATE | ZIP CODE

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

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

26. CERTIFICATE

(This item must be completed by applicant)

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

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

(1) LICENSE FEE CATEGORY: 7B

(2) LICENSE FEE ENCLOSED: $ 150.00

b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)* Phil Palmer

(1) NAME *(Type of Print)* Phil Palmer

(2) TITLE Chief Executive Officer

c. DATE May 15, 1984

NRC FORM 313M (9-81)

70097

RADIATION SAFETY COMMITTEE

1. This committee has been established by authority of Mr. Phil Palmer, Chief Executive Officer of G. N. Wilcox Memorial Hospital as the administrative body responsible for the safe use of radioisotopes at G. N. Wilcox Memorial Hospital.

2. The members of the Radiation Safety Committee shall be composed of at least four members and will include:

   a. the Radiation Safety Officer.

   b. a management representative.

   c. a representative of the nursing staff.

   d. a physician specialist from each department where radioactive material is used.

   e. the consultant health physicist.

3. The committee is responsible for:

   a. 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.

   b. 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.

4. In performing its duties, the committee shall:

   a. 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.

   b. Review the training and experience of all individuals who use radioactive material (including physicians, technologists, physicists, and pharmacists) and determine that their qualifications are sufficient to enable them to perform their duties safely and in accordance with NRC regulations and the conditions of the license.

   c. 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 10CFR19.12.

d. Review and approve all requests for use of radioactive material within the institution.

e. 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.

f. Review the entire radiation safety program at least annually to determine that all activities are being conducted safely and in accordance with NKC 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 inspections, written safety procedures, and the adequacy of the institution's management control system.

g. Recommend remedial action to correct any deficiencies identified in the radiation safety program.

h. Maintain written records of all committee meetings, actions, recommendations, and decisions.

i. Ensure that the byproduct material license is amended, when necessary, prior to any changes in facilities, equipment, policies, procedures, and personnel, as specified in the license.

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

TRAINING AND EXPERIENCE

NAME OF AUTHORIZED USER	AUTHORIZATION
C. Funaki, M.D.	Groups I, II, III, IV, and V In vitro studies Xenon 133 Strontium 90 eye applicator
P. Claremont, M.D.	Groups I, II, and III In vitro studies Xenon 133 Iodine 131 for treatment of hyperthyroidism, cardiac disfunction and thyroid carcinoma
Q. Belles, M.D.	In vitro studies
H. Nakamura. M.D.	Groups I, II, and III In vitro studies Xenon 133 Iodine 131 for treatment of hyperthyroidism, cardiac disfunction and thyroid carcinoma
T. Crane, M.D.	Strontium 90 eye applicator

All physicians listed above are currently licensed under NRC license No. 53-15737-01.

70097

MAY 15 1984

INSTRUMENTATION

1. SURVEY METERS

a. Manufacturer's name: Victoreen Model 741F
Detector: ion chamber
No. of instruments available: 1
Range: 0 - 25,000 mR/hr
Use: package surveys

b. Manufacturer's name: Victoreen Model 490
Detector: pancake type g.m. detector
No. of instruments available: 1
Range: 0 - 800,000 cpm
Use: contamination surveys

c. Manufacturer's name: Nuclear Associates CD V-700
Detector: g.m.
No. of instruments available: 1
Range: 0 - 50 mR/hr

2. DOSE CALIBRATOR

Manufacturer's name: Capintec CRC-6
Number of instruments available: 1
range: 0 - 20 Ci
Use: assaying patient doses

3. INSTRUMENTS USED FOR DIAGNOSTIC PROCEDURES

TYPE OF INSTRUMENT	MANUFACTURER'S NAME	MODEL NO.
gamma camera	Technicare	
rectilinear scanner	Picker	84FD
scanner	Picker	Spectrascaler 4

4. OTHER

a. Beckman LS-150 automatic liquid scintillation counter for tritium counting.

b. NML 5000 automatic gamma counter for RIA counting.

c. Nuclear Chicago Model 8725 scaler and NaI well detector for counting.

d. Beckman Biogamma gamma counter for sample counting.

CALIBRATION OF RADIATION DETECTION INSTRUMENTS

1. SURVEY METERS

Survey meters will be calibrated annually by Gamma Corporation. Their calibration procedures are contained in Gamma Corporation's renewal application dated January 27, 1982 on file with the NRC under License No. 53-16847-01. Survey meters will be checked for constancy against a built-in sealed source or other sealed source prior to each use. Readings differing greater than 20% will be cause for investigation and recalibration, if necessary.

2. LABORATORY INSTRUMENTS

1. The thyroid uptake counting system will be tested semi-annually with a known quantity of I-131 to insure that the minimum detectable thyroid activity is less than 0.04 uCi.

3. DOSE CALIBRATORS

1. The dose calibrators will be tested for response to geometrical variation of samples upon installation.

A 30 ml vial containing 2 mCi of Tc-99m in a volume of 1 ml will be used. The vial will be assayed at the appropriate setting, then the volume of liquid will be increased to 2, 4, 8, 10, 20, and 25 ml. After each addition, the vial will be gently agitated and reassayed. The 10 ml vial will be used as a standard, and the ratio of measured activities calculated for each volume to the reference volume. This is the volume concentration factor (F). The correction factors will be plotted against the volumes on linear graph paper. This graph will be used to select proper volume correction factors for routine assays if variations are greater than +-2%.

2. The dose calibrator will be checked daily for instrument constancy with a source of Cs-137. The Cs-137 will be used to check the instrument settings for Cs-137, I-131, Tc-99m, and Xe-133. The dose calibrator will be adjusted or repaired whenever the results of the daily constancy checks vary from the true values by more than +-5%.

a. Place a clean, empty "blank" vial in the dose calibrator and observe the background reading. If the background is not higher than normal adjust the "zero adjust" to give a reading of zero.

b. Assay the Cs-137 source at each of the settings listed above. Record the readings.

c. Variations in the daily readings greater than +-5% require repair or adjustment of the dose calibrator.

d. Investigate higher than normal background levels to determine their origin and to eliminate them if possible by decontamination, relocation or other means.

3. Prior to initial use and quarterly thereafter, the instrument shall be checked for linearity. Checks for linearity shall be made by assaying a vial of Tc-99m of activity at the same maximum activity normally used, then reassaying the same vial at 6, 24, 30, and 48 hours after the initial assay. Instances where the difference in the measured activity is greater than +-5% from the calculated will require adjustment or repair of the dose calibrator.

a. Take a background with a "blank" vial and adjust to zero.

b. Assay the Tc-99m vial and record this value.

c. Repeat Step b. at the time intervals stated above, and record each time and reading.

d. Using the 30-hour activity measurements as a starting point, calculate the predicted activities at time listed above using the following table:

Assay Time (hours)	Correction Factor
0	31.633
6	15.853
24	1.995
30	1.000
48	0.126

e. Calculate the percent difference between the actual readings and the predicted readings and record them. Errors greater than +-5% require adjustment or repair of the dose calibrator.

4. Prior to initial use and annually thereafter, each dose calibrator shall be tested for accuracy using calibrated sealed sources certified traceable to NBS.

NUCLIDE	NOMINAL ACTIVITY	CALIBRATION ERROR
Cs-137	200 uCi	+-4.3%
Ba-133	250 uCi	+-5%
Co-57	5 mCi	+-5%

Measured activity differing from the decayed activity of the reference source by greater than +-5% shall require adjustment or repair of the dose calibrator.

a. Take a background reading with a "blank" vial and zero adjust.

b. Assay the reference standards in the dose calibrator at the appropriate settings.

c. Take three readings with each source and determine the average reading. Record the average reading of each source.

d. Correct the activity of each reference to determine the source activity at the day of the test. Record the corrected activity of each source.

e. Calculate the percent difference between the measured activity and the corrected activity. Record the percent difference.

f. Calibration checks that do not agree within +-5% indicate that the instrument should be repaired or adjusted. If this is not possible, calculate a correction factor to be used during routine assay of radionuclides.

g. Keep a log of these calibration checks.

long-term storage?

FACILITIES AND EQUIPMENT

1. The nuclear medicine facility consists of an imaging room and a hot area, as shown in Figure 1. The hot area includes an isotope storage area, a waste storage area, and a compounding and assaying area. The RIA laboratory is shown in Figure 2.

2. The isotope storage area consists of a cave made of 2-inch thick lead bricks. Individual dose vials and syringes are also kept in lead "pigs" inside the storage area. The laboratory counter surfaces of the nuclear medicine facility will be of nonabsorbent material, such as plastic laminate, and will be covered with absorbent paper.

3. The waste storage area is a waste container lined with 1 mm lead. An additional waste storage area is located in another part of the hospital, and is kept locked at all times.

4. The compounding area includes an L-shield for preparing doses and a dose calibrator with shielding for assaying of individual doses.

5. The hot area also has a fume hood used during preparation of I-131 therapy doses. The fume hood is turned on whenever a liquid therapy dose is prepared.

70097

MAY 1 5 1984

G. N. WILCOX MEMORIAL HOSPITAL

scale:
1/8" = 1'

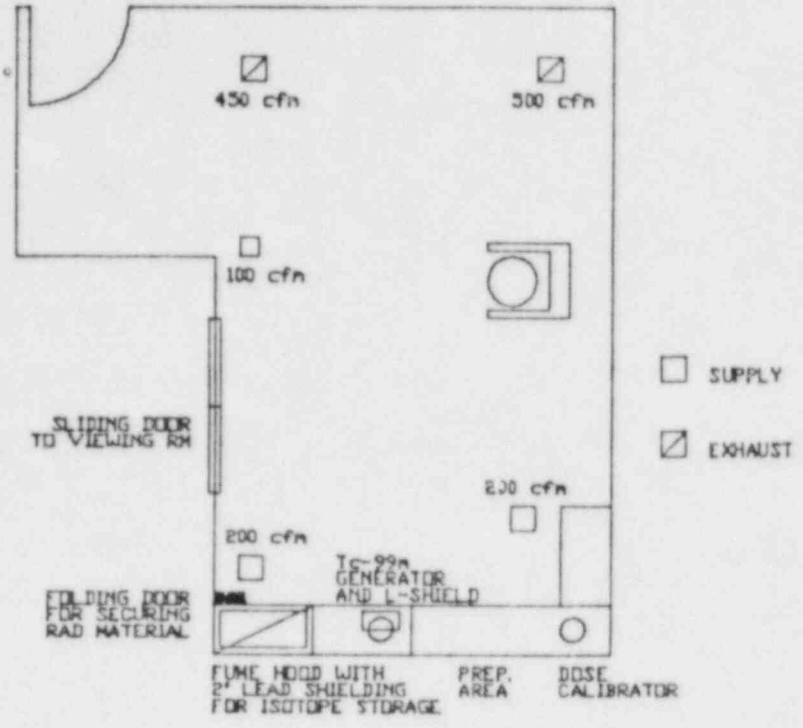

Figure 1 - Nuclear Medicine Laboratory

scale:
1/8" = 1'

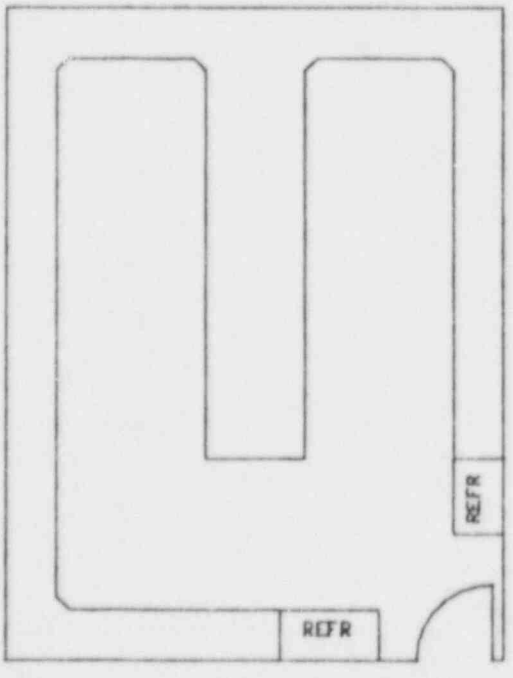

Figure 2 - Radioimmunoassay Laboratory

PERSONNEL TRAINING PROGRAM AND FREQUENCY

1. All personnel (including nursing, maintenance, and security personnel) who enter the controlled areas of the laboratories will be given appropriate instruction and information on the storage, transfer, and use of radioactive materials or of the radiation in such areas.

2. All personnel who work with and handle radioactive materials will be given a one hour lecture (or tape-slide show) before being allowed to enter a controlled area and annually thereafter. The topics to be included in the training will be:

a. ALARA exposure philosophy.

b. The hospital's procedures for handling radioactive sources.

c. The NRC license and license conditions.

d. Health protection problems associated with radiation exposure.

e. Procedures to minimize exposure.

f. Purposes and functions of protective devices employed.

g. Applicable provisions of the Code of Federal Regulations.

h. Reporting of unsafe conditions.

i. Appropriate responses in the event of an accident.

j. Exposure and bioassay reports which they may request.

Additional instruction will be provided whenever there is a significant change in duties.

3. Ancillary personnel (i.e., clerical, nursing, security, maintenance and housekeeping) whose duties require them to work in the vicinity of radioactive materials will receive annual instruction pertinent to their duties in the form of videotapes and color slides. For example, the videotape "Radiation Protection for Support Personnel" will be used to instruct maintenance, support and housekeeping personnel. The color slide set, "Nursing Care For Radionuclide Therapy Patients", produced and sold by Training Resources, will be used to provide instruction to appropriate nursing staff.

70097

PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL

1. The Chief Purchasing Agent will place all orders direct for radioactive materials for the nuclear medicine department and RIA laboratory, based on requests from either department. The department placing the order will ensure that the requested materials and quantities are authorized by the license and that possession limits are not exceeded.

2. When therapy doses of iodine-131 or phosphorus-32 are ordered, a written request will be obtained from the authorized physician who will perform the procedure. The Chief Nuclear Medicine Technologist will reference the physician's written request when placing the request to the Chief Purchasing Agent. The physician's request will indicate isotope, compound, activity, and other medical information.

3. During normal working hours, carriers will be instructed to deliver packages containing radioactive materials directly to the nuclear medicine laboratory or the radioisotope laboratory, whichever is marked on the package.

4. During off-duty hours, the emergency room personnel will accept delivery of these packages in accordance with the procedures outlined in Mr. Palmer's memorandum (attached).

MEMORANDUM FOR: Security Personnel

FROM: Phil Palmer, Chief Executive Officer

SUBJECT: RECEIPT OF PACKAGES CONTAINING RADIOACTIVE MATERIAL

Any packages containing radioactive material that arrive outside normal working hours (7:00 a.m. to 4:30 p.m. Monday through Friday) shall be signed for by the senior nurse on duty and taken immediately to the Nuclear Medicine Department or the Radioisotope Laboratory, whichever is marked on the package. Unlock the door, place the package on top of the counter next to the waiting area, and relock the door.

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

RADIATION SAFETY OFFICER: Clarence Funaki, M.D.
OFFICE PHONE: 245-1030
HOME PHONE: 332-8835

ALTERNATE: Philip Manly, C.H.P.
OFFICE PHONE: 621-8892 (Oahu)
BEEPER: 533-3877 X5584

PROCEDURES FOR SAFELY OPENING PACKAGES
CONTAINING RADIOACTIVE MATERIALS

1. All packages that are labelled with YELLOW II and YELLOW III transportation labels will be monitored for external radiation levels. A survey shall be made around each package (1) at the surface and (2) at 3 feet from the package with a Geiger-Mueller detector. Packages with greater than Type A quantities shall be monitored as required by 10 CFR 20.205(c).

2. If the survey reveals radiation levels greater than 10 mrem per hour at 3 feet or greater than 200 mrem per hour at the package surface, stop the procedure and notify the Radiation Safety Officer or alternate. The RSO or alternate will make and record a more careful measurement of the radiation levels. These results shall be provided to the carrier and the NRC Region V as soon as available.

3. All shipments of liquid radioactive materials will be tested for leakage. Visually inspect the package for any sign of damage, i.e., wetness or crushed package. If damage is noted, stop immediately and notify the Radiation Safety Officer or Mr. Manly. Records of monitoring required by 20.205(b) and (c) shall be maintained.

a. Wipe the external surface of the package containing liquid radioactive material with a dry filter paper or section of a paper towel and count the wipe in a gamma counter or with a pancake detector and calibrated low level survey meter. If the removable contamination exceeds 0.01 uCi/100 sqcm (greater than 200 counts per minute above background measured with a pancake detector), put on plastic gloves and seal the package in a plastic bag. Notify the Radiation Safety Officer or Mr. Manly immedately and do not proceed further. Record the results of this test.

b. If the package is not contaminated, open the outer package following manufacturer's directions, as supplied. Put on protective gloves and remove the packing slip. Open the inner package to verify the contents against the packing slip. Also inspect the final container to insure it is not broken or leaking, and that all seals are intact.

c. Wipe the external surface of the final container with a dry wipe held with forceps or a cotton swab on a stick. Count the wipe and record the results.

4. Monitor packaging materials with a pancake detector and survey meter before discarding. If the packaging material is contaminated treat it as radioactive waste. If free of contamination, (no reading above background) obliterate or remove all radiation labels before discarding.

GENERAL RULES FOR SAFE 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 and injection of patient doses 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. Do not store food, drink, or personal effects with radioactive material.

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%. For therapeutic doses, also check the patient's name, isotope, chemical form, and activity against the physician's order.

7. Wear personnel monitoring devices (film badges or TLD's) when required, at all times while in areas where radioactive materials are used or stored. These should be worn at chest or waist level and always on the outside of a lead apron. When not used, store the devices in a designated low background area.

8. Wear TLD finger badges during elution of generators and preparation, assay, and injection of radiopharmaceuticals. Wear finger badges with the detector towards the palm of the hand.

9. Dispose of radioactive waste only in the specially designated waste containers.

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 the name of the compound, radionuclide, date, activity, and radiation level if applicable.

13. Always transport radioactive material in shielded containers.

EMERGENCY PROCEDURES
(To be posted in all restricted areas)

MINOR SPILLS

1. NOTIFY persons in the area that a spill has occurred.

2. PREVENT THE SPREAD by covering the spill with absorbent paper.

3. CLEAN UP the spill, using disposable gloves and remote handling tongs. Carefully fold the absorbent paper and wipe from the outer edge to the center of the spill area. Dispose of the absorbent paper into a plastic bag, along with the gloves and treat as radioactive waste.

4. SURVEY the area with a low-range, thin window G-M survey meter. Check the spill area, the area around the spill, and your hands and clothing.

5. REPORT the incident to the Radiation Safety Officer or Mr. Manly.

MAJOR SPILLS

1. CLEAR THE AREA and notify all persons not involved in the spill to vacate the room.

2. PREVENT THE SPREAD by covering the spill with absorbent paper, but do not attempt to clean up. Confine the movement of all personnel potentially contaminated to prevent the spread.

3. SHIELD THE SOURCE if there is a direct radiation source problem, but only if it can be done without further contamination or without significantly increasing your radiation exposure.

4. CLOSE THE ROOM and lock the door behind you.

5. CALL FOR HELP by notifying the Radiation Safety Officer or Mr. Manly.

6. STAND BY FOR MONITORING and decontamination if necessary. Contaminated clothing should be removed and stored for further evaluation by the Radiation Safety Officer or alternate. If the spill is on the skin, flush thoroughly and then wash with mild soap and lukewarm water.

RADIATION SAFETY OFFICER: Clarence Funaki, M.D.
OFFICE PHONE: 245-1030 HOME PHONE: 332-8835

ALTERNATE: Philip Manly, C.H.P.
OFFICE PHONE: 621-8892 BEEPER: 533-3877 X5584

70097

SURVEY PROCEDURES

1. TYPES OF SURVEYS

a. All elution, preparation and injection areas will be surveyed daily with a GM survey meter and decontaminated if necessary.

b. Laboratory areas where less than 200 uCi are used will be surveyed monthly.

c. Waste storage areas and 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 analyzing wipe test samples will be sufficiently sensitive to detect 200 dpm/100 sq.cm. Wipes taken in high background areas will be removed to a low background area for measurement.

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

a. A drawing of the area surveyed, identifying relevant features such as active storage areas, active waste areas, etc.

b. The name of the person conducting the survey and the date of the survey.

c. The equipment used for the survey, including serial numbers and relevant sensitivities.

d. Measured exposure rates and contamination levels, keyed to locations on the drawing (including identification of contamination levels requiring reduction).

f. Corrective action taken to reduce radiation or contamination levels requiring reduction, and the radiation or contamination levels after the action was taken.

3. Areas will be cleaned if the contamination levels exceed 200 dpm/100 sqcm.

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

WASTE DISPOSAL PROCEDURES

1. Solid radioactive waste generated in any laboratory will be segregated according to half-life and collected in specially designated waste containers lined with plastic bags.

2. Radionuclides of less than 8-day half-life shall be collected and stored in a central waste storage area, and radionuclides of greater than 8-day half-life shall be stored in separate containers in the storage area.

3. All waste of less than 65-day half-life will be held for at least 10 half lives before being monitored for disposal.

4. Each container of short-lived radionuclides (less than 8-day half-life) will be monitored in a low background area with a low level survey meter and a pancake GM detector to determine if the radiation levels are different from background. Prior to making this survey, all shielding will be removed from the final containers. Mo-99 generators will be broken down and the plastic columns surveyed. If no radiation above background is measured, the container may be released to ordinary trash for disposal. All radiation warning signs and labels will be removed or obliterated.

5. Waste containing microcurie quantities of I-125 from RIA assays will be held for a minimum of 5 half-lives, then monitored with a survey meter with a pancake-type g.m. detector with a 1.4 mg/sq.cm. window. If radiation levels not above background are measured on the RIA waste, warning signs and labels will be removed or obliterated and the waste will be released to ordinary trash for disposal.

6. Long-lived waste will be packaged in accordance with D.O.T. requirements and shipped to U.S. Ecology Company (Washington State license No. WN-I019-2).

7. A record of the monitoring and results of all waste that is released will be maintained.

8. Liquid waste will be disposed of through the sink in the laboratory to the sanitary sewer system. A log of all waste disposed of to the sewer will be kept. Sewer releases will be totaled semi-annually and quantities and concentrations of each radionuclide released will be calculated.

THERAPEUTIC USE OF RADIOPHARMACEUTICALS

1. All patients treated with I-131 will be placed in a private room that has a toilet. The large surfaces in the room and toilet areas that are more likely to be contaminated will be covered with absorbent pads or protective material. Small items, such as telephones, doorknobs, or other items touched by the patient will be covered with plastic bags or wrappings.

2. The patient's room will be properly posted with a RADIOACTIVE MATERIALS sign.

3. The patient's room and surrounding areas will be surveyed as soon as practical after administration of therapeutic doses. Exposure rates will be measured at the patient's bedside and at three feet from the patient after administration. The Radiation Safety Officer or his designate will then determine how long a person may remain at these positions and will post these times on the patient's chart and on the door. The results of daily surveys will be used to recalculate permitted times, which will be posted on the patient's chart and on the door.

4. The form, Doctor's Orders for Patients Who Have Received Phosphorus-32 and Iodine-131 Radionuclide Therapy, will be completed immediately after administration of the treatment dose and posted on the patient's chart. Nurses who attend the patient will be advised of the requirements for wearing personnel monitoring by the Radiation Safety Officer.

5. Radiation levels in unrestricted areas will be maintained less than 2 mR/hr or less than 100 mR/7 days (0.6 mR/hr).

6. All linens will be surveyed for contamination before being removed from the patient's room and, if necessary, held for decay.

7. Disposable plates, cups, eating utensils, tissue, surgical dressings, and other similar waste, will be placed in a specially designated container. The material will be held until surveyed and released by the Radiation Safety Officer or his designee.

8. Nondisposable items used for patients will be held in designated containers and checked for contamination by the Radiation Safety Officer. Items may be returned for normal use after verified free of contamination.

9. If urine and vomitus from I-131 patients are collected, they will be stored for decay in the radioactive waste storage area. Such stored wastes will be retained until they have reached background levels, as measured with a low level survey meter and 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. Hospital staff personnel who routinely render medical or nursing care to the therapy patient will be provided with and required to read the special instructions on the patient's chart for handling patients with therapeutic doses of radionuclides.

12. Nurses will change surgical dressings for P-32 therapy patients only by direction of a physician. Stained dressings shall be collected in plastic bags and monitored by the Radiation Safety Officer or designee. These dressings should be handled only with tongs or tweezers and disposable gloves worn.

13. Patients may be released from the hospital with greater than 8 mCi but less than 30 mCi of activity, if instructions as enclosed are given to the patient. These instructions shall be given by the patient's physician or the Radiation Safety Officer, and a written copy shall be provided for the patient. A copy of these instructions shall be maintained in the patient's file.

14. The Radiation Safety Officer shall be consulted before surgery is performed on a patient with therapeutic amounts of radionuclides; the Radiation Safety Officer shall also be consulted before autopsy is performed on a deceased patient with therapeutic amounts of radionuclides.

RADIATION SAFETY PROCEDURES FOR HANDLING PATIENTS WITH THERAPEUTIC DOSES OF RADIONUCLIDES

1. PURPOSE

a. The purpose of these procedures is to familiarize nursing personnel with the procedures to be followed to minimize their exposure and minimize the chance of spreading contamination when caring for patients who have received therapeutic doses of radionuclides.

2. GENERAL

a. Non-sealed radioactive sources are usually administered in liquid form, either by injection or orally. The radioactive material will remain in the patient until it is removed by radioactive decay or is excreted.

b. These procedures apply to patients who have received non-sealed radioactive sources for therapeutic purposes. They do not apply to patients who have received small amounts of radioactive material in connection with diagnostic tests such as scans.

c. Nurses who attend the patient will be advised by the Radiation Safety Officer of the need to wear personnel monitoring devices and of the amount of time (stay time) that they may spend near the patient.

3. SPECIFIC PROCEDURES

a. Place the patient in a room with the bed near the outside wall of the room. A corner room is ideal. Place no other patients in the room.

b. Consistent with good care for the patient, carry out only minimal nursing procedures close to the patient. If the patient's clinical condition requires constant observation, rotate personnel required to perform adequate nursing care in order to minimize personnel exposure. The patient's bed should be approached only when required by nursing duties.

c. Nursing personnel should observe their stay time restrictions. Custodial, utility, maintenance, and food service personnel should not enter the room until they have first checked at the nursing station.

d. Unless contraindicated for other reasons, the patient may have visitors. Visitors should be instructed to stay at least 6 feet from the patient, except for short periods to deliver mail or shake hands, etc. The visitors should limit their visits to not more than 30 minutes per day, and the patient must remain in bed while visitors are in the room.

e. A television set, telephone, books, etc., may be provided to the patient. These items should not be returned to unrestricted use until they have been monitored and found to be free from radioactive contamination.

f. The food tray will be prepared entirely with disposable components. These will be disposed of as waste within the patient's room. Uneaten food will not be given to other patients or staff members.

g. Necessary contamination control measures are very similar to isolation techniques:

1) Cover the mattress and pillow on the bed with plastic or rubber material.

2) Wear gloves when changing bed linen, dressings, or other items that have been in contact with the patient. When done, remove gloves inside out and dispose of in radioactive waste container and wash hands.

3) The patient must wear hospital pajamas.

4) Place a plastic-lined waste basket and linen hamper in the patient's room.

5) Place waste, soiled linen, etc., in designated containers for monitoring before release or disposal.

6) Personnel items for patient care (thermometer, bedpan, etc.) will be kept in the patient's room.

7) Ambulatory patients will use toilet in their room.

8) Diagnostic samples of blood, urine, and feces should be obtained only when authorized by the Nuclear Medicine Department physician.

9) Urine and vomitus can be radioactive. In case of any accident involving a spillage of urine or a patient who vomits, notify the Radiation Safety Officer. Wear gloves and place the clean-up rags in the designated container.

h. No nurse, visitor, or attendant who is pregnant should be permitted in the room of a patient who has received a therapeutic dose of radioactivity until the patient no longer presents a radiation hazard. Female visitors should be asked whether they are pregnant.

i. If a nurse, attendant, or anyone else suspects that his skin or clothing is contaminated, he should notify the Nuclear Medicine Department immediately. He should remain in the patient's room until checked by the Radiation Safety Office or designee.

j. If the patient dies, notify the physician who administered the radionuclide. The body will not be removed without the advice of the physician.

k. The room will not be returned to general use until cleared by the Radiation Safety Officer or alternate.

INSTRUCTIONS FOR FAMILY OF RELEASED PATIENT

Name of patient: _____

Name of hospital: _____

For further information, contact: _____ Phone No.: _____

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

_____ was treated on _____, 19___,

with _____ millicuries of _____ in the form of _____.

NO SPECIAL RADIATION SAFETY PRECAUTIONS ARE NECESSARY AFTER _____.

UNTIL THAT DATE:

Persons under 45 years of age should not remain closer than 3 feet for more than 1/2 hour per day, and not remain closer than 6 feet for more than 2 hours per day for a period of 3 weeks. At other times, remain at least 6 feet from the patient.

Persons over 45 years of age should not remain closer than 3 feet for more than 4 hours per day for the next 3 weeks. At other times, remain at least 6 feet from the patient.

NOTE: During the above times, brief periods of closer contact (for example, while shaking hands, etc.) are permissible.

SPECIAL PRECAUTIONS:

a. Spouse or other person caring for patient: _____

_____

b. Children or pregnant women: _____

_____

c. Sleeping arrangements: _____

IF THE PATIENT IS TO BE HOSPITALIZED, OR IF DEATH SHOULD OCCUR, NOTIFY THE FOLLOWING INDIVIDUAL(S) IMMEDIATELY:

_____ _____

_____ _____

DOCTORS ORDERS FOR PATIENTS WHO HAVE RECEIVED THERAPY
DOSES OF IODINE-131 OR PHOSPHORUS-32

Patient, _____ (name), received _____ mCi of _____ (isotope)
by _____ (route) at _____ (time) am/pm on _____ (date), 19____.

EXPOSURE RATES IN MR/HR

Date/Time	at bedside	3 feet from bed	Adjacent areas

COMPLY WITH ALL CHECKED ITEMS

___ 1. No visitors.
___ 2. Assign to room with bed near outside wall.
___ 3. Patient may not leave room.
___ 4. Pregnant visitors are not permitted.
___ 5. Visitors under 18 are not permitted.
___ 6. Attendants wear personnel dosimeters.
___ 7. Visitors should stay 6 feet from patient.
___ 8. Visitors should limit visiting time to 30 minutes.
___ 9. Patient to use disposable utensils and dishes.
___ 10. Cover mattress and pillow with plastic.
___ 11. Wear gloves when changing bed linen, dressings, etc.
___ 12. Patient to wear hospital pajamas.
___ 13. Place plastic-lined waste basket and linen hamper in patient's room. Place waste, soiled linen in these containers.
___ 14. Personal items for patient to be kept in patient's room.
___ 15. Diagnostic samples of blood, urine, and feces obtained only when authorized by Nuclear Medicine Department physician.
___ 16. Ambulatory patients to use commode in their room.
___ 17. Notify Nuclear Medicine or Radiation Safety Officer in case of spillage of urine or patient who vomits.
___ 18. Hold all linens and disposable wastes in room until cleared by Nuclear Medicine or Radiation Safety Officer.
___ 19. At patient's discharge, call Nuclear Medicine to clear the room prior to admitting housekeeping personnel to room.

Special orders: _____
_____

In case of any difficulty, call the RSO or alternates:	days	nights
_____	_____	_____
_____	_____	_____

If patient dies before _____, notify the Radiation Safety Officer or alternates.

_____, M.D. _____
Attending Physician Date

PROCEDURES FOR ADMINISTERING I-131 DOSES

1. Personnel administering therapeutic doses of I-131 should wear their personnel dosimeters, including ring dosimeters, with detector towards the palm of the hand.

2. Never handle a therapeutic dose of I-131 directly with the hands. Use forceps or other remote handling devices. Whenever possible, keep the dose in a shielded container.

3. Always wear disposable gloves and a lab coat or other protective clothing when administering a therapeutic dose. After the administration is complete, dispose of the gloves as waste and monitor hands and clothing for contamination.

4. Liquid doses of I-131 may release vapors to the atmosphere when they are opened. Whenever opening a liquid dose, do so in the fume hood with a face velocity of at least 0.5 m/sec so that vapors will be drawn away from you. Capsules do not release vapors and do not need to be handled in this manner unless they are crushed.

5. The number of personnel present in an area where administration of a therapeutic dose of I-131 is performed should be minimized. All personnel present where administration of a greater than 1.0 mCi of liquid I-131 must have bioassays performed of their thyroid burden before and after the administration.

BIOASSAY FOR I-131

1. Bioassay for I-131 will be required for all personnel who handle unsealed sources of more than 1 mCi of I-131 in a fume hood, or more than 0.1 mCi of I-131 on an open bench. In addition, all personnel who are within 6 feet of operations involving more than the above mentioned quantities shall also participate in bioassays.

2. Bioassays shall be performed at the following frequencies:

   a. Prior to employment or beginning work with I-131 to establish a baseline level and annually thereafter to reconfirm the baseline levels.

   b. Between 24 and 72 hours after exposure to I-131 in the quantities mentioned above.

   c. Within 2 weeks after the last possible exposure to I-131 when the employee is terminating activities involving I-131.

3. Bioassays shall consist of a determination of the individual's thyroid burden. The equipment used for this determination shall have a minimum detectable activity of 0.01 uCi I-131, as determined with a standard thyroid phantom.

4. If the measured thyroid burden exceeds 0.04 uCi I-131, the following action shall be taken:

   a. An investigation of the operations involved, including air and other in-plant surveys, shall be carried out to determine the causes of exposure and evaluate the potential for further exposures.

   b. The bioassay must be repeated within two weeks.

   c. If continued work in the area might cause the limits for air concentration in 10 CFR 20 to be exceeded, the worker will be restricted from such work.

   d. Actions shall be taken to reduce the potential for further exposures.

   e. Any reports of exposure required by 10 CFR 20 will be furnished to the employee.

5. If the measured thyroid burden exceeds 0.14 uCi I-131, the following actions shall be taken in addition to the steps outlined in 4 above:

   a. Refer the employee to appropriate medical/health physics consultation.

PROCEDURES FOR USING XENON-133

1. Each patient to use the Xe-133 system will first be evaluated by the physician or technologist to determine if the patient can complete the study and give quantative results. The patient will then be instructed on the purpose of the test and the hazards involved, as well as what the patient is expected to do to minimize leakage of xenon.

2. The patient will wear nose clamps and will be tested on the apparatus prior to injection of Xe-133.

3. If the patient accidentally comes off the apparatus prior to washout, the physician or technologist will immediately close the valve to the gas delivery system and assist the patient out of the room.

4. All other personnel will be instructed to vacate the room. The Radiation Safety Officer will be notified and personnel will not be allowed to re-enter the room for at least 15 minutes.

CALCULATIONS OF EXPECTED AIR CONCENTRATIONS
FOR USE ON XENON-133

1. Xenon-133 gas will be administered to patients through an Atomic Products Corporation Pulmonex Xenon System. All vials containing Xe-133 for dispensing will be contained in lead shielded glass syringes, and will be stored in the shielded storage area in the fume hood prior to use. Expired gases containing Xe-133 will be exhausted through the gas trap in the Pulmonex Xenon System.

2. The trap is tested for excessive leakage by an Atomic Products Corporation "Xenon Trap Monitor". Exhaust air from the xenon charcoal trap flows into the monitor which contains an end-window g.m. detector, audio beeper, and visual alarm. During the patient washout cycle, the normal xenon leakage will cause the audio alarm to give a relatively long beep, then pause, then another long beep. As the concentration increases, the frequency of the beeps increases. The audio alarm is set to beep continuously at concentrations of 1E-2 uCi/cc. A continuous audio alarm indicates excessive xenon-133 leakage and the system will not be used again until the charcoal in the gas trap has been replaced.

3. It is estimated that as much as 10% of the administered xenon might leak during administration and storage of the charcoal trap. A workload of 1 patients per week is estimated, with an administration of 20 mCi per patient. The required ventilation flow rate to insure airborne activity concentrations are not exceeded is

$$V = \frac{(20 \text{ mCi/wk})(.1)(1000 \text{ uCi/mCi})}{(1 \text{ E-5 uCi/ml})(40 \text{ hrs/wk})} \times \frac{\text{cfm}}{1.7 \text{ E6 ml/hr}}$$

$$V = 3 \text{ cfm}$$

The air from the imaging room returns to a central air conditioner, where it is cooled and redistributed to the nuclear medicine area and other areas. In addition, air is also exhausted directly to the atmosphere through a fume hood located in the dose assay area. Measured exhaust and supply flow rates show a total supply of 500 cfm to the nuclear medicine area and a total exhaust of 950 cfm with the fume hood off and 1850 cfm with the fume hood on from the same area. Thus, the area has 450 to 1350 cfm made up from outside air, will above the 3 cfm required. Measurements of air flow also showed that the nuclear medicine area is at negative pressure with respect to surrounding areas. Air flow directions are also given in Figure 1.

4. Using the assumptions given above, the airborne activity concentrations of air entering unrestricted areas can be estimated:

C = A / V

A = 1 patients/wk x 20 mCi/patient x 1000 uCi/mCi

x 52 weeks/yr x 0.1

A = 1 E5 uCi/yr

V = 450 cfm x 1.49 E10 ml/yr/cfm

V = 6.7 E12 ml/yr

C = 1 E5 uCi/yr / 6.7 E12 ml/yr

C = 1 E-8 uCi/ml

The estimated concentration of 1 E-8 uCi/ml supplied to unrestricted areas is below 10% of the allowable concentration of 3 E-7 uCi/ml.

5. Ventilation flow measurements of the fume hood will be repeated at six month intervals to verify the facility flow rates are adequate.

6. Should there be a patient who accidently comes off the apparatus, the following air concentrations will be present in the imaging room:

Assumptions:

10 mCi released as patient comes off apparatus
4,000 cu.ft. room volume
1,350 cu.ft. per minute net exhaust rate

Immediate dilution:

$$\frac{10 \text{ mCi}}{4000 \text{ cu.ft}} \times \frac{3.5\text{E-}5 \text{ cu.ft.}}{\text{ml.}} \times \frac{1000 \text{ uCi}}{\text{mCi}} = 8.75\text{E-}5 \text{ uCi/ml}$$

$$\text{Removal constant} = \frac{1350 \text{ cu.ft.}}{\text{min.}} \times \frac{1}{4000 \text{ cu.ft.}} = 0.34 \text{ per minute}$$

After 15 minutes, the air concentration will be 5.3E-7 uCi/ml, less than the allowable 40 hour average concentration for restricted areas, so the requirements of 10CFR20.103 are met. If an assumption of a dilution factor of 2 is made for air released to unrestricted areas, then the requirements of 10CFR20.106 are also met.

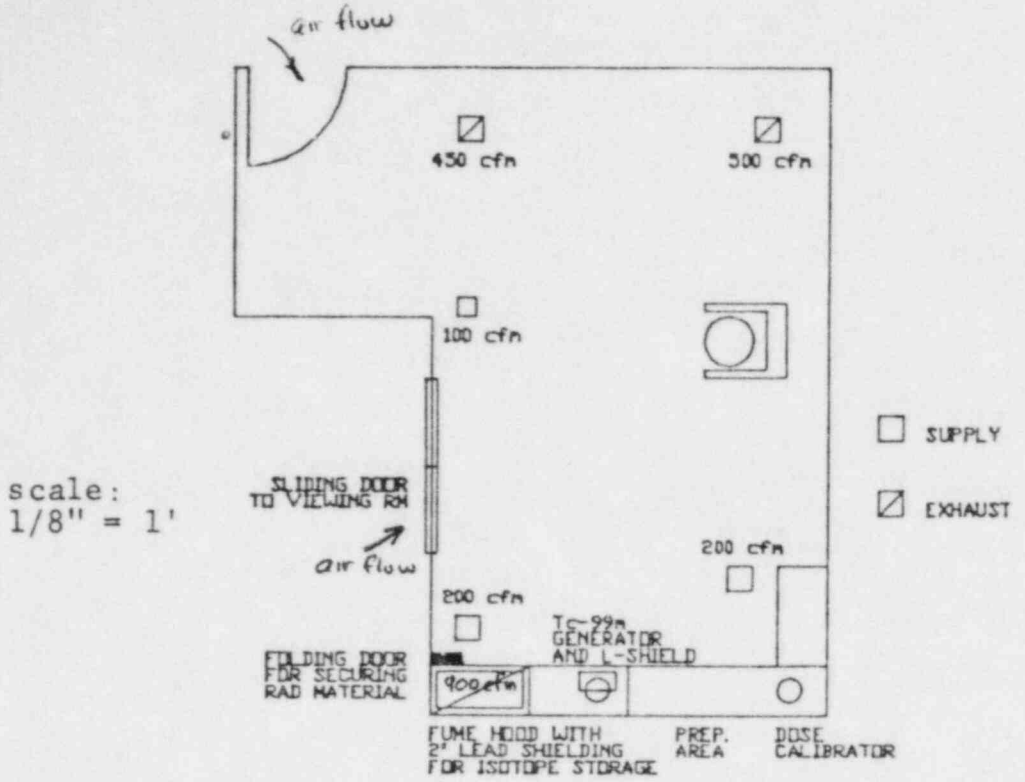

Figure 1 - Nuclear Medicine Laboratory

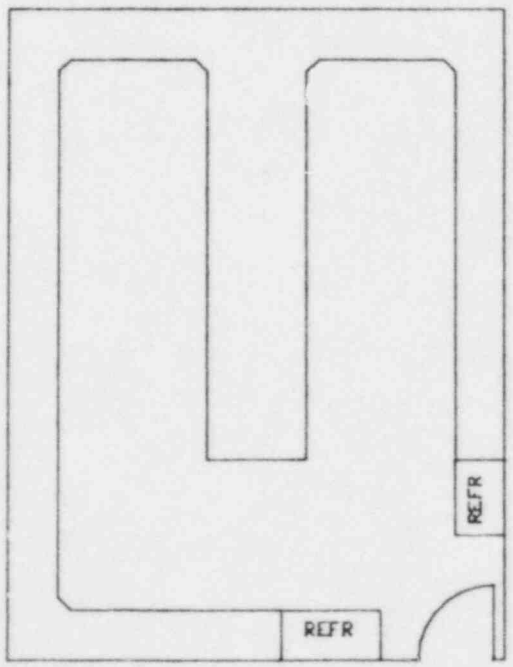

Figure 2 - Radioimmunoassay Laboratory

RULES FOR SAFELY HANDLING THE STRONTIUM-90 EYE APPLICATOR

1. Wear your ring badge whenever you handle the strontium-90 eye applicator. The ring badge should be worn with the detector on the palm side of the hand.

2. Remove the Sr-90 eye applicator from its secured storage location just before use. Do not leave it out any longer than necessary.

3. After removing the Sr-90 eye applicator from its secured storage location,

   a. Do not touch the treatment end of the applicator with your hands or other portions of your body.

   b. Always hold the applicator by its handle.

   c. Except during patient treatment, do not point the treatment end of the applicator toward another person, especially toward the eyes.

4. If the applicator is to be sterilized, place a sponge or gauze dampened with a sterilizing agent on a flat surface, then wipe the treatment end of the applicator across the gauze or sponge. Do not hold the sponge or gauze in your hand to sterilize the applicator.

5. During treatment, hold the patient's eye lids open with tape or other device, not with your fingers.

6. Immediately after treatment and/or resterilization, return the Sr-90 eye applicator to its storage cabinet and to its secured location (e.g. locked cabinet).

7. Do not remove any metal or plastic inserts from the manufacturer-supplied storage container. These items are generally a part of the container's shielding. Removal of these items can lead to excessive and unnecessary radiation exposures.

PROCEDURES FOR MAINTAINING OCCUPATIONAL
RADIATION EXPOSURES AS LOW AS REASONABLY ACHIEVABLE

1. MANAGEMENT PHILOSOPHY AND RESPONSIBILITIES

a. The management of G. N. Wilcox Memorial Hospital is committed to the philosophy of maintaining occupational radiation exposures as low as reasonably achievable (ALARA). The procedures described below outline the methods by which the management philosophy will be implemented.

b. The management will perform an annual audit of the ALARA program of this medical facility. This review will include review of personnel exposure records and inspections, and consultation with the Radiation Safety Officer or alternates. The results of the audit will be documented.

c. The management encourages changes to facilities or operating procedures where such changes will reduce occupational radiation exposure at reasonable costs.

d. The management will review suggestions by employees of ways to reduce occupational radiation exposure. Where suggestions are not implemented, the reasons for not implementing them will be documented.

2. RESPONSIBILITIES OF THE RADIATION SAFETY COMMITTEE (RSC)

a. The RSC will review the qualifications of each potential authorized user with respect to the types and quantities of materials and uses for which he has applied to assure that appropriate measures will be taken to maintain exposures ALARA.

b. When considering a new use of byproduct material, the RSC will review the measures taken to maintain exposures ALARA. The measures to be taken to maintain exposures ALARA, such as procedures or special equipment, should be outlined in the proposal to the RSC.

c. The RSC will delegate authority to the Radiation Safety Officer (RSO) for enforcement of the ALARA concept. The RSC 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.

d. The RSC will perform a quarterly review of occupational radiation exposure with particular attention to instances where Investigational Levels are exceeded. The purpose of this review is to assess trends in occupational exposure an an index of the ALARA program quality and to decide if action is warranted when Investigational Levels are exceeded.

3. RADIATION SAFETY OFFICER (RSO)

a. The RSO will perform an annual review of the radiation safety program for adherence to ALARA concepts.

b. The RSO will review external radiation exposures of authorized users quarterly to determine that their exposures are ALARA.

c. The RSO will review records of radiation surveys for radiation levels in restricted and unrestricted areas quarterly to determine that they were at ALARA levels.

d. The RSO will instruct all occupational workers in the philosophy of ALARA, the management's commitment to ALARA, the control levels established by this medical facility, and the procedures to be taken when occupational exposure exceeds the control level.

e. The RSO will establish a means for soliciting and evaluating employee suggestions for reducing occupational radiation exposure.

4. AUTHORIZED USER RESPONSIBILITIES

a. Authorized users will consult with the RSO for proper procedures to maintain exposures ALARA for all new radioisotope procedures.

b. Authorized users will inform all people they supervise of the ALARA concept and their support of it.

5. OCCUPATIONAL WORKER RESPONSIBILITIES

a. Occupational workers will follow radiation safety procedures and use any special equipment designated to keep his exposures ALARA.

b. Occupational workers will report instances to the RSO where they think their exposure may have exceeded the control levels, or where they think their personnel monitoring device may have been inadvertently exposed.

c. Occupational workers are encouraged to suggest any changes to operating procedures or special equipment that they think may reduce occupational radiation exposures. Such suggestions will be evaluated by the RSO.

6. ESTABLISHMENT OF CONTROL LEVELS FOR MAINTAINING OCCUPATIONAL RADIATION EXPOSURES ALARA

a. In order to maintain exposures ALARA, this medical facility has established control levels for occupational radiation exposure. The control levels are as follows:

70097

Organ	Investigational Levels (mrems per calendar quarter) Level I	Level II
Whole body, head and trunk; active blood-forming organs; lens of eyes; or gonads	125	375
Hands and forearms; feet and ankles	1875	5625
Skin of the whole body	750	2250

b. The RSO will review the results of personnel monitoring not less than once per calendar quarter and document the results of the review on the NRC-5 form or equivalent.

c. If personnel exposures are below Level I investigation level, no action is necessary.

d. If personnel exposures are greater than Level I but less than Level II, the RSO will report the results to the next Radiation Safety Committee. No other action is required unless deemed appropriate by the Radiation Safety Committee, when the exposure is considered in context with overall department exposures and the exposure history of the individual.

e. If personnel exposures are above Level II, the RSO will in a timely manner determine the cause of the exposures and, if necessary, take action. A report of the investigation, actions taken, and exposures recorded will be presented to the next Radiation Safety Committee meeting, and the details of the report will be recorded in the RSC minutes.

70097