FORM NRC-313M (8-78) 10 CFR 35	U.S. NUCLEAR REGULATORY COMMISSION APPLICATION FOR MATERIALS LICENSE – MEDICAL	Approved: GAO R0557

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

Southeast Missouri Hospital
1701 Lacey Street
Cape Girardeau, MO. 63701

TELEPHONE NO.: AREA CODE (314) 334 4822

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

Same as 1.a.

2. PERSON TO CONTACT REGARDING THIS APPLICATION

Wayne A. Mattes, R.T.

TELEPHONE NO.: AREA CODE (314) 334 4822 x252

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

a. ☐ NEW LICENSE
b. ☐ AMENDMENT TO LICENSE NO. _____
c. ☒ RENEWAL OF LICENSE NO. 24-00128-03

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

See attached sheet Item 4.

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.)*

Herbert W. Mower, Sc.D.
Wayne A. Mattes, N.M.T.

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	2000
10 CFR 35.100, SCHEDULE A, GROUP IV	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP V	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP VI	X	2000

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	2000

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
Americium - 241 (Amersham/Searle Model # A.M.C.24)	Sealed Source	13 millicuries	Anatomical Marker

MAR 9 1979

Control No. 01443

INFORMATION REQUIRED FOR ITEMS 7 THROUGH 23

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

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

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

24. PERSONNEL MONITORING DEVICES

TYPE (Check appropriate box)			SUPPLIER	EXCHANGE FREQUENCY
a. WHOLE BODY	X	FILM	R.S. Landauer, Jr. & Co.	Monthly
		TLD		
		OTHER (Specify)		
b. FINGER		FILM		
	X	TLD	R.S. Landauer, Jr. & Co.	Monthly
		OTHER (Specify)		
c. WRIST		FILM		
		TLD		
		OTHER (Specify)		

d. OTHER (Specify)

Annual bioassay on all personnel.

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: 7.B.

(2) LICENSE FEE ENCLOSED: $ 150.00

b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)*

O. D. Niswonger

(1) NAME *(Type or Print)*
O. D. Niswonger

(2) TITLE
Administrator

c. DATE
March 5, 1979

FORM NRC-313M (8-78)

PRIVACY ACT STATEMENT

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

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

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

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

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

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

FORM NRC-313M
(8-78)

4. Individual users

Earl W. Johnson, M.D.
Milton Shoss, M.D.
Thomas Lovinggood, M.D.
Harold Rapp, M.D.
Ernest D. Johnson, III., M.D.
Carl F. Ritter, M.D.
G. Ray Ridings, M.D.
Paul C. Horn, M.D.

5. Radiation Safety Officer

We have elected to choose two Radiation Safety Officers due to their expertise in various fields and to cover for absence of each other.

Herbert William Mower, Sc.D. - See attached supplement A.

Wayne A. Mattes, R. T. - See attached supplement A and attached curriculum of Nuclear Medicine training.

Item No. 5
Date: March 5, 1979

FORM NRC-313M-SUPPLEMENT A (7-77) 10 CFR 30 — U.S. NUCLEAR REGULATORY COMMISSIO

TRAINING AND EXPERIENCE
AUTHORIZED USER OR RADIATION PROTECTION OFFICER

1. NAME OF AUTHORIZED USER OR RADIATION PROTECTION OFFICER	2. STATE OR TERRITORY IN WHICH LICENSED TO PRACTICE MEDICINE
Herbert William Mower, Sc.D.	

3. CERTIFICATION

SPECIALITY 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	TYPE AND LENGTH OF TRAINING: SUPERVISED LABORATORY EXPERIENCE (HOURS) D
a. RADIATION PHYSICS AND INSTRUMENTATION	Massachusetts Institute of Technology (M.I.T.) 62-68 New England Roentgen Ray Soc(66-72)	300 30	10 50
b. RADIATION PROTECTION	M.I.T. (66-72)	30	50
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	M.I.T. (61-72)	200	10
d. RADIATION BIOLOGY	M.I.T. (66-72) Columbia University Med School	10 (73)25	10 --
e. RADIOPHARMACEUTICAL CHEMISTRY	M.I.T. (66-72)	5	5

Control No. 01443

FORM NRC-313M-SUPPLEMENT A (8-78) — U.S. NUCLEAR REGULATORY COMMISSION

TRAINING AND EXPERIENCE
AUTHORIZED USER OR RADIATION SAFETY OFFICER

1. NAME OF AUTHORIZED USER OR RADIATION SAFETY OFFICER	2. STATE OR TERRITORY IN WHICH LICENSED TO PRACTICE MEDICINE
Wayne A. Mattes, R.T. (A.R.R.T.-Radiology & Nuclear Medicine	

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	TYPE AND LENGTH OF TRAINING: SUPERVISED LABORATORY EXPERIENCE (Hours) D
a. RADIATION PHYSICS AND INSTRUMENTATION	St. Francis Hospital Cape Girardeau, MO. 63701 School of Radiologic Tech. June 1971 - June 1973	140	30
b. RADIATION PROTECTION	Nuclear Medicine School June 1973 - June 1974 (See attached cirriculum)	10	10
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	Southeast Mo. St. University Cape Girardeau, MO. Aug. 1977 to Dec. 1977 "Atomic Physics - 48 hours"	15	15
d. RADIATION BIOLOGY	"	25	25
e. RADIOPHARMACEUTICAL CHEMISTRY		20	20

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

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

CURRICULUM

Orientation and Introduction

Lecturer: M. Shoss M.D. 3 hours

A. Tour of the Nuclear Medicine facilities at St. Francis Hospital.

B. Tour of the Nuclear Medicine facilities at Southeast Missouri Hospital.

C. Introduction by Dr. M. Shoss, Radiologist.

Item No. 5
Date: March 5, 1979

MATHEMATICS

Lecturer: Mrs. Mevi Ahuja, B.S.(Physics), B.A. (Mathematics), M.S. (Radiation Biology). 15 hours

1. Review: Signs, symbols.
2. Exponents
3. Logrithms
4. Statistics: Normal distribution; Poisson distribution
5. Nuclear Counting Statistics

Item No. 5
Date: March 5, 1979

RADIATION PHYSICS

Lecturer: Mrs. Mavi Ahuja, B.S. (Physics), B.A. (Mathematics), M.S. (Radiation Biology). 15 hours

1. Atomic Radiation Processes
   a. Isomeric transitions
   b. Meta-stable states and internal conversion
   c. β-decay: Positron Decay; Electron Capture
   d. α- decay
2. Interaction of charged particles with matter
   a. Elastic and inelastic collisions
   b. Specific Ionization
   c. Generalized Bragg Curve
   d. Annihilation and Brehmsstrahlung radiation
3. Photon interactions with matter
   a. Compton scattering
   b. Photo-electric absorption
   c. Pair production
4. Neutron Interactions

RADIATION PROTECTION

Lecturer: Mrs. Mevi Ahuja, B.S. (Physics) B.... (Mathematics) M.S. (Radiation Biology)
(10 Hours)

1. Units of Radiation Exposure and Recommendation of the ICRU
2. Rad, RBE, REM, and Dose Equivalent
3. Survey Instruments
4. Personal Monitoring Instruments
5. External Radiation Hazards
   (a) linear attenuation coefficient
   (b) shielding in time and distance
6. Internal Radiation Hazards
7. Dose Calculation for Internal Radiation Emitters
8. Fundamental Principles of Contamination Control
9. Modifying Factors in Long-Term Exposure

AEC LICENSING, REGULATIONS, AND RECORDS

Lecturer: Stephen A. Kuhn
(5 hours)

A. LICENSING

1. Types of Human-Use Licenses

B. TRAINING REQUIREMENTS FOR RADIOISOTOPES USERS

C. PROTECTION OFFICER OR COMMITTEE

1. Shielding, Signs, Monitoring, Calibration of Instruments, etc.

D. RECORDS

1. Waste Disposal
2. Medical Examinations of Radionuclide Users
3. Survey Instrument Calibration

RADIATION BIOLOGY

Lecturer: Navi Ahuja
(25 Hours)

1. Introduction and Scope
2. History and Principles
3. Effects on Chemical Systems
4. Biochemical Effects
5. Theories of Action
   a. Classical Target Theories
   b. D-37 Dose
   c. Modified Target Theories
   d. Influence of LET
   e. 'Direct' and 'Indirect' Action
6. Effects on Micro-organisms
7. Intracellular Effects
8. Relative Cellular Susceptibility
9. Acute Radiation Syndrome
10. Effects of Ionizing Radiation on Digestive System
11. Effects on Blood and Hematopoietic Systems
12. Effects on Other Systems
13. Modifying Factors
14. Radiation Carcinogeneous
15. Radiation and Aging
16. Radiation and Life Span
17. Immunological Effects of Radiation
18. Genetic Effects of Radiation
19. Internal Emitters

Item No. 5
Date: March 5, 1979

NUCLEAR PHYSICS AND INSTRUMENTATION LECTURER

STEPHEN A. KUHN, B.S., R.T. NUC. MED. (ARRT), R.T. NUC. MED. (ASCP)
Ravi Ahuja & Physician on Teaching Staff

95 HOURS

I. NUCLEAR PHYSICS

1. ATOMIC STRUCTURE
2. NUCLEAR CONSTITUTION
3. NUCLEAR MODELS
4. NUCLEAR NOMENCLATURE
5. ISOTOPES
6. MASS DEFECT
7. BINDING ENERGY
8. ELECTRON VOLT
9. NUCLEAR FORCES
10. NUCLEAR STABILITY
11. EXTRA-NUCLEAR CONSTITUTION
12. ATOMIC MASS STANDARD
13. DECAY SCHEMES
14. DECAY PATTERNS
15. DISINTEGRATION CONSTANT
16. PHYSICAL HALF-LIFE
17. BIOLOGICAL HALF-LIFE & EFFECTIVE HALF-LIFE
18. CONSTANCY OF DISINTEGRATION
19. SPECIFIC ACTIVITY

II. INSTRUMENTATION

1. Randomness of Radiation
2. Statistical Error Determination
3. Statistical Fluctuations in Patient Counting
4. The Efficiency of Detection Equipment
5. Counting Geometry
6. Inverse Square Law
7. Cosine Law
8. Systems of Dection
9. Dector Section
10. Analyzer Section
11. Data Section

Item No. 5
Date: March 5, 1979

RADIOCHEMISTRY AND RADIOPHARMACEUTICALS LECTURER

STEPHEN A. KUHN, B.S., R.T. NUC. MED. (ARRT), R.T. NUC. MED. (ASCP) 20 HOURS
Nevi Ahuja, and Physician on Teaching Staff.

I. RADIOCHEMISTRY

1. INTRODUCTION
2. CHROMATOGRAPHY
3. COLUMN CHROMATOGRAPHY
4. RADIO-IODINATION
5. RADIOMETRIC ANALYSIS
6. RADIO-TRACER PRINCIPLES

II. RADIOPHARMACEUTICALS

1. INTRODUCTION
2. CHARACTERISITICS OF AN IDEAL RADIOPHARMACEUTICAL
3. QUALITY CONTROL, PYROGEN TESTING, AND STERILIZATION OF RADIOACTIVE PHARMACEUTICAL
4. BIOCHEMICAL BASIS OF ORGAN AND TISSUE SPECIFICITY
5. NUCLIDE GENERATORS
6. ROUTINE CLINICAL RADIOPHARMACEUTICAL

   A. CHEMICAL, FORM, CHARACTERISITICS, AND USES .
      a. Labeled particles
      b. Chromium-51
      c. Cobalt-57 and Cobalt-60
      d. Technetium
      e. Mercury-197 and Mercury-203
      f. Iron-55 and Iron-59
      g. Gold-198
      h. Strontium-85 and Strontium-87m
      i. Selenium-75
      j. Xenon-133
      k. In-113m (Lung, Liver, etc. Recently approved.)

BASIC LABORATORY PROCEDURES AND TECHNIQUES

Lecturer: Stephen A. Kuhn, B.S., R.T. NUC. MED. (ARRT), R.T. NUC.MED. (ASCP)- 40 Hours

A. Thyroid Studies
   1. Thyroid uptake and scan
   2. Thyroid Suppression test
   3. Thyroid stimulation test
   4. Protein-bound I131
   5. T3 resin test
   6. Thyroidal Plasma clearance of I131

B. Hematological Studies
   1. Red cell volume studies
   2. Plasma volume studies
   3. Red cell survival studies
   4. Spleenic sequestration
   5. Plasma Iron Clearance
   6. Plasma Iron Turnover rate
   7. Incorporation of Iron into red cells
   8. Combined blood volume, red cell volume, and red cell survival

C. Gastrointestinal Studies
   1. Vitamin B12 absorption
      a. Eight hour plasma test
      b. Urinary excretion test
   2. Exudative enteropathy
   3. Gastrointestinal bleeding
   4. Gastrointestinal absorption studies
      a. Iron absorption
      b. Labeled fat absorption

D. Renal Studies
   1. Chlormerodrin accumulation test
   2. I131 ortho-iodohippurate renogram
   3. Glomerular filtration rate

CLINICAL APPLICATION OF RADIONUCLIDES

Lecturer: Stephen A. Kahn, Mavi Ahuja, and Physician on Teaching Staff
(130 Hours)

A. LIVER SCANNING

1. Rationale for Scan
2. Indications and Contraindications
3. Agents
   a. Physical and Chemical Properties
   b. Mechanism of Action
4. Dosage and Procedure

B. PLACENTA LOCALIZATION

1. Rationale for Test
2. Indications and Contraindications
3. Agents
   a. Physical and Chemical Properties
4. Dosage and Procedures
   a. Accuracy of Procedures

C. THYROID UPTAKE AND SCAN PROCEDURES USING I-131

1. Rationale
2. Indications and Contraindications.
3. Agents
   a. Physical and Chemical Properties
4. Dosage and Procedure

D. PANCREATIC SCANNING

1. Rationale for Scan
2. Indications and Contraindications
3. Agents
   a. Physical and Chemical Properties
4. Dosage and Procedure

E. BONE SCANNING

1. Rationale for Scan
2. Indications and Contraindications
3. Agents
   a. Physical and Chemical Properties
4. Dosage and Procedure

F. BRAIN SCANNING

1. Rationale for Scan
2. Indications and Contraindications
3. Agents
   a. Physical and Chemical Properties
4. Dosage and Procedure

G. RENAL SCANNING

1. Rationale for Scan
2. Indications and Contraindications
3. Agents
   a. Physical and Chemical Properties
4. Dosage and Procedure

H. LUNG SCANNING

1. Rationale for Scan
2. Indications and Contraindications
3. Agents
   a. Physical and Chemical Properties
4. Dosage and Procedure

I. IODINE TRIOLEIN-OLEIC ACID ABSORPTION

1. Rationale for Test
2. Indications and Contraindications
3. Agents
   a. Physical and Chemical
4. Dosage and Procedure

J. COBALT VITAMIN B-12 ABSORPTION

1. Rationale for Test
2. Indications and Contraindications
3. Agents
   a. Physical and Chemical Properties
4. Dosage and Procedure

K. BLOOD VOLUME, RBE MASS, PLASMA VOLUME, AND RBE SURVIVAL STUDIES

1. Rationale for Study
2. Indications and Contraindications
3. Agents Used
   a. Physical and Chemical Properties
4. Dosage

L. FERROKINETIC STUDIES

1. Rationale for Study
2. Indications and Contraindications
3. Agents Used
   a. Physical and Chemical Properties
4. Dosage and Procedure

M. IN VITRO THYROID STUDIES

1. Rationale for Study
2. Indications and Contraindications
3. Agents
   a. Physical and Chemical Properties
4. Procedures

N. EXUDATIVE ENTEROPATHY STUDIES

1. Rationale for Study
2. Indications and Contraindications
3. Agents
   a. Physical and Chemical Properties
4. Dosage and Procedure

O. RENAL STUDIES (CHLOROMERODRIN ACCUMULATION TEST, I-131 ORTHO-IODOHUPPURATE RENOGRAM, AND GLOMERULAR FILTRATION RATE)

1. Rationale for Test
2. Indications and Contraindications
3. Agents
   a. Physical and Chemical Properties
4. Dosage and Procedure

P. CISTERNOGRAPHIC STUDIES

1. Rationale for Study
2. Indications and Contraindications
3. Agents
   a. Physical and Chemical Properties
4. Dosage and Procedure

B. [redacted] ANATOMY, PHYSIOLOGY AND PATH[redacted]GY

Lecturer: M. Shoss M.D. 50 hours

A. Anatomical Nomenclature
   1. Plural forms
   2. Prefixes and suffixes
   3. Spelling

B. Cells, Tissues, Organs Systems
   1. Structure of cells
   2. Cell division
   3. Organ
   4. Systems

C. The Blood
   1. Constituents
   2. Plasma and Red Cells
   3. Pathological terms

D. The Respiratory System
   1. Components
   2. Respiratory Passages
   3. Detailed study of the lungs
   4. Physiology of respiration

E. The Digestive System
   1. Components
   2. Structure of Walls
   3. Function
   4. Pathological conditions

F. The Urinary System
   1. Components
   2. Physiology of the kidney
   3. Function of the kidney
   4. Pathological conditions

G. The Nervous System
   1. Components
   2. Detailed study of the central nervous system
   3. The abnormalities of the nervous system
   4. Some pathological conditions
   5. Blood supply to the brain

H. The Endocrine System
   1. Components
   2. Physiology of some Endocrine glands
   3. Some pathological conditions

THERAPEUTIC RADIONUCLIDES

Lecturer: Stephen A. Kuhn & Milton Shoss, M.D.
(10 Hours)

A. THERAPY OF THYROID DISEASES WITH IODINE-131

1. Possible Carcinogenic Effect
2. Risk of Leukemia
3. Induced Hypothyroidism
4. Carcinoma Present in the Thyroid
5. Indications for Radioiodine Therapy in Hyperthyroidism
6. Dosage of Iodine-131

B. PHOSPHORUS-32 THERAPY

1. Treatment of Chronic Leukemia
2. Primary Hemorrhagic Thrombocythemia
3. Polycythemia Vera
4. Pleural and Peritoneal Effusions
5. Dosage

C. COLLOIDAL GOLD-198 and YTTRIUM-90

1. Pleural and Peritoneal Effusions
2. Dosage

7. Names and Specialties of Medical Isotopes Committee

M. Shoss, M.D. - Radiology, Nuclear Medicine
G. R. Ridings, M.D. - Radiation Therapy
T. A. Lovinggood, M.D. - Pathology
J. R. Dzur, M.D. - Internal Medicine
W. A. Mattes, R.T. - Nuclear Medicine and X-Ray Technology
R. W. Meyer - Assistant Administrator

Item No. 7
Date: March 5, 1979
Control No. 01443

8. Training and Experience

Earl W. Johnson - NRC License No. 24-00128-03, Amendment No. 32
Milton Shoss - NRC License No. 24-00128-03, Amendment No. 32
Harold Rapp - NRC License No. 24-00128-03, Amendment No. 32
Ernest D. Johnson,III, NRC License No. 24-00128-03, Amendment No. 32
Carl F. Ritter - NRC License No. 24-00128-03, Amendment No. 32
- Dr. Ritter was incorrectly licensed in Amendment Number 32, and should be licensed as in NRC License No. 24-00128-03 Amendment No. 29. This should include Groups I, II, III and Iodine 131 as Iodide for treatment of hyperthryoidism and cardiac dysfunction and strontium 90 eye applicator

Paul C. Horn - See attached supplements A and B. We request license for in-vitro studies and Group I.

G. Ray Ridings - See attached supplements A and B, as well as attached cirriculum vitae

FORM NRC-313M-SUPPLEMENT A (9-78) — U.S. NUCLEAR REGULATORY COMMISSION

TRAINING AND EXPERIENCE
AUTHORIZED USER OR RADIATION SAFETY OFFICER

1. NAME OF AUTHORIZED USER OR RADIATION SAFETY OFFICER	2. STATE OR TERRITORY IN WHICH LICENSED TO PRACTICE MEDICINE
Paul C. Horn, M.D.	Mo., Fla., Ind., Ky.

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C
American Board of Pathology	Anatomic and Clinical Pathology	June 1971

4. TRAINING RECEIVED IN BASIC RADIOISOTOPE HANDLING TECHNIQUES

FIELD OF TRAINING A	LOCATION AND DATE(S) OF TRAINING B	TYPE AND LENGTH OF TRAINING: LECTURE/LABORATORY COURSES (Hours) C	TYPE AND LENGTH OF TRAINING: SUPERVISED LABORATORY EXPERIENCE (Hours) D
a. RADIATION PHYSICS AND INSTRUMENTATION	A) Lectures were in Nuclear Medicine Dep't., Univ. of Ky., Medical Center, Lexington, Ky. Jan-April, 1970 under Dr.Preston	20 hours	90
b. RADIATION PROTECTION	B) Supervised experience has been under Dr. T.A.Lovinggood, Cape Girardeau, MO. over a period of years between Nov., 1970 to Feb., 1979.	10	25
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY		10	20
d. RADIATION BIOLOGY		10	20
e. RADIOPHARMACEUTICAL CHEMISTRY		10	20

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

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
I 125	less than 10 microcuries	St. Francis and Southeast Hositals, Cape Girardeau, MO.	8 years	Medical diagnosis In-Vitro Group I
Co 57	less than 1 microcuries			
Cr 51	less than 5 microcuries			

FORM NRC-313M-SUPPLEMENT B
(8-78)

U. S. NUCLEAR REGULATORY COMMISSION

PRECEPTOR STATEMENT

Supplement B must be completed by the applicant physician's preceptor. If more than one preceptor is necessary to document experience, obtain a separate statement from each.

1. APPLICANT PHYSICIAN'S NAME AND ADDRESS

FULL NAME

Paul C. Horn, M.D.

STREET ADDRESS

1701 Lacey Street

CITY	STATE	ZIP CODE
Cape Girardeau	MO.	63701

KEY TO COLUMN C

PERSONAL PARTICIPATION SHOULD CONSIST OF:

1-Supervised examination of patients to determine the suitability for radioisotope diagnosis and/or treatment and recommendation for prescribed dosage.

2-Collaboration in dose calibration and actual administration of dose to the patient including calculation of the radiation dose, related measurements and plotting of data.

3-Adequate period of training to enable physician to manage radioactive patients and follow patients through diagnosis and/or course of treatment.

2. CLINICAL TRAINING AND EXPERIENCE OF ABOVE NAMED PHYSICIAN

ISOTOPE A	CONDITIONS DIAGNOSED OR TREATED B	NUMBER OF CASES INVOLVING PERSONAL PARTICIPATION C	COMMENTS *(Additional information or comments may be submitted in duplicate on separate sheets.)* D
I-131 or I-125	DIAGNOSIS OF THYROID FUNCTION		
	DETERMINATION OF BLOOD AND BLOOD PLASMA VOLUME	greater than 100	
	LIVER FUNCTION STUDIES	10	
	FAT ABSORPTION STUDIES	10	
	KIDNEY FUNCTION STUDIES		
	IN VITRO STUDIES	greater than 1000	
OTHER			
I-125	DETECTION OF THROMBOSIS		
I-131	THYROID IMAGING		
P-32	EYE TUMOR LOCALIZATION		
Se-75	PANCREAS IMAGING		
Yb-169	CISTERNOGRAPHY		
Xe-133	BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES		
OTHER			
Tc-99m	BRAIN IMAGING		
	CARDIAC IMAGING		
	THYROID IMAGING		
	SALIVARY GLAND IMAGING		
	BLOOD POOL IMAGING		
	PLACENTA LOCALIZATION		
	LIVER AND SPLEEN IMAGING		
	LUNG IMAGING		
	BONE IMAGING		
OTHER			

PRECEPTOR STATEMENT *(Continued)*

2. CLINICAL TRAINING AND EXPERIENCE OF ABOVE NAMED PHYSICIAN *(Continued)*

ISOTOPE A	CONDITIONS DIAGNOSED OR TREATED B	NUMBER OF CASES INVOLVING PERSONAL PARTICIPATION C	COMMENTS *(Additional information or comments may be submitted in duplicate on separate sheets.)* D
P-32 *(Soluble)*	TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA, AND BONE METASTASES		
P-32 *(Colloidal)*	INTRACAVITARY TREATMENT		
I-131	TREATMENT OF THYROID CARCINOMA		
	TREATMENT OF HYPERTHYROIDISM		
Au-198	INTRACAVITARY TREATMENT		
Co-60 or Cs-137	INTERSTITIAL TREATMENT		
	INTRACAVITARY TREATMENT		
I-125 or Ir-192	INTERSTITIAL TREATMENT		
Co-60 or Cs-137	TELETHERAPY TREATMENT		
Sr-90	TREATMENT OF EYE DISEASE		
	RADIOPHARMACEUTICAL PREPARATION		
Mo-99/ Tc-99m	GENERATOR		
Sn-113/ In-113m	GENERATOR		
Tc-99m	REAGENT KITS		
Other			

3. DATES AND TOTAL NUMBER OF HOURS RECEIVED IN CLINICAL RADIOISOTOPE TRAINING

Jan.-April 1970, 235 hours at the University of Kentucky Med. Center.
Nov., 1970-Feb. 1979, at Southeast Missouri Hospital in Cape Girardeau, MO.

4. THE TRAINING AND EXPERIENCE INDICATED ABOVE WAS OBTAINED UNDER THE SUPERVISION OF:

a. NAME OF SUPERVISOR
T. A. Lovinggood

b. NAME OF INSTITUTION
Southeast Missouri Hospital

c. MAILING ADDRESS
1701 Lacey Street

d. CITY
Cape Girardeau, Missouri

5. MATERIALS LICENSE NUMBER(S)
24-00128-03

6. PRECEPTOR'S SIGNATURE
T. A. Lovinggood, M.D.

7. PRECEPTOR'S NAME *(Please type or print)*
1. T. A. Lovinggood, M.D.
2. Dr. Preston, Univ. of Kentucky Medical Center

8. DATE
March 5, 1979

FORM NRC-313M-SUPPLEMENT B
(8-78)

FORM NRC-313M-SUPPLEMENT A (8-78) — U.S. NUCLEAR REGULATORY COMMISSION

TRAINING AND EXPERIENCE
AUTHORIZED USER OR RADIATION SAFETY OFFICER

1. NAME OF AUTHORIZED USER OR RADIATION SAFETY OFFICER	2. STATE OR TERRITORY IN WHICH LICENSED TO PRACTICE MEDICINE
G. Ray Ridings, M.D.	MO, OK, FL, TX, MI

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C
Radiology	Radiology	Dec., 1955

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	University of Michigan 1952-1955, Ann Arbor, Mich. Southeast Mo. Hospital Cape Girardeau, MO.	Over 100	Over 100
b. RADIATION PROTECTION	Same as (a)	Over 30	Over 30
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	Same as (a)	Over 100	Over 100
d. RADIATION BIOLOGY	Same as (a)	Over 50	Over 50
e. RADIOPHARMACEUTICAL CHEMISTRY	Same as (a)	Over 30	Over 30

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

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

G. RAY RIDINGS, M.D.

Curriculum Vitae

DATE AND PLACE OF BIRTH: November 22, 1918; Missouri

MARITAL STATUS: Married, December 28, 1941; two children

RELIGION: Protestant

EDUCATION:

Arkansas State College (now University), Jonesboro, Arkansas, 1936-1939, A.B., July 1, 1939

Vanderbilt Medical School, Nashville, Tennessee, 1946-1950, M.D., June 6, 1950

Internship:

Vanderbilt Hospital, Nashville, Tennessee, July 1, 1950 to June 30, 1951

Residency:

Assistant Resident - Internal Medicine, Vanderbilt Hospital, Nashville, Tennessee, July 1, 1951, to June 30, 1952

Assistant Resident - Radiology, University Hospital, Ann Arbor, Michigan, July 1, 1952, to June 30, 1953

Resident - Radiology, University Hospital, Ann Arbor, Michigan, July 1, 1953, to June 30, 1954

CERTIFICATION AND LICENSE TO PRACTICE MEDICINE:

State of Tennessee, November 10, 1950
State of Missouri, February 3, 1963
State of Texas, November 19, 1967
State of Florida, March 12, 1971

Specialty Board Certification:
Diplomate, Board of Radiology, 1955

Control No. 01443
Item No. 8
Date: March 5, 1979

ACADEMIC EXPERIENCE:

Instructor, Military Science and Tactics, Arkansas State College, Jonesboro, Arkansas, September 1, 1940, to November 23, 1942.

Junior Clinical Instructor, Radiology, University Hospital, Ann Arbor, Michigan, July 1, 1954, to June 30, 1955.

Instructor, Radiology, Vanderbilt Medical School and Department of Radiology, Vanderbilt Hospital, Nashville, Tennessee, July 1, 1955, to December 31, 1955.

Associate Professor, Radiology, Department of Radiology, University of Mississippi Medical Center, Jackson, Mississippi, January 1, 1956, to February 28, 1957.

Professor and Head, Department of Radiology, University of Oklahoma School of Medicine, Oklahoma City, Oklahoma, March 1, 1957, to December 31, 1962. Chairman of the Medical Center Isotopes Committee, March 1, 1957, to December 31, 1962. Cancer Coordinator, July 1, 1959, to December 31, 1962. Member of the Faculty Board, Hospitals Management Committee, Research Committee, M.E.N.D. Committee, Executive Committee of the Medical Faculty, March 1, 1957, to December 31, 1962.

Professor and Head, Section of Radiation Therapy, University of Missouri School of Medicine, Columbia, Missouri, October 1, 1962, to August 31, 1967; Cancer Coordinator, University of Missouri Medical Center, February 1, 1965, to August 31, 1967; Director, University of Missouri Medical Center Tumor Registry, February 1, 1965, to August 31, 1967. Consultant in Radiotherapy, Washington University School of Medicine, St. Louis, Missouri, July 1, 1965, to August 31, 1967.

Clinical Professor of Radiology, University of Texas Southwestern Medical School, Dallas, Texas, January 1, 1968, to June 30, 1971; actively training UTSWMS residents the entire period.

Clinical Professor of Radiation Therapy, University of Miami School of Medicine, 1973-1975.

PROFESSIONAL APPOINTMENTS:

Staff Radiologist, Vanderbilt Hospital, July 1, 1955, to December 31, 1955.

Staff Radiologist, University of Mississippi Hospital, January 1, 1956, to February 28, 1957.

PROFFESIONAL APPOINTMENTS (Continued:

Head, Department of Radiology, University of Oklahoma Hospitals, March 1, 1957, to December 31, 1962; also at same Hospitals, Chief of Radiotherapy, July 1, 1957, to December 31, 1962; and Director, Isotopes Laboratories, March 1, 1957, to December 31, 1962. Consultant, VAHOC, March 1, 1957, to December 31, 1962. Attending Radiologist, Oklahoma Central State Hospital, July 1, 1957, to December 31, 1962. Attending Radiologist, Kiowa Indian Hospital, Lawton, Oklahoma, January, 1961, to August 31, 1962. Attending Radiologist, University of Oklahoma Health Service, January 1, 1961, to August 31, 1962.

Head, Section of Radiotherapy, University of Missouri Medical Center, October 1, 1962, to August 31, 1967. Consultant in Radiotherapy, Kansas City General Hospital, October, 1964, to August 31, 1967. Member, Consulting Staff, Boone County Hospital, October 25, 1966, to August 31, 1967. Acting Chief of Radiotherapy, Ellis Fischel State Cancer Hospital, January 28, 1966, to June 30, 1966; Member, Consulting Staff, Ellis Fischel State Cancer Hospital, May 1, 1966, to Aug. 31, 1967.

Director of Radiation Therapy, St. Paul Hospital, Dallas, Texas, August 1, 1967, to January 31, 1971; Consulting Staff, Radiation Therapy, Presbyterian Hospital, Dallas, Texas, January 2, 1970, to January 31, 1971. Consulting Staff, Children's Memorial Hospital, August 1, 1967, to January 31, 1971. Consulting Staff, Radiation Therapy, Richardson Memorial Hospital, Richardson, Texas, July 1, 1969, to January 31, 1971.

Director of Charles Judson Williams Cancer Treatment Center and active member of staff, Baptist Memorial Hospital; in same Hospital, Chief, Service of Radiation Therapy; member of Medical Board; member of Cancer Committee; Radiation Protection Officer, August 15, 1971, to Sept. 31, 1975. Staff appointments in Jacksonville Hospitals: Staff of St. Vincent's Hospital, August 3, 1971, to date; Staff of University Hospital, and member of Cancer Committee, June 22, 1971, to date; Staff of St. Luke's Hospital, September 21, 1971, to date; Staff of Methodist Hospital, October 27, 1971, to date; Staff of Hope Haven Children's Hospital, January 10, 1972, to date; Staff of Memorial Hospital of Jacksonville, August 15, 1971, to date.

Head, Radiation Therapy Service, Southeast Missouri Hospital, Cape Girardeau, Missouri, November 1, 1975.

PROFESSIONAL AFFILIATIONS:

American Medical Association
Florida Medical Association
Duval County Medical Society
Missouri Radiological Society - Member of Board of Directors, 1966-1967
The American Society of Therapeutic Radiologists
The Society of Nuclear Medicine

Item No. 8
Date: March 5, 1979

PROFESSIONAL AFFILIATIONS (Continued):

The American College of Radiology - Fellow, 1966
The Association of University Radiologists
Radiological Society of North America
The American Association for the Advancement of Science
Sigma Xi
Oklahoma State Radiolgic Society - Secretary, 1962
Coordinators of Cancer Teaching - 1960-1967
Association for Cancer Teaching - 1967 to date
Missouri Association of Tumor Registry Directors - Vice-President and Executive Secretary, 1966-1967
American Society of Clinical Oncologists, 1974 to date
American Radium Society, 1974 to date
American Cancer Society - Member, Board of Directors, Missouri Division, 1966-1967; Member, Board of Directors, Texas Division 1967 to date; Executive Committee, Texas Division, 1969 to June 30, 1971; Member, Board of Directors, Florida Division, 1971 to date.

HONORS:

Phi Theta Kappa, Arkansas State College, 1938
Scabbard and Blade, Arkansas State College, 1938
Alpha Omega Alpha, Vanderbilt Medical School, 1949; Vice-President, 1949-1950
Guest Examiner - American Board of Radiology; December, 1963; December, 1965; December, 1967; June, 1968; December, 1969; December, 1971.

OTHER:

Military Service: Active Duty, United States Army, March 1, 1940, to May 20, 1946; (2nd Lieutenant to Major, F.A.)

EXHIBITS:

A Technique for Radium Fractionation; Radiological Society of North America, Chicago, November, 1963.

Radium Fractionation in Treatment of Cervical Carcinoma; Missouri State Medical Society Meeting, April 4,. 1965.

The Tumor Registry; New Aspects; Radiological Society of North America, Chicago, November, 1964.

Treatment of Cervical Carcinoma; National Medical Society, St. Louis, Missouri, August, 1967.

Radiation Therapy Records; A Computerized Clinical Approach; Radiological Society of North America, Chicago, December, 1969.

PUBLICATIONS:

Ridings, G. R.: Chapter 13: Discussion, Clinical Radiobiology, in Roentgens, Rads and Riddles, A Symposium on Supervoltage Radiation Therapy, Edited by Friedman, M., Brucer, M., and Anderson, E.; U. S. Government Printing Office, Washington, 25, D.C., 1956

Ridings, G. R.: Fractionated Intrauterine Radium Applications: Use of a Small Diameter After-Loading Intrauterine Applicator. American J. of Roentgenology, Radium Therapy and Nuclear Medicine 89: 500-501, March, 1963.

Ridings, G. R. and Johnston, R. E.: X-Ray Dose Measurements with a Locally-constructed Water Phantom. J. Oklahoma State Medical Assoc. 56:334-337, July, 1963.

Ridings, G. R. and Brandt, E. E., Jr.: Some Aspects of Cancer Registry Procedures at the University of Oklahoma Hospital. J. Oklahoma State Medical Assoc. 56:431-441, September, 1963.

Ridings, G. R.: Irradiation in Management of Peptic Ulcer. Missouri Medicine 60:285-287, April, 1964.

Ridings, G. R.: Radiation Therapy for Carcinoma of the Cervix Uteri. J. of Oklahoma State Medical Assoc. 47:347-353, July, 1964.

Ridings, G. R.: Ewing's Tumor. Radiological Clinics of North America 2:315-325, August, 1964.

Condit, P. T., Ridings, G. R., and Coin, J. W.: Methotrexate and Radiation in the Treatment of Patients with Cancer. Cancer Research 24:1524-1533, October, 1964.

Wilson, W. J., Templeton, A. W., Ridings, G. R., and Jansen, C.: Combined Lymphography, Inferior Venacavography and Urography. Missouri Medicine 62:290-295, April, 1965

Rinker, C. T., Templeton, A. W., Mackenzie, J., Ridings, G. R., Almond, C. H. and Kiphart, R.: Combined Superior Venacavography and Azography in Patients with Suspected Lung Carcinoma. Radiology 88: 441-445, March, 1967.

Ridings, G. R.: Radiotherapy of the Leukemias. Radiological Clinics of North America 6:83-89, April, 1968.

Ridings, G. R. and Coffman, W.: I-131 Retention Curves by Whole-Body Counter: Detection of Thyroid Cancer Residuals. Radiology 80:739-740, October, 1967.

Ide, C. H. and Ridings, G. R.: Radiotherapy of a Recurrent Adenocarcinoma of Meibomian Gland. Archives of Opthalmology 79:540-544, May, 1968.

PUBLICATIONS (Continued):

Lewellyn, T., Jansen, C., Ridings, G. R., and Coffman, W. J.: Roentgenographically Undetectable Pulmonary Metastases from Thyroid Carcinoma Demonstrated by Lung Scan. Radiology 91: 753-754, October, 1968.

Ridings, G. R., Renal Adenocarcinoma: Regression of Pulmonary Metastases Following Irradiation of Primary Tumor. Cancer 27: 936-938, April, 1971.

Ridings, G. R., and Marvin, P. A.: A Rapid Patient Immobilization Procedure. Radiology 113:473-474, November, 1974.

In Preparation:

Ridings, G. R., Radiation Therapy: Facility Design and Organization (to be submitted in approximately one month).

MISCELLANEOUS:

1. Afterloading Cervical Radium Applicator, commercially produced, 1968.

2. Planned Department of Radiology, which was constructed, 1959. Designed a Computerized Tumor Registry System at the University of Oklahoma, which now serves as the basis for a regional Registry for Oklahoma; also for the University of Missouri Tumor Registry and for the Association of Missouri Tumor Registries; additionally, for St. Paul and Presbyterian Hospitals in Dallas, Texas.

3. Design and supervise construction of Charles Judson Williams Cancer Treatment Center, Jacksonville, Florida, 1971.

APPENDIX C

INSTRUMENTATION

1. Survey meters

   a. Manufacturer's name: EON

      Manufacturer's model number: PSM-700

      Number of instruments available: 1

      Minimum range: 0.01 mr/hr to 0.5 mr/hr

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

   b. Manufacturer's name: Victoreen

      Manufacturer's model number: 740 D

      Number of instruments available: 1

      Minimum range 0 mr/hr to 25 mr/hr

      Maximum range 0 mr/hr to 25,000 mr/hr

2. Dose calibrator

   Manufacturer's name: Searle Radiographics

   Manufacturer's model number: CRC-22NB

   Number of instruments available: 1

3. Diagnostic instruments

Type of Instrument	Manufacturer's Name	Model No.
Scintillation Camera	Searle Radiographics PHO/Gamma LFOV	000-75007T
Magascanner Rectilinear Scanner	Picker Nuclear	500

4. Other

   a. Picker Spectroscaler III A Gamma Scintillation Counter — Serial No. 280

   b. NRD Instrument Co. Gamma Well Counter — Model No. L-6 Serial No. 89

   c. Radx Ventil-Con — Model No. 101

   d. Radx Xenon Trap — Model No. 120

   e. Radx Xenon-Kow II — Model No. 150

   f. Gamma Counter — S/P AW-1450

10.8-21

Item No. 9
Date: March 5, 1979

CALIBRATION OF SURVEY INSTRUMENTS

Check appropriate items.

X 1. Survey instruments will be calibrated at least annually and following repair.

X 2. Calibration will be performed at two points on each scale.

The two points will be approximately 1/3 and 2/3 of full scale. A survey instrument may be considered properly calibrated when the instrument readings are within ±10% of the calculated or known values for each point checked. Readings within ±20% are considered acceptable if a calibration chart or graph is prepared and attached to the instrument.

X 3. Survey instruments will be calibrated

X a. By the manufacturer

____ b. At the licensee's facility

(1) Calibration source

Manufacturer's name _____
Model no. _____
Activity in millicuries _____
Accuracy _____
Traceability to primary standard _____

____ (2) The calibration procedures in Section I of Appendix D will be used

or

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

X c. By a consultant or outside firm

(1) Name Health Physics Associates, Lt.

(2) Location Northbrook, Ill. 60062

(3) Procedures and sources

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

____ are attached

Item No. 10
Date: March 5, 1979

CALIBRATION OF DOSE CALIBRATOR

A. Sources Used for Linearity Test

(Check as appropriate)

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

or

_____ Other* (specify) _____

B. Sources Used for Instrument Accuracy and Constancy Tests

Radionuclide	Activity (mCi)	Accuracy
Co-57	1.0	better than 5%
Ba-133	0.250	better than 5%
Cs-137	0.100	better than 5%
Other - 60 Co	0.100	better than 5%
_____	_____	_____

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

or

_____ Equivalent procedures are attached.

*Must be equivalent to the highest activity used.

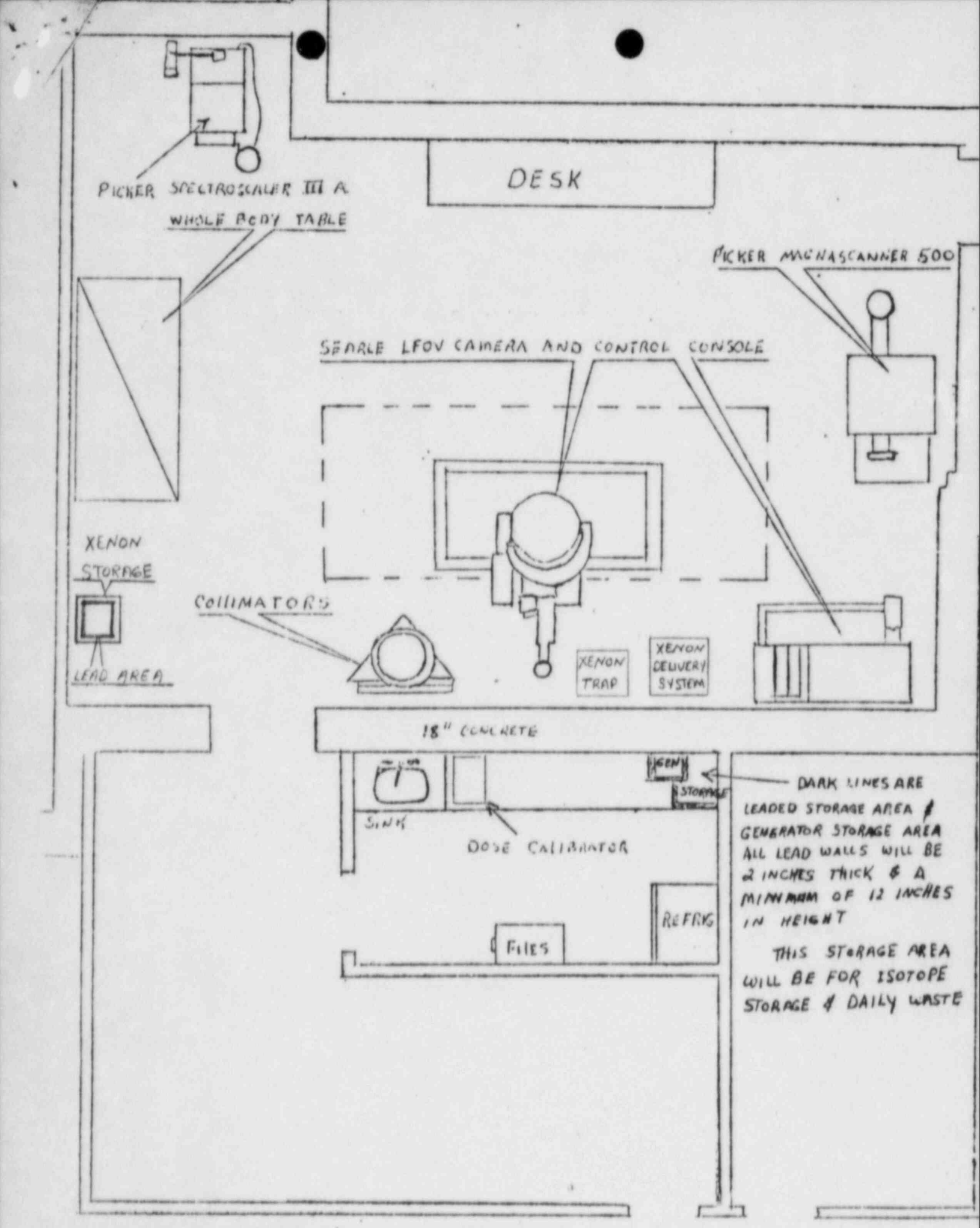
FACILITIES AND EQUIPMENT

The Imaging Room is 18 feet by 30 feet. Within the Imaging Room is; a scintillation camera, a rectilinear scanner, an uptake machine with a well counter, a desk area for record keeping, a Xenon-133 delivery system with Xenon trap and a storage area for Xenon-133 gas. The room has an exhaust vent which creates a negative pressure in the room.

The Hot Lab is an adjacent 8 foot by 13 foot room. Within the Hot Lab is; a sink, a refrigerator, normal trash can, a dose calibrator, storage for non-radioactive supplies, storage area for useful radioactive materials (this area is surrounded by 2 inch lead bricks 12 inches high), storage for radioactive waste (dependent upon the quantity of radioactive waste the material is either stored behind 2 inch lead brick or within cabinet space which is enclosed by 1/8 inch lead). Numerous lead storage containers of between 1/4 inch to 1/2 inch lead thicknesses are utilized. Eleven inch tongs are used for handling high concentrations of radioactive materials. The counter top is lined with plastic backed absorbent paper. Work areas for the preparation of radioactive materials utilize 2 inch lead bricks for personnel shielding. Background radiation is minimal and does not interfere with the measurement of radioactive materials. Syringe shields form Atomic Development Corporation are used.

All radioactive material is received by the Nursing Office at the Emergency Room. A RADIOACTIVE SHIPMENT HANDLING AND INSPECTION FORM is completed by the individual receiving the material and it is then forwarded to the Nuclear Medicine Department by the hospital security and given to the Nuclear Medicine personnel. If after hours or on weekends the material is placed in the Nuclear Medicine Hot Lab. Instructions on receiving radioactive materials have been given to the Nursing Office and Security personnel.

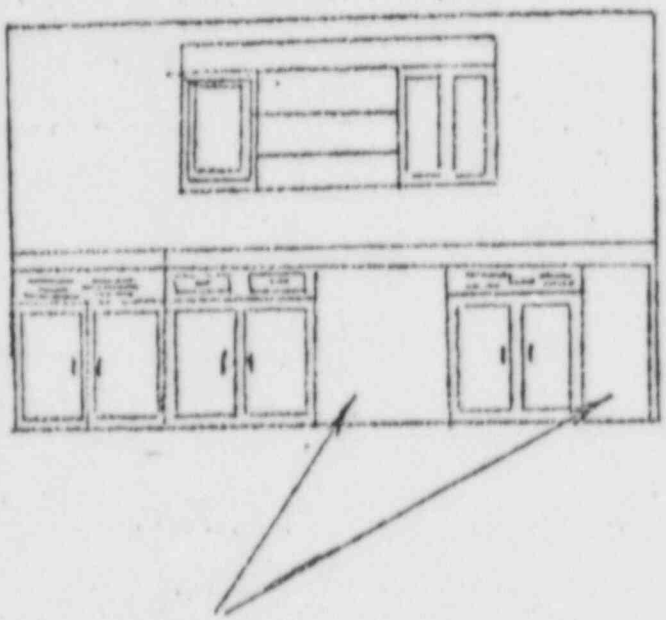
Diagrams of the department are included. One diagram shows the department with its equipment, storage and shielding areas. While another shows the ventilation system to the Imaging Room which uses and stores radioactive Xenon 133 gas.



SCALE 1/4" = 1'

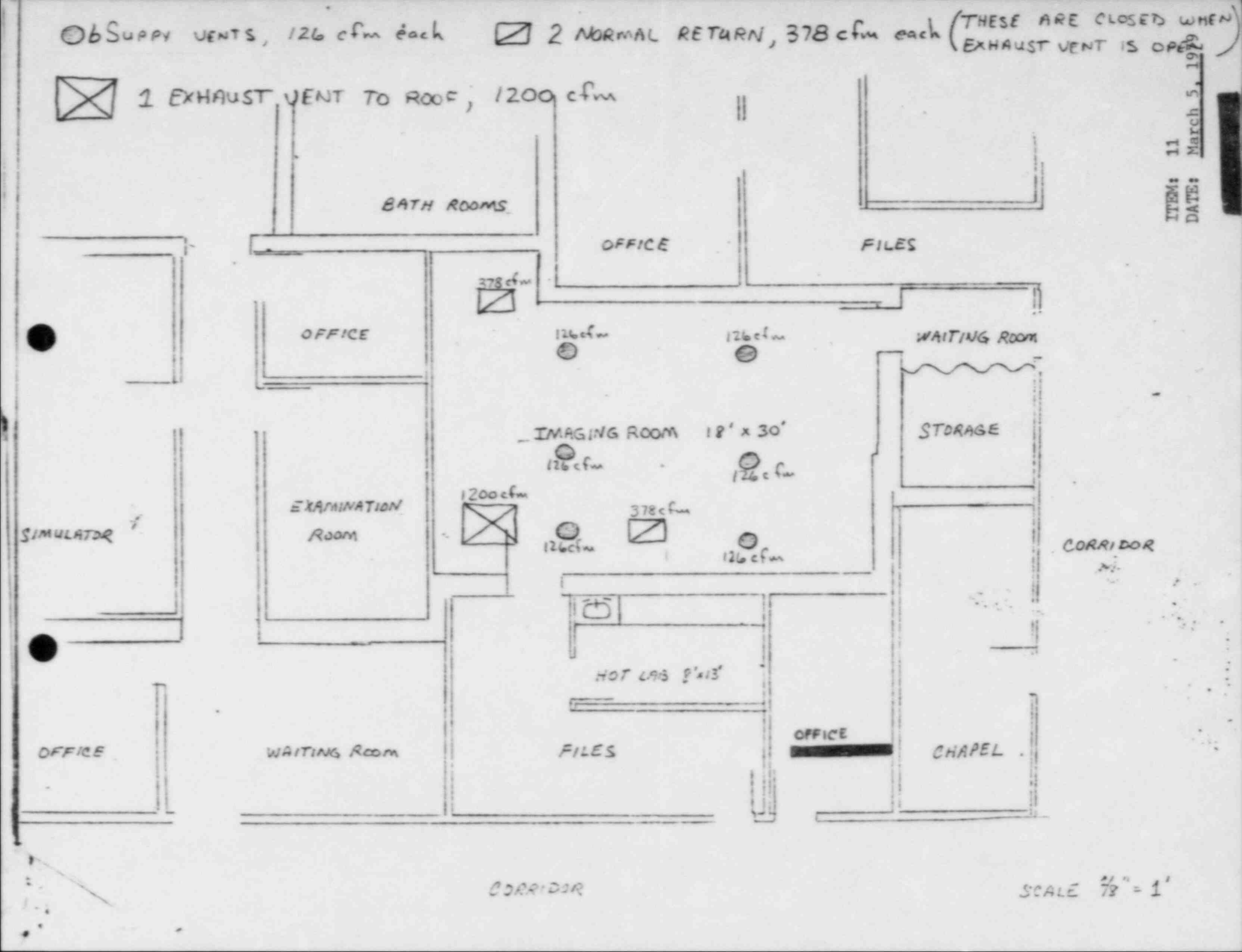
ITEM 11
DATE: March 5, 1979

FRONT VIEW OF HOT LAB WORK AREA



THESE TWO AREAS WILL BE FOR STORAGE OF RADIOACTIVE MATERIALS TO DECAY TO BACKGROUND. THE BACK IS 18 INCHES OF CONCRETE, THE BOTTOM IS THE GROUND, THE TOP, BOTH SIDES AND THE FRONT WILL BE SHIELDED WITH ⅛ TO ¼ INCHES LEAD.

ITEM: 11
DATE: March 5, 1979


6 SUPPLY VENTS, 126 cfm each
2 NORMAL RETURN, 378 cfm each (THESE ARE CLOSED WHEN EXHAUST VENT IS OPEN)
1 EXHAUST VENT TO ROOF, 1200 cfm
ITEM: 11
DATE: March 5, 1979
BATH ROOMS
OFFICE
FILES
378 cfm
OFFICE
126 cfm
126 cfm
WAITING ROOM
IMAGING ROOM 18' x 30'
126 cfm
126 cfm
STORAGE
1200 cfm
378 cfm
EXAMINATION Room
SIMULATOR
126 cfm
126 cfm
CORRIDOR
HOT LAB 8'x13'
OFFICE
WAITING Room
FILES
OFFICE
CHAPEL
CORRIDOR
SCALE 1/8" = 1'

PERSONNEL TRAINING PROGRAM

All personnel who work with or in the vicinity of radioactive material shall be properly instructed:

a. Before assuming duties with or in the vicinity or radioactive materials.
b. During annual refresher training.
c. Whenever there is a significant change in duties, regulations, or the terms of the license.

All personnel who work with radioactive materials shall have completed a formal course of training approved by the American Medical Association and be registered or registry eligible by the American Registry of Radiological Technologist, or the American Society of Clinical Pathologists or the Certifying Board of Nuclear Medicine Technologists.

All personnel who receive or work in the vicinity of radioactive material shall receive in-service education which will cover the following items:

a. Areas where radioactive material is used or stored.
b. Potential hazards associated with radioactive material.
c. Radiological safety procedures appropriate to their respective duties.
d. Pertinent NRC regulations.
e. Rules and regulations of the license.
f. Pertinent terms of the license.
g. Their obligation to report unsafe conditions.
h. Appropriate response to emergencies or unsafe conditions
i. Their right to be informed of their radiation exposure and bioassay results.
j. Locations where the licensee has posted or made available notices, copies of pertinent regulations and copies of pertinent licenses and license conditions.

Procedures for Ordering Radioactive Materials

All radioactive material orders will be placed under the supervision of the Senior Nuclear Medicine Technologist. He will ensure that the requested materials and quantities are authorized by the license and that possession limits are not exceeded.

Hospital Receiving Procedures for Radionuclides

A. During Working Hours -

1. Radionuclides are to be delivered to the Emergency Room reception area.

2. Upon receipt of radionuclide package by the Emergency Room personnel, a Radioactive Shipment Handling and Inspection Form is filled out and initialed by the person receiving the package.

3. The package with the inspection form is taken immediately to the Nuclear Medicine Department and stored in the Hot Lab. The Hospital Security shall transport the material.

4. Nuclear Medicine personnel then monitors package (refer to Nuclear Medicine receiving procedure). This information is logged and initialed on a radioactive shipment receipt form and is filed along with the initial inspection form, in the Nuclear Medicine Department.

B. During Off-Duty Hours -

1. Above steps 1,2,3, are to be followed.

2. After package is placed in the Hot Lab, it is then relocked by the Emergency Room personnel.

Item No. 13
Date: March 5, 1979

SOUTHEAST HOSPITAL
1701 Lacey, Cape Girardeau, Mo. 63701
Phone (314) 334-4822

X-18

RADIOACTIVE SHIPMENT HANDLING AND INSPECTION FORM

DATE RECEIVED _____ TIME _____ AM PM RECEIVED BY _____

VISUAL INSPECTION OF PACKAGE # _____ (NUMBER PACKAGES ACCORDINGLY)

Exterior Package Condition

O.K. _____ PUNCTURED _____ STAINED _____

WET _____ CRUSHED _____ OTHER _____

If the package is damaged and labeled "Radioactive Materials", the person handling the package should wear disposible gloves and place the package inside a plastic bag. If the area where the package was placed is wet, restrict the areas exact location from all traffic. The packages should then be transported to the Nuclear Medicine Hot Lab. The handler should leave the gloves with the package in the Hot Lab. Immediately notify one of the following personnel:

1. Wayne A. Mattes, ext. 252 of 334-6641
2. Ken Barrett, ext. 252 or 334-6798
3. Tom Welch, ext. 251 or 335-8664
4. Ron Fluegge, ext. 254 or 243-7457

If the package is O.K. upon receipt, simply transport it to the Nuclear Medicine Hot Lab.

Please remember to lock both the Hot Lab and the Nuclear Medicine Department when leaving.

REVISED
11-25-77

Item No. 13
Date: March 5, 1979

RADIOACTIVE SHIPMENT RECEIPT REPORT

X-19

1. P.O.# _____ SURVEY DATE _____ TIME _____

   SURVEYOR _____

2. CONDITION OF PACKAGE:

   _____ O.K._____ PUNCTURED_____ STAINS_____ WET

   _____ CRUSHED_____ OTHER _____

3. RADIATION UNITS OF LABEL: _____UNITS (mR/hr)

4. MEASURED RADIATION LEVELS: a. Package surface _____ mR/hr
   b. 3' from surface _____ mR/hr

5. DO PACKING SLIP AND VIAL CONTENTS AGREE?

   a. Radionuclide _____ yes _____ no difference _____
   b. Amount _____ yes _____ no difference _____
   c. Chem Form _____ yes _____ no difference _____

6. WIPE RESULTS FROM: a. Outer _____ CPM = _____ DPM
   eff=( )

   b. Final source container _____ CPM =_____ DPM
   eff=( )

7. SURVEY RESULTS OF PACKING MATERIAL AND CARTONS_____ mR/hr, CPM above Bkg.

8. IF PACKAGE WAS SHIPPED WITH DRY ICE, WAS DRY ICE PRESENT IN PACKAGE AT TIME OF RECEIPT? _____ YES_____ NO_____ N/A

9. DISPOSITION OF PACKAGE AFTER INSPECTION: _____.

10. IF NRC/CARRIER NOTIFICATION REQUIRED, GIVE TIME, DATE, PERSONS NOTIFIED.

REVISED
11-25-77

Item No. 13
Date: March 5, 1979

APPENDIX J

WASTE DISPOSAL

1. Liquid waste will be disposed of (check as appropriate)

_____ By commercial waste disposal service (see also item 4 below).

_X_ In the sanitary sewer system in accordance with §20.303 of 10 CFR Part 20.

_____ Other (specify): _____

2. Mo-99/Tc-99m generators will be (check as appropriate)

_X_ Returned to the manufacturer for disposal.

_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 generators disposed of as normal trash. (Note: This method of disposal may not be practical for generators containing long-lived radioactive contaminants.)

_____ Disposed of by commercial waste disposal service (see also item 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.

_____ Disposed of by commercial waste disposal service (see also item 4 below).

_____ Other (specify): _____

4. The commercial waste disposal service used will be

_____
(Name) (City, State)

NRC/Agreement State License No. _____

Item No. 18
Date: March 5, 1979

SOUTHEAST HOSPITAL

PROCEDURES FOR USE OF GROUPS IV AND V RADIOPHARMACEUTICALS

(Iodine 131, Phosphorous 32 (soluble or colloidal), Gold 198 (Colloical))

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 and Section 3.3 of NCRP Report #37.
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 one meter and three meters from the center of the isotope volume. 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 and on his door. The results of daily surveys will be used to recalculate permitted times which will be posted on the patient's chart and on his door.
4. The form, Nursing Instructions for Patients Treated with Phosphorous 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 not exceed 10 mrem per week taking into account the appropriate use factors.
6. All linens will be surveyed for contamination before being removed from the patinet'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

Item No. 19
Date: March 5, 1979

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. Urine and vomitus, from Iodine 131 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 routinely providing care for patients with therapeutic doses of radionuclides will wear personal radiation monitoring devices (film badges).

b. 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 Radiation Therapy Department if you have any questions about the care of these patients.

c. No visitors under 18 years of age are allowed.

d. Patients must remain in bed while visitors are in the room and visitors should remain at least six feet from the patient.

e. Radioactive patients are to be confined to their rooms except for special medical or nursing purposes approved by the Radiation Therapy Department.

f. No nurse, visitor, or attendant who is pregnant shall be permitted in the room of a patinet 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.

g. Attending personnel must wear rubber or disposable plastic gloves when ahndling 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.

h. 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 Radiation Safety Officer for proper disposal of the contents of the designated waste container.

i. 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 Radiation Safety Office.

j. 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 Radiation Safety Office.

k. Surgical dressings should be changed only as directed by the radiotherapist. Gold 198 leaking from a puncture would 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 Radiation Safety Office. Handle these dressings only with tongs or tweezers. Wear disposable gloves.

l. For Iodine 131 patients:

(1) 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 Radiation Safety Office.

(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 administraion, 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 Radiation Safety Office, ext. 254 or 252. Meanwhile, handle all contaminated material with disposable gloves and avoid spreading contamination.

(5) All vomitus must be kept in the patient's room for disposal by the Radiation Safety Officer. 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 triply flushed (3 times).

m. 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, notigy the Radiation Safety Officer.

n. If a nurse, attendant, or anyone else knows or suspects that his skin, or clothing, including shoes, is contaminated, notify the Radiation Safety Officer 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.

o. If a therapy patient should need emergency surgery or should die, notify the Radiation Safety Officer immediately.

p. When the patient is discharged, call the Radiation Safety Office and request that the room be surveyed for contamination before remaking the room.

SOUTHEAST HOSPITAL

NURSING INSTRUCTIONS FOR PATIENTS TREATED WITH
PHOSPHOROUS 32, GOLD 198, OR IODINE 131

Patient's Name:_____ No.:___-___-_____ Date:__/__/__

Room No.:_____ Physician's Name:_____ Isotope:_____

Date and Time of Administration:__/__/__ @__:__ AM/PM Dose:_____

Method of Administration:_____

Exposure rates in mR/hr

Date	1 meter	3 meters

Comply with all items below

1. Visiting time permitted:_____
2. Visitors must remain at least 6 feet from patient (2 meters).
3. Patient may NOT leave room.
4. Visitors under 18 NOT permitted.
5. Pregnant visitors NOT permitted.
6. Film badges must be worn.
7. Do NOT release room to admitting until OK'ed by Radiation Safety Officer.

Comply with all checked items below

____ 1. Gloves must be worn while attending patient.

____ 2. Patient must use dispos able utensils

____ 3. All items must remain in room until OK'ed by Radiation Safety Office.

____ 4. Smoking is NOT permitted.

____ 5. Other instructions:

In case of Emergency, contact: Dr. Herbert W. Nower, RSO, x 254 or (home) 334-4577

Signed:_____
Radiation Safety Office

Item No. 19
Date: March 5, 1979

SOUTHEAST HOSPITAL

PROCEDURES FOR USE OF GROUP VI SEALED SOURCES
(Americum 241, Cesium 137, Cobalt 60, Gold 198, Iodine 125, Iridium 192, and Strontium 90)
FOR TREATMENT OF PATIENTS

1. Sealed sources are stored in the designated "Radium Room." This room is to be used solely for receiving, handling, and storing radioactive sources. It is an isolated room adjacent to an unrestricted corridor and stairwell (low occupancy areas) and an external wall. The sources are in appropriate containers, the containers are then placed within a lead box of 4 inches minimum thickness. The average distance from the lead enclosure to the uncontrolled areas is 4 feet.

2. Precautions used while handling sealed sources

   a. Sealed sources are only handled by personnel approved by the Radiation Safety Officer.

   b. TLD finger rings or bracelets and film badges shall be worn.

   c. Sources shall never be handled directly. Forceps or other long handled devices shall always be used.

   d. In the Radium Room, the Procedures Room, the O.R., or the patient's room, sources will be contained within their designated containers and within a lead shield of 2 inches minimum thickness until used. During preparation for use, they will be within a 2 inch minimum thickness container and behind a lead-glass viewing area (if appropriate).

3. Special instructions are provided for nursing care for patients who are treated with sealed sources. See Appendix 1, attached.

4. Sealed sources are transported to and from the Radium Room on specially designed carts with cylindrical inner lead containers of 1 inch minimum thickness within an outer container of 2 inches minimum thickness. For temporary implants, the containers remain in the patient's room until the sources are removed from the patient.

5. Source accountability is maintained through a source inventory board in the

Radium Room. The detailed procedures are contained in Appendix 2, attached. Source inventories are performed quarterly and the results entered in the Radium Room log book along with other pertinant data as wipe tests, source replacement, etc. Following removal of the sources, the sources are double-counted and a survey is made of the patient and environs to determine that all sources are removed and accounted for.

6. Surveys to be performed during the course of treatment. Patients will be surveyed as soon as is feasible after the sources are administered. Readings will be taken at 1 meter and 3 meters from the center of the implant with a Victoreen Cutie Pie (740 D), EGN PSM-700 Portable Radiological Survey Meter, or comparable instrument. For temporary implants, a second survey will be taken as close as possible to the site of the implant after the sources are removed. This is to assure that all sources have been removed.

For permanent implants, periodic reductions will be implemented regarding the safety precautions as determined by the isotope used, the strength, the half-life, and the guidelines presented in NCRP Report #37. Periodic surveys will be performed as needed to implement these procedures.

All temporary sources will be double-counted upon removal and all areas inhabited by the patient, when the sources were implanted, will be surveyed to assure that all sources are accounted for.

SOUTHEAST HOSPITAL

PROCEDURES FOR USE OF RADIUM, RADON 222, AND GROUP VI SOURCES
(Cesium 137, Gold 198, Iodine 125, Iridium 192)
FOR TREATMENT OF PATIENTS

1. All patients treated with brachytherapy sources 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 and Section 3.3 of NCRP Report #37.
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 1 meter and 3 meters from the center of the implant. 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 and on the door to the room.
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 not exceed 10 mrem per week, taking into account the appropriate use factors.
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. A source count will also be done. At the same time all radiation signs will be removed.
8. Instructions to Nurses
   a. Nurses routinely providing care for patients with therapeutic doses of radionuclides will wear personal radiation monitoring devices (film badges).

b. 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 Radiation Therapy Department if you have any questions about the care of these patients.

c. Nurses should spend only the minimum necessary time near a patient for routine nursing care.

d. When a nurse receives an assignment to a therapy patient, a film badge should be obtained immediately from the Radiation Safety Office. The badge shall be worn only by the nurse to whom it is issued and shall not be exchanged between nurses.

e. Pregnant nurses shall not be assigned to the personal care of these patients.

f. 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 Radiation Safety Officer at once.

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

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

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

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

k. No special precautions are needed for sputum, urine, vomitus, stools, dishes, instruments, utensils, or bedding unless specifically ordered.

l. These patients must stay in bed unless orders to the contrary are written.

m. No visitors under 18 years of age are allowed.

n. Visitors should sit at least six feet from the patient and should remain no longer that the times specified on the form posted on the patinet's door and in his chart.

o. No nurse, visitor, or attendent who is pregnant shall 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.

p. Emergency Procedures

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

(2) If the patient dies, or

(3) If the patient requires emergency surgery, IMMEDIATELY call Dr. Herbert W. Mower, RSO, x 254 (home) 334-4577.

q. At the conclusion of treatment, call the Radiation Safety Officer and request that the patient and room be surveyed to be sure that all sources have been removed.

SOUTHEAST HOSPITAL

NURSING INSTRUCTIONS FOR PATIENTS TREATED
WITH BRACHYTHERAPY S OURCES

Patient's Name:_____ No.: ___-___-_____ Date:__/__/__

Room No.:_____ Physician's Name:_____ Isotope:_____

Date and Time of Administration:__/__/__@___AM/PM Activity:_____

Date and Time Sources to be Removed:__/__/__@___AM/PM

Exposure rates in mR/hr

Date	1 meter	3 meters

Comply with all items below

1. Wear film badge
2. No pregnant visitors
3. No visitors under 18 years of age
4. A dismissal survey must be performed before patient is discharged
5. Patient must have a private room

Comply with all checked items below

___ 1. Gloves must be worn while attending patient.

___ 2. Place laundry in linen bag and save.

___ 3. Housekeeping may not enter the room.

___ 4. Patient may not have visitors.

___ 5. Other instructions:

In case of Emergency, contact: Dr. Herbert W. Mower, RSO, x 254 or (home) 334-4577

Item No. 20
Date: March 5, 1979
Control No. 01443

APPENDIX 2
COVERS ITEM 20 f.

INVENTORY CONTROL FOR BRACHYTHERAPY SOURCES

The inventory control board for brachytherapy sources indicates the current use and availability of the sources used in temporary implants or insertions. These include the radium needles and radium tubes stored in the radium safe and the cesium tubes stored in the two cylinders behind the safe. The board has a partition for each drawer in the safe, a partition for each cylinder, and a partition for each room where patients with sources are housed.

SOURCE IDENTIFICATION

Each source has a color-coded pin denoted by a solid color or a base color with a contrasting top. A source inventory with identifying colors is posted in the radium room adjacent to the inventory control board.

PATIENT IDENTIFICATION

When a patient is loaded with sources, a 3x5 card with the patient's name, number, date of implant, and expected date of removal should be pinned in the box corresponding to the patient's room. When the cources are removed and returned to the radium room, the 3x5 card should also be removed.

SOURCE LOCATION

Whenever a source is removed from the sage or from its cylinder, the corresponding color-coded pin should be moved from the storage compartment ot the appropriate room-number box. This, along with the patient identification card, indicates the location of all sources. When the sources are returned to the radium room for storage, again, move the corresponding pins to the proper partition. When sources are returned:

BE SURE THAT ALL SOURCES ARE ACCOUNTED FOR

The number of sources and the value of each source should correspond to the

pins for the given patient. Report any discrepancies immediately to the Physicist, Administrative Tech, or the Radiotherapist.

TANDEM STORAGE

Sources may be stored within the tandem in the tandem drawre. In this case, the appropriate pins should be in the 'Tandem' partition, rather than in the partition designated for that source. The important thing is to know where the sources are, not where they should be.

9/1/78 HWM

SOURCES REMOVED FROM PATIENT

After the sources are removed and before the patient is discharged, the patient shall be surveyed with a suitable meter to determine that all sources are removed. This will be recorded on the therapy chart.

12/15/78 HWM

A. QUANTITIES TO BE USED:

1. We estimate a patient load of 10 per week or 520 per year with an average use of 10 millicuries of Xenon-133 per patient.

2. Possession limit - 2.0 curies of Xenon-133.

B. USE AND STORAGE AREAS:

1. Imaging Room - measures 18 x 30 x 8 feet. Attachment #1 is a diagram showing the Imaging Room in correlation to its proximity to unrestricted areas. Storage of the Xenon-133 shall be in the northeast corner of the Imaging Room instead of the hot lab due to the exhaust system. Xenon-133 will be stored in a Model No. 150 Radx Xenon-Kow II which is completely lined with 3/16 inch lead. The Xenon-Kow II shall also be stored behind 2 x 4 x 8 inch lead bricks.

2. Attachment #2 is a diagram showing the ventilation system within the Imaging Room. There are six supply vents with a total flow rate of 756 cfm. There are two return air vents in the ceiling which return 756 cfm to the return air plenum above the ceiling. The two exhaust vents exhaust a total of 1200 cfm to an exhaust vent which leads to the Hospital roof on the North Wing.

   The two return air vents and the two exhaust vents are on a damper system with the control located in the Imaging Room. The switch which controls the exhaust fan is also in the Imaging Room. The control switch on the damper system regulates the four dampers over the two return air vents and two exhaust vents. The system is set to either have the return air vents open and the exhaust vents closed or the opposite. We will keep the control set so that the two exhaust vents are open and the two return vents are closed. This will give us 0% air recirculation.

C. PROCEDURES FOR ROUTINE USE:

Xenon-133 will be procured from General Electric in 1.0 curie ampules and the ampules will be crushed, diluted to 100 ml volume and dispensed in a Radx Model 150 Xenon-Kow II transfer system in strict accordance with the manufacturer's instruction. After each use, the sealing "O" rings on the Xenon-Kow II will be inspected for cracks and damage. Any evidence of damage will result in a change of rings. The entire unit will be inspected by Radx annually.

Withdrawals from the Xenon-Kow II will be done with a lead shielded glass syringe and assayed in our Searle Dose Calibrator, Model CRC-22NB. All personnel handling Xenon-133 will wear wrist badges in addition to their whole body badges in order to assess exposure to the extremities.

Item No. 21
Date: March 5, 1979

Xenon-133 will be administered to patients via a Radx Model 101 Ventil-Con in accordance with Radx instructions for use. Face masks or mouthpieces with nose clamps will be used to prevent loss of Xenon-133 during the patient study.

Exhaled Xenon-133 will be collected in a Radx Model 120 Xenon Trap. This model has a built in saturation detector which gives an audio/visual signal when the Xenon-133 in the trap exhaust port reaches 2×10^{-2} uCi/ml.

D. EMERGENCY PROCEDURES:

In case of accidental release of Xenon-133, the following procedures will be followed:

1. The room will be evacuated.

2. The Xenon Trap will be turned on and the room closed.

3. The room will not be reopened until a minimum of 10 complete air exchanges have taken place. The exhaust system provides 22.2 complete air exchanges per hour, therefore, the room will be kept closed for a minimum of 27 minutes.

4. The room will be reopened for use when the radiation level in the room, as determined by our Eon PSM-700 Portable Radiological Survey Meter, has returned to normal for the room.

E. AIR CONCENTRATIONS OF XENON-133 IN RESTRICTED AREAS:

Imaging Room - the Xenon-Kow II is a non-pressurized system and, therefo· , is not prone to leaks. However, some Xenon-133 will be lost in the transferring process. We plan to use 1 curie each 2 1/2 weeks; therefore, the following assumptions are made:

ASSUMPTIONS:

1. 1% per curie loss in transferring operations spread over the 2 1/2 week life or 10 mCi/2 1/2 weeks, or 4 mCi/week.

2. 10 patients per week.

3. 25% leakage rate from patients who will either disconnect from the machine and exhale entire lung contents of Xenon-133 into the room, or leak from around the face mask or mouthpiece.

   It should be emphasized that the 25% leakage rate is used as a maximum and that the expected leakage rate is not near that high.

4. 10 mCi of Xenon-133 used per patient.

5. The Ventil-Con is reported by Radx to lose approximately 1% per day by diffusion through membranes and the Ventil-Con is normally loaded with 50 mCi of Xenon-133; thus in a 5 day work week there would be 2.5 mCi lost.

6. The Xenon Trap activates a warning system when the concentration in the exhaust port exceeds 2×10^{-2} uCi/ml. It is assumed for this calculation that the level is at this for the washout period of each patient.

Trap pumps at 5 liters/minute
Average washout time = 10 minutes
Xenon loss per patient through trap:
$= 5 \times 10^{3}$ ml/min. x 10 min. x 2×10^{-2} uCi/ml
$= 1 \times 10^{3}$ uCi/pt.
= 1 mCi/pt.

It should be emphasized that this is a maximum figure and that the dynamics of Xenon-133 adsorption on charcoal would dictate that once Xenon-133 begins to pass through the system, its concentration grows geometrically which would activate the alarm and the charcoal cartridge would be replaced.

Xenon-133 per week lost into the room contribution from:

Transfer Operations.....	4.0 mCi
Ventil-Con.....	2.5 mCi
Patients (10 pts/wk x 10 mCi/pt x 25%)..	25.0 mCi
Xenon Trap (1 mCi/pt x 10 pts/wk).....	10.0 mCi
	41.5 mCi/wk
	4.15×10^{4} uCi/wk

Room exhaust rate = 1200 cfm

$$1200 \text{ cfm} \times \frac{6.8 \times 10^{7} \text{ ml/40 hr wk}}{1 \text{ cfm}} = 8.16 \times 10^{10} \text{ ml/40 hr wk}$$

Xenon-133 concentration/40 hr. wk.:

$$\frac{4.15 \times 10^{4} \text{ uCi/wk.}}{8.16 \times 10^{10} \text{ ml/40 hr. wk.}} = 5.08 \times 10^{-7} \text{ uCi/40 hr. wk.}$$

This figure is well below the MPC of a restricted area as set forth in 20.103 of 10CFR Part 20 as 1×10^{-5} uCi/ml.

F. CONCENTRATION IN UNRESTRICTED AREA:

The Xenon-133 lost in the Imaging Room as described in Section E will be exhausted into the atmosphere above the roof line of the Hospital. Attachment #3 is an aerial view of the Hospital showing:

1. The roof, which is a restricted area (however, since the atmosphere is unrestricted we are treating this area as an unrestricted area.

2. The exhaust vent.

3. The nearest air intake, which is 32 feet from the exhaust vent and the same height above the roof.

4. The prevailing wind direction, which is from the southwest towards the northeast.

All Hospital windows are kept closed at all times:

1. Xenon-133/year exhausted to the atmosphere, contribution from:

Imaging Room:

$$41.5 \text{ mCi/wk.} \times 52 \text{ wk./yr.} = 2.158 \times 10^3 \text{ mCi/yr.}$$
$$= 2.158 \times 10^6 \text{ uCi/yr.}$$

2. Air flow per year:

Exhaust rate = 1200 ft^3/min.

Exhaust per year:

$$\frac{1.2 \times 10^3 \text{ ft}^3}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} \times \frac{24 \text{ hr}}{\text{day}} \times \frac{365 \text{ day}}{\text{yr}} = \frac{6.3 \times 10^8 \text{ ft}^3}{\text{yr}}$$

$$\frac{6.3 \times 10^8 \text{ ft}^3}{\text{yr}} \times \frac{2.832 \times 10^4 \text{ ml}}{\text{ft}^3} = \frac{1.78 \times 10^{13} \text{ ml}}{\text{yr}}$$

3. Average concentration per year:

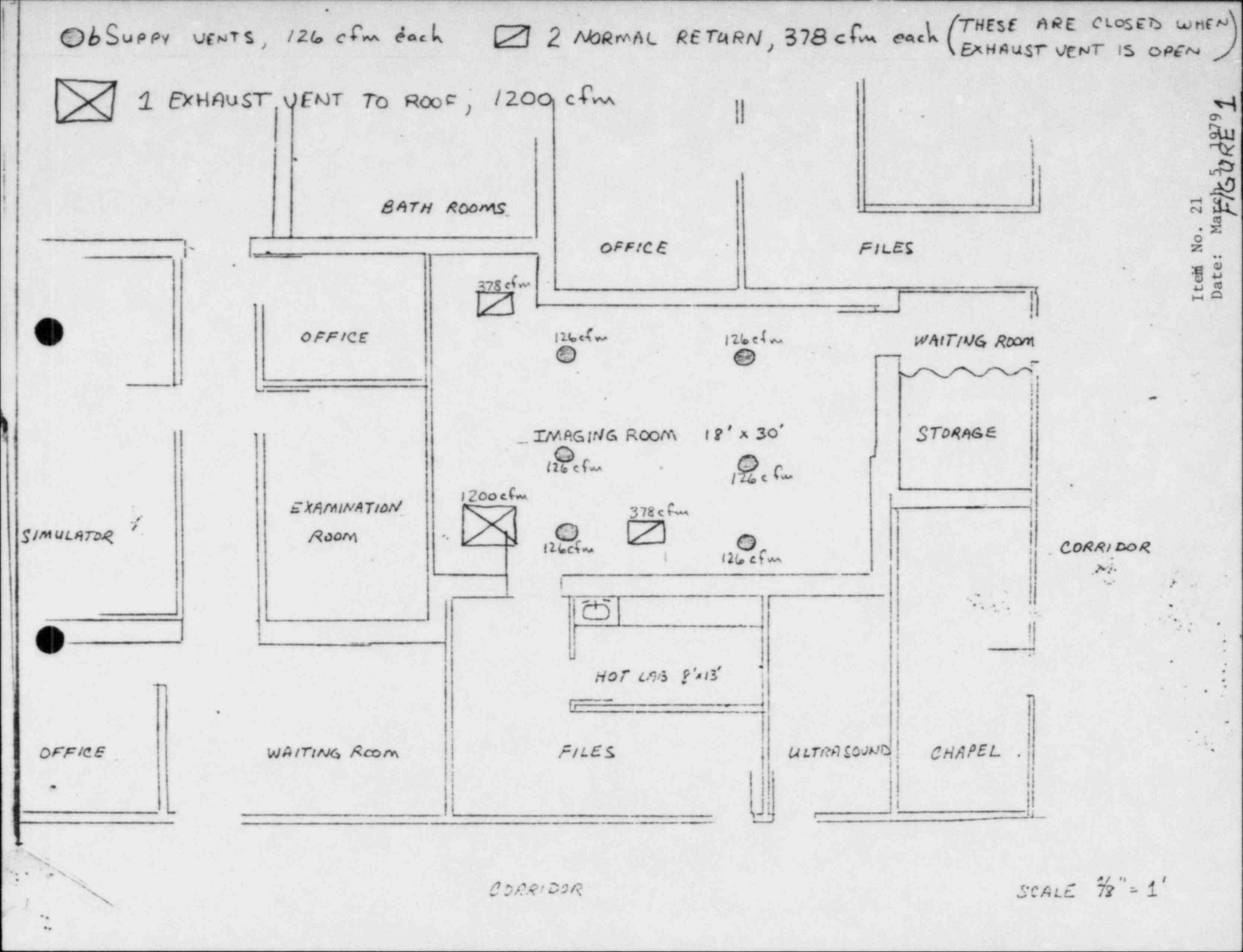
$$\frac{2.158 \times 10^6 \text{ uCi/yr}}{1.78 \times 10^{13} \text{ ml/yr}} = 1.21 \times 10^{-7} \text{ uCi/ml}$$

This is well below the MPC of 3×10^{-7} and since the calculations represent worse conditions, the safety margin appears adequate.

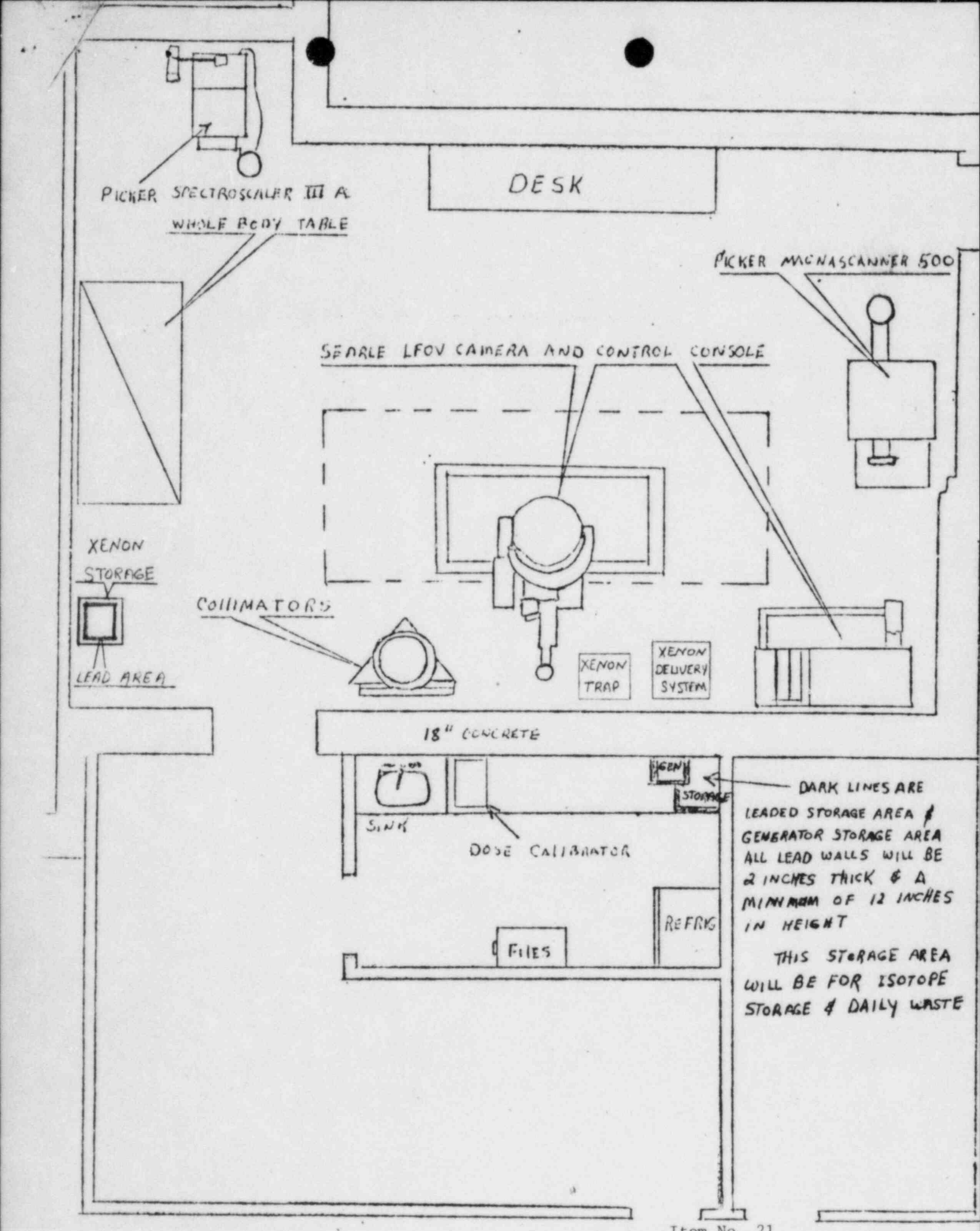
G. ADSORPTION ONTO CHARCOAL TRAPS:

The Xenon Trap from Radx has a GM detector system monitoring the exhaust port of the trap. It is designed in such a fashion that when the unit is first turned on the alarm activates for a few seconds to indicate that the system is functional. The alarm is set to activate when the concentration in the exhaust port exceeds 2×10^{-2} uCi/ml. The exhaust will enter into the Imaging Room and has been considered in previous calculations (see E.6).

Saturated filters will be plugged and placed in storage behind a minimum of 1/4 inch lead shielding in the hot lab. Attachment #4 is a diagram showing where the saturated filter will be stored in the hot lab. The storage time will not be less than 15 half lives, at which time it will be surveyed to make sure it has returned to normal background. Since the filter is plugged and completely sealed, it is not anticipated that it will contribute to the Xenon-133 air concentration.



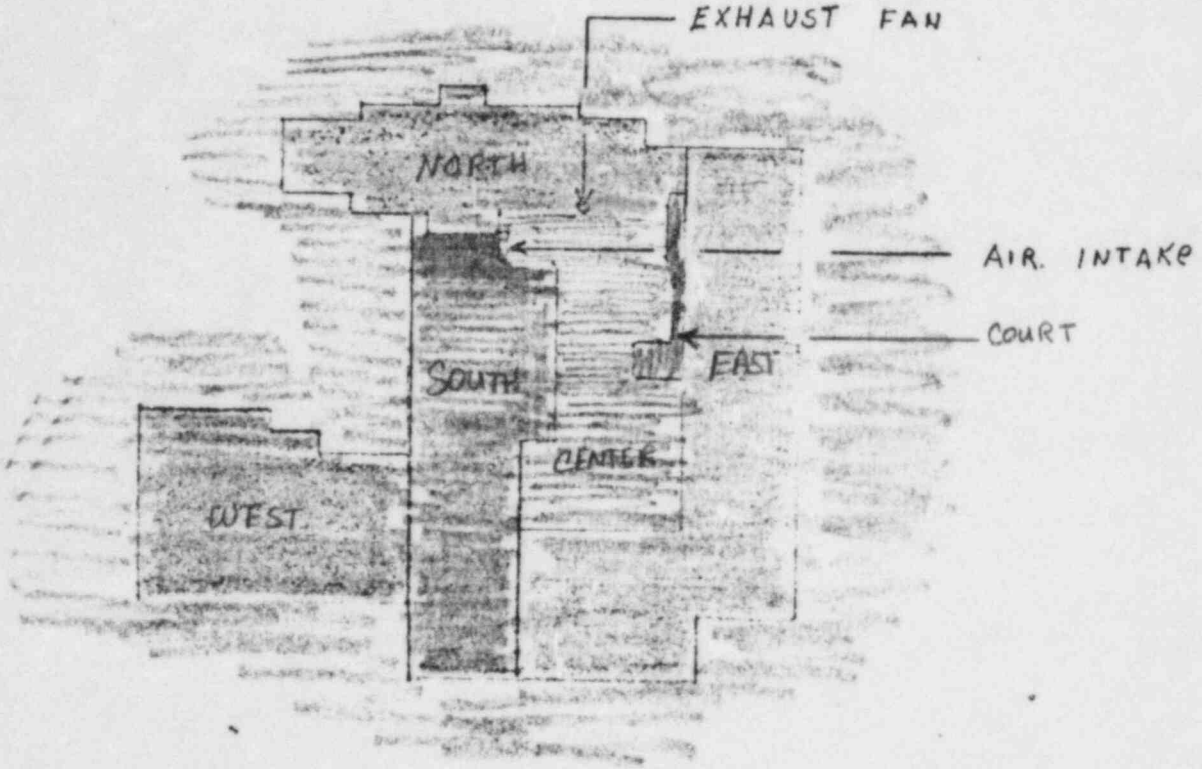
Item No. 21
Date: March 5, 1979
FIGURE 1



SCALE 1/4" = 1'

Item No. 21
Date: March 5, 1979

ATTACHMENT #3
(2-28-77) W.M.

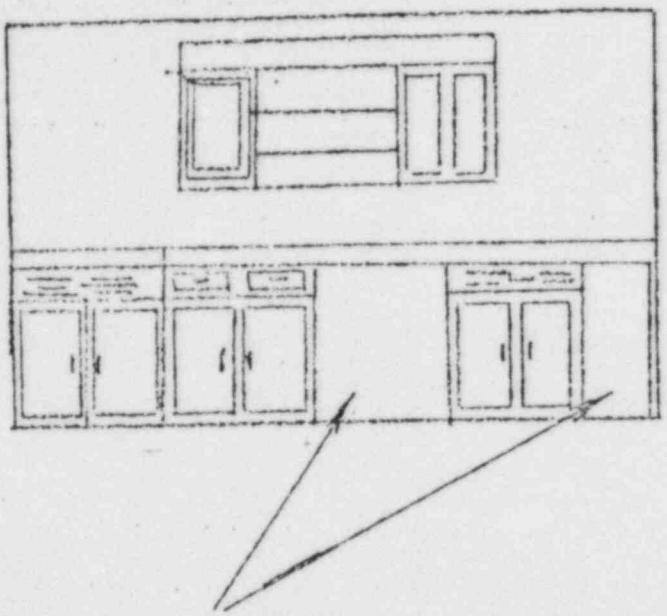


PREVAILING WIND DIRECTION IS S.W. TOWARDS N.E.

NORTH WING:	4 FLOORS
South WING:	4 FLOORS
EAST WING:	5 FLOORS
West WING:	3 FLOORS
CenTeR AREA:	1 FLOOR
RestaKted Court:	GROUND

Item No. 21
Date: March 5, 1979

FRONT VIEW OF HOT LAB WORK AREA



THESE TWO AREAS WILL BE FOR STORAGE OF RADIOACTIVE MATERIALS TO DECAY TO BACKGROUND. THE BACK IS 10 INCHES OF CONCRETE, THE BOTTOM IS THE GROUND, THE TOP, BOTH SIDES AND THE FRONT WILL BE SHIELDED WITH ⅛ TO ¼ INCHES LEAD.

THESE AREAS WILL BE USED TO STORE THE XENON-133 CHARCOAL FILTER CARTRIDGE WHEN IT BECOMES SATURATED.

Item No. 21
Date: March 5, 1979