EXHIBIT A

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 Material 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

Medical X-Ray Center, P.C.
1417 S. Minnesota
Sioux Falls, SD 57105

TELEPHONE NO.: AREA CODE (605) 336-0515

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

Steven M. Jones, M.S.

TELEPHONE NO.: AREA CODE (605) 336-0515

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

a. ☐ NEW LICENSE
b. ☒ AMENDMENT TO LICENSE NO. 40-01493-02
c. ☐ RENEWAL OF LICENSE NO. _____

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 letter

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.)*

Steven M. Jones, M.S.
Medical Physicist

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		
10 CFR 35.100, SCHEDULE A, GROUP I		AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP II		AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP III		
10 CFR 35.100, SCHEDULE A, GROUP IV		AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP V		AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP VI (see attached letter)	X	500

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.	X	30
GOLD-198 AS COLLOID FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.		
IODINE-131 AS IODIDE FOR TREATMENT OF THYROID CARCINOMA	X	200
XENON-133 AS GAS OR GAS IN SALINE FOR BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES.		

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

FORM NRC-313M
(8-78)

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

24. PERSONNEL MONITORING DEVICES

TYPE (Check appropriate box)			SUPPLIER	EXCHANGE FREQUENCY
a. WHOLE BODY		FILM		
		TLD		
		OTHER (Specify)		
b. FINGER		FILM		
		TLD		
		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
McKennan Hospital/Sioux Valley Hospital

MAILING ADDRESS
Addresses attached

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:
(10 CFR 170-31) Category #7(B)-Amendment

(2) LICENSE FEE ENCLOSED: $ 40.00

b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)*
F. R. Czeswik

(1) NAME *(Type or Print)*
F. R. Czeswik,

(2) TITLE
Business Manager

c. DATE
7/31/81

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.

LYLE E. SCHROEDER

PRESIDENT
Sioux Valley Hospital
1100 South Euclid
Sioux Falls, SD 57105

July 27, 1981

Mr. Steve M. Jones
Medical X-Ray Center
1417 South Minnesota Avenue
Sioux Falls, SD 57105

Dear Mr. Jones:

This is to advise you that we at Sioux Valley Hospital do agree to admit patients containing radioactive material prescribed and administered by authorized physicians of the Medical X-Ray Center, P.C.

I have visited with our nursing staff and they have advised me that this does not seem to be a nursing problem. Appropriate policies and procedures for the care of the patients with radium implants are developed. As long as nursing is informed that radioactive materials are inserted, there should not be a problem.

Sincerely,

Lyle E. Schroeder
President

LES/kf
cc: Mary Fuller
Vice President of Nursing

McKennan Hospital

(605)339-8000
800 E. 21st Street, Sioux Falls, South Dakota 57101

TO WHOM IT MAY CONCERN:

McKennan Hospital agrees to admit patients containing radioactive material prescribed and administered by authorized physicians of the Medical X-Ray Center.

Authorized by

Henry J. Morris
Executive Director

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
Donald G. Nordstrom, M.D.

STREET ADDRESS
1417 S. Minnesota Ave

CITY | STATE | ZIP CODE
Sioux Falls SD 57105

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		
	LIVER FUNCTION STUDIES		
	FAT ABSORPTION STUDIES		
	KIDNEY FUNCTION STUDIES		
	IN VITRO STUDIES		
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		Also helped in a research project where the same technique was used in Dogs.
P-32 *(Colloidal)*	INTRACAVITARY TREATMENT	12	
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

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

a. NAME OF SUPERVISOR
Howard B. Latourette, M.D.

b. NAME OF INSTITUTION
University of Iowa Hospitals & Clinics

c. MAILING ADDRESS
Division of Radiation Therapy

d. CITY
Iowa City, Iowa 52242

5. MATERIALS LICENSE NUMBER(S)

6. PRECEPTOR'S SIGNATURE

7. PRECEPTOR'S NAME *(Please type or print)*
Hamed H. Tewfik, M.D.

8. DATE
June 8, 1981

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

Note that Dr. Nordstrom is an authorized user on NRC license #40-11160-01. NO

40-1493-3 Tele

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: Robert Peter DeClark, M.D.

STREET ADDRESS: 1417 Minnesota Ave

CITY: Sioux Falls | STATE: South Dakota | ZIP CODE: 57103

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		
	LIVER FUNCTION STUDIES		
	FAT ABSORPTION STUDIES		
	KIDNEY FUNCTION STUDIES		
	IN VITRO STUDIES		
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			

Robert P. DeClark, MD's

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	4*6	
	TREATMENT OF HYPERTHYROIDISM	12	
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	Thyroid carcinoma patients are treated in conjunction with Donald G. Nordstrom M.D. certified by Am Board of Radiology in Therapeutic Radiology in 1978.		

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

Sept 1966 – Sept 1969 – Diagnostic Radiology
U of Iowa – 2–8 wk rotations

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

a. NAME OF SUPERVISOR: Richard Peterson

b. NAME OF INSTITUTION: U of Iowa

c. MAILING ADDRESS: U of Iowa Hospitals

d. CITY: Iowa City Iowa

5. MATERIALS LICENSE NUMBER(S)

6. PRECEPTOR'S SIGNATURE: Richard E Peterson MD

7. PRECEPTOR'S NAME *(Please type or print)*: RICHARD E. PETERSON, M.D. certified by Am Bd of Nuclear Medicine

8. DATE: April 30, 1981

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
Steven M. Jones, M. S. Medical Physicist	N.A.

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C

4. TRAINING RECEIVED IN BASIC RADIOISOTOPE HANDLING TECHNIQUES

FIELD OF TRAINING A	LOCATION AND DATE(S) OF TRAINING B	TYPE AND LENGTH OF TRAINING	
		LECTURE/ LABORATORY COURSES *(Hours)* C	SUPERVISED LABORATORY EXPERIENCE *(Hours)* D
a. RADIATION PHYSICS AND INSTRUMENTATION	Colorado State Univ. (1977-78) Univ.of Colorado (1978-79)	20 30	10 500
b. RADIATION PROTECTION	Colorado State Univ. (1077-78) Univ.of Colorado (1978-79)	10 25	5 5
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	Colorado State Univ. (1977-78) Univ.of Colorado (1978-79)	10 15	
d. RADIATION BIOLOGY	Colorado State Univ. (1977-78) Univ.of Colorado (1978-79)	20 30	
e. RADIOPHARMACEUTICAL CHEMISTRY	Colorado State Univ. (1977-78) Univ.of Colorado (1978-79)	26 20	16 10

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

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
Co-60	3853 Ci	Univ.of Colorado Medical X-Ray Center	1978-81 (50 hours)	Therapy (external)
Cs-137	250 mCi	Univ. of Colorado	1978-80 (20 hours)	Brachytherapy
I-131	100 mCi	Medical X-Ray Center	1980-81 (40 hours)	Therapy (oral)
Ir-192	62 mCi	Univ. of Colorado	1978-79 (10 hours)	Brachytherapy
P-32	10 mCi	Medical X-Ray Center	1980-81 (5 hours)	Therapy (oral)
Ra-226	150 mCi	Medical X-Ray Center	1980-81 (20 hours)	Brachytherapy
Tc-99m	1000 mCi	Univ. of Colorado	1978-79 (10 hours)	Diagnostic Imaging

Item 19: Therapeutic Use of Radiopharmaceuticals

A. Procedures in Appendix K of NRC Reg. Guide 10.8 will be followed.

B. 1) Personnel will always wear disposable gloves and use remote pipetting and tongs to prepare and handle radiopharmaceuticals. All work will be performed in the radioisotope lab (see figure 1(a) and 1(b)) within fume hood, behind two inch lead bricks.

2) Bioassays will be performed on personnel involved in preparing oral solutions of I-131 for therapeutic doses. These bioassays will be performed routinely at intervals recommended by NRC Reg. Guide 8.20.

3) Weekly surveys using a low-level GM survey meter will continue to be performed in the isotope preparation laboratory. Decontamination procedures are attached.

DECONTAMINATION PROCEDURES

Radioactive accidents and contamination of working areas and personnel can be prevented by identifying potential problems and instituting appropriate corrective measures. In the event of a radioactive accident, decontamination techniques outlined below will be followed in order to minimize exposure to personnel and prevent contamination of other areas of the lab, particularly, radiation detection equipment.

PROCEDURE FOR A MAJOR RADIOACTIVE ACCIDENT

A major accident in the isotope laboratory would be a liquid spill.

1. Contain the spill with absorbent paper, vacate the area and prevent reentrance.

2. Immediately notify the Radiation Safety Officer. If personally contaminated either have someone else perform the notification while you proceed with personnel decontamination procedures, or remove contaminated clothing, cover hands with gloves if contamination is suspected and proceed with notifications. Every effort must be made to prevent spread of contamination.

3. Survey all persons who may be contaminated. Proceed with personnel decontamination procedures. Do not allow anyone to leave until it has been determined that they are not contaminated.

4. Determine the exposure level. With high exposure levels, more than one person who is classified as an occupationally exposed worker may need to be enlisted to aid with the initial decontamination procedure, thus limiting exposure to any one individual. This should be done under the supervision of the Radiation Safety Officer.

5. Using protective clothing, footwear, and gloves, start decontamination procedures. Working quickly yet carefully, absorb all liquid and place in a plastic bag. Tape shut and place in another bag to further prevent further contamination. Tape the second bag, label, and store in a shielded area. This procedure will remove much of the radioactivity, allowing the decontamination to proceed at a slower, more deliberate pace. One person should remain uncontaminated to transfer waste as needed and to operate survey instruments.

AREA DECONTAMINATION-LOW LEVEL EXPOSURE

1. With a GM survey meter, either directly or using wipes of areas of suspected contamination, accurately demarcate the contaminated area. Mark the area with tape. Cover the surrounding clean area to help prevent accidental tracking of contamination. Start at the outside of the contaminated area and clean toward the center, using detergent and small amounts of liquid. Absorb contaminated liquid with paper towels and place in a marked waste bag. Abrasive powder and a scrub brush may be used to remove persistent contamination. Contaminated wax on tiles may be removed with a strong wax remover. Check frequently with a GM survey meter to determine when an area is below twice background. If another person is not available to help with surveying, remember to change gloves before operating the survey meter. A disposable glove placed over the GM tube will help prevent accidental contamination.

2. When the entire area is thought to be decontaminated, survey thoroughly by obtaining wipes to be checked with the GM survey meter. If no contamination above twice background is present, remove marking tape and place in waste.

3. Survey protective clothing and place in storage or waste if contaminated. Check for personal contamination and proceed with personal decontamination procedures if necessary.

4. Remove all contaminated waste to the waste storage area.

5. Develop ways in which a repeat of the incident may be prevented.

If contamination cannot be reduced to twice background by cleaning procedures, area of low-level contamination will be covered with paper or plastic and lead sheet (as necessary), and the radioactive contamination allowed to decay. These areas will be clearly labeled and checked with a GM survey meter after an appropriate time has elapsed.

PERSONNEL DECONTAMINATION

Everyone who may have been contaminated during a spill or area decontamination procedure must be checked for personal contamination before leaving the area. A GM survey meter may be used for this purpose.

1. Check clothing and belongings for contamination. Remove contaminated articles and determine the extent of skin contamination.

2. Local areas of skin contamination may be decontaminated by spot cleaning. Adjacent areas of uncontaminated skin may be covered with plastic and taped to prevent spread of contamination. Wash the skin thoroughly with soap or mild detergent and tepid water, scrubbing gently with a brush and rinsing frequently.

3. If skin contamination is extensive, a thorough shower is necessary. Clean hair, hands and fingernails carefully. Cut contaminated hair and fingernails if necessary.

4. If residual contamination exists, remove by further spot cleaning, using the following methods. Avoid the prolonged use of any one method. Repeated ineffective decontamination techniques may only irritate the skin, hampering further techniques and increasing absorption of radioactivity through the skin.

   A. Preparations using water, by increasing strength:

      1) Soap.

      2) Abrasive soap.

      3) Commercial detergents.

      4) Chelating agent.

      5) Complexing agent (e.g. 1% citric acid) should be applied under medical supervision because of potential injury to skin surface.

   B. Preparations without water:

      1) Cornmeal and powdered detergent in equal parts, applied as a paste and gently scrubbed on skin surface. Remove paste with paper tissue.

      2) Strong cleansing hand cream, gently scrubbed on skin surface and removed with paper tissue.

      3) Cream of 4% Carbose, 3% Versene, 8% commercial detergent, and water, gently scrubbed on skin surface and rinsed thoroughly.

   C. Persistant contamination may also be removed by perspiration. Wrap the area in plastic or rubber or cover with gloves. Tape securely. After one or two hours remove carefully to prevent recontamination (e.g. turn gloves inside out).

   Following skin decontamination procedures, apply lanolin-based cream to offset local irritations.

Item 20: Therapeutic Use of Sealed Sources

A. The area where the sealed Cs-137 will be stored, including the proximity of the storage area to unrestricted areas, is shown in an attached sketch. The Cs-137 storage room is a restricted area located in the basement of the Medical X-Ray Center. The shielding thickness of the storage safe and calculations used to check the adequacy of the shielding appears on a separate attached sheet. The calculations show that the radiation levels in unrestricted areas will conform to paragraphs 20.105 (B) (1) and (B) (2) of 10 CFR Part 20.

B. Special precautions to be used while handling sealed sources:

1. Transfer of sources from lead storage containers to lead transporting container (described in part d of item 20) will be performed with a two inch lead wall placed between the sources and the radiotherapist.

2. Physical transfer of sources between storage and transport container or patient and transport container will be done using tongs to avoid hand contact and reduce exposure to hands.

3. Gloves will be worn to avoid skin contamination in case of accidental contact with hands.

4. The sources will remain unshielded only during these transfer procedures and only for the minimum time necessary to complete the transfers.

C. A ring badge containing one thermoluminescent dosimeter will be worn by the radiotherapist during all source transfer and afterloading procedures. The dosimeter is changed and read monthly. This service is provided by R. S. Landauer, Jr. & Co. of Glenwood, Illinois.

D. A lead-lined transport container will be used to transport the Cs-137 sources between the storage site and the place of use. This container was manufacturered by the Radium Chemical Co., Inc. of New York, NY, and is designed for the transport of Ra-226 needles. The container is lined with one inch of lead and is equipped with a 14 inch handle, so the container may be carried approximately 1.5 feet below waist level. The transport container will be kept locked while sources are being transported.

E. Method for maintaining source accountability at all times:

1. Personnel removing Cs-137 sources from the storage room at the Medical X-Ray Center for any purpose will enter all applicable data on the source accountability chart (attached).

2. All sources will be accounted for by the radiotherapist immediately after removal from the patient (before leaving the patient's room) and before replacing sources in the storage safe at the Medical X-Ray Center. Sources will then be "signed in" on the source accountability chart by the radiotherapist after they have been replaced in the storage safe.

3. Sources will be returned to storage immediately following the conclusion of treatment.

4. The radiation safety officer will conduct a source inventory every 3 months.

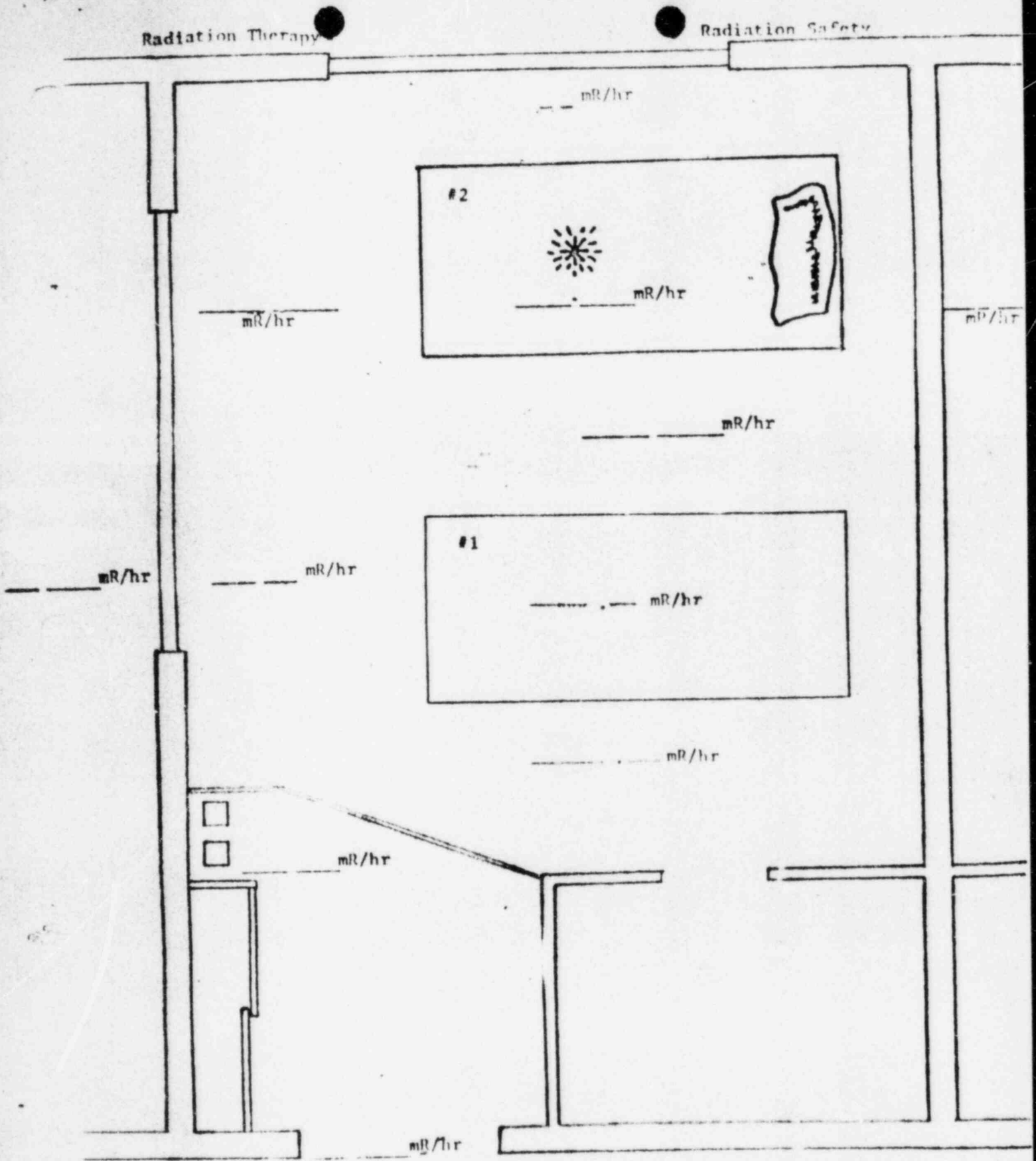
F. A radiation protection survey of the patient's hospital room and neighboring rooms will be performed as soon as possible after the ^{137}Cs sources are implanted in the patient. Attached are data sheets which will be used to record data from this survey. The survey will include measurements of the exposure rates at 3 feet (or 1 m) from the patient, at 3 feet (or 1 m) from the bedside, at the bedside, and at the entrance to the room. The room will then be posted in accordance with section 20.203 or 20.204 of 10 CFR Part 20. These exposure rates and the times a person may remain at these positions will be posted on the patient's chart.

Following removal of all ^{137}Cs sources from the patient, a second radiation protection survey will be performed before the patient is released from the hospital to assure all sources have been removed. The results of this survey will be noted in the patient's chart. Upon completion of this final survey, all radiation signs will be removed.

These radiation protection surveys will be performed using a "Cutie Pie" survey meter (Victoreen model 740-F) calibrated to within ±10% as our present license requires. Also available is a low-level GM survey meter (Victoreen model 490).

Radioactive Source Accountability Chart

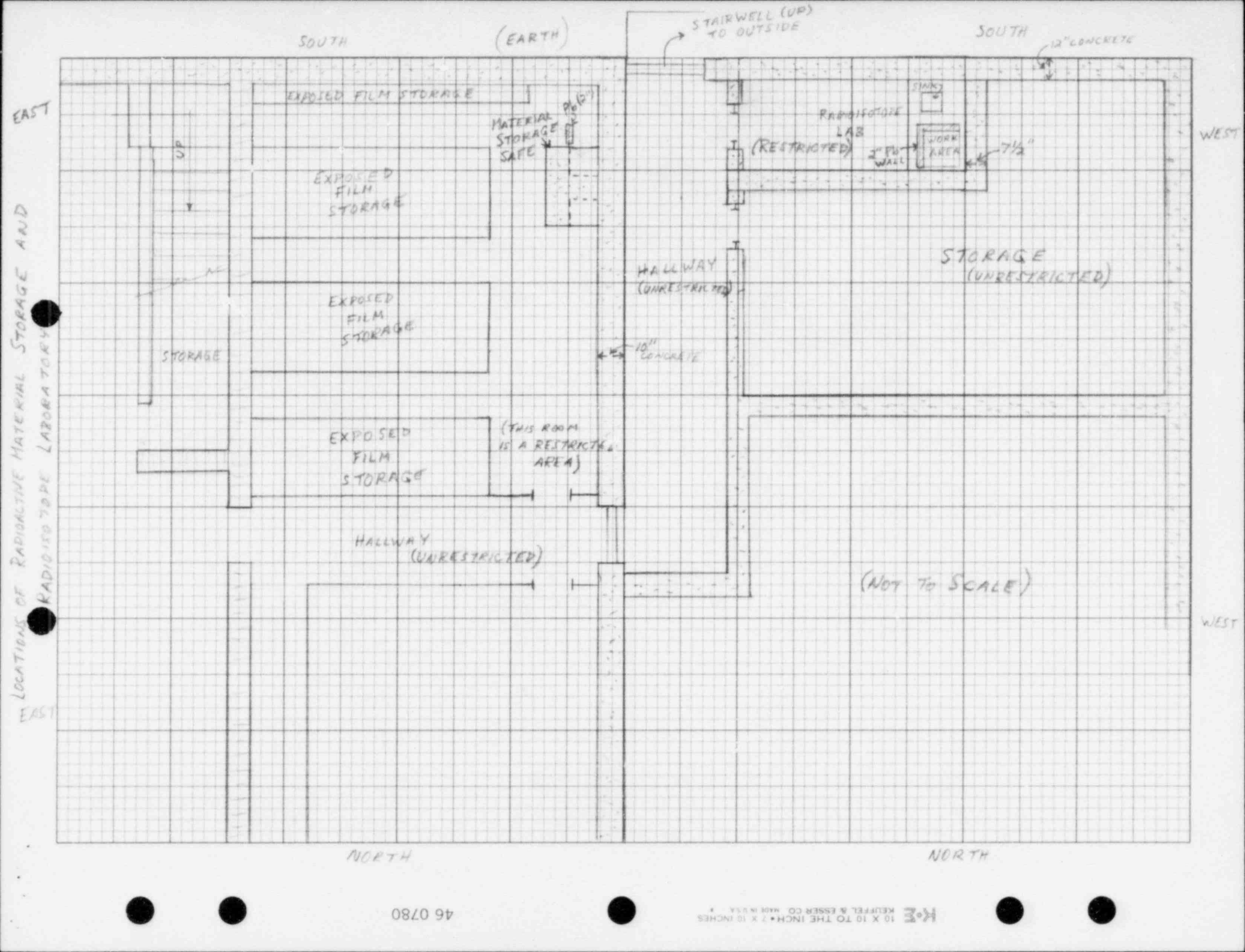
Identification of source(s) Removed	Date Removed	Location	Purposes	Expected Return Date	Date Returned



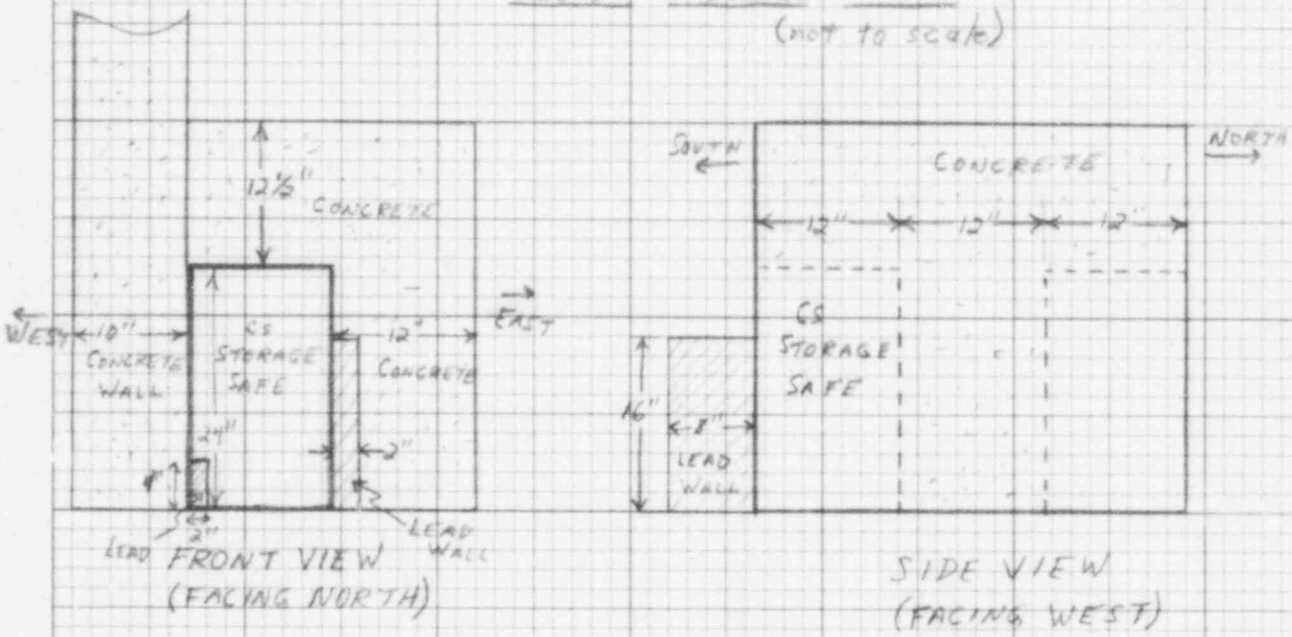
PATIENT NAME _____ DATE _____ #2 PATIENT NAME _____

HOSPITAL # _____ ROOM# _____ HOSPITAL # _____

08654



DETAIL #1
CESIUM STORAGE SAFE
(NOT TO SCALE)



EXPOSURE RATE CALCULATIONS

DIRECTION	SHIELDING THICKNESS[1] (cm) LEAD	CONCRETE	TOTAL FRACTIONAL TRANSMISSION[2]	DISTANCE[3] (cm)	SURFACE EXPOSURE RATE (mR/hr)[4]
UP	3.2	32	6×10^{-4}	90	0.1
NORTH	2.54	30.5	1.3×10^{-3}	76	0.4
EAST	2.54	30.5	1.3×10^{-3}	46	1.0
WEST	7.6	25.4	1.2×10^{-5}	41	0.012 (UNRESTRICTED AREA)
SOUTHEAST (~45°)	9.7	—	2.5×10^{-5}	28	0.05

1 Shielding thickness includes 2.54 cm lead from storage "pigs" in which the Cesium sources will reside.

2 Data from NCRP 49 (appendix D) $T_{total} = T_{Pb} \times T_{CONCRETE}$

3 Approximate distance from sources to exterior surface of safe.

4 Theoretical exposure rate (X) at surface of storage safe using this equation: $X = \frac{\Gamma \cdot A \cdot T_{total}}{d^2} = \frac{3.3 \frac{R\,cm^2}{hr\,mCi} \cdot 500\,mCi \cdot T}{d(cm)^2}$.