NRC FORM 313M
(9-81)
10 CFR 35

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIALS LICENSE – MEDICAL

Approved by OMB
3150-0041

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

VETERANS ADMINISTRATION MEDICAL CENTER
Hot Springs, SD 57747

TELEPHONE NO.: AREA CODE (605) 745 4101

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

Brian F. Langley CNMT RT (N)BS

TELEPHONE NO.: AREA CODE (605) 745 4101

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

a. ☐ NEW LICENSE
b. ☐ AMENDMENT TO LICENSE NO.
c. ☒ RENEWAL OF LICENSE NO. 40-16087-01

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

Jan K. Pieczka, M.D.
M.G. Norris, M.D.
James R. Schuft, M.D.

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

Brian F. Langley CNMT RT(N)BS

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	3 mCi
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	
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		

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	500 mCi

6.b. RADIOACTIVE MATERIAL FOR USES NOT LISTED IN ITEM 6.a. *(Sealed sources up to 3 mCi used for calibration and reference standards are authorized under Section 35.14(d), 10 CFR Part 35, and NEED NOT BE LISTED.)*

ELEMENT AND MASS NUMBER	CHEMICAL AND/OR PHYSICAL FORM	MAXIMUM NUMBER OF MILLICURIES OF EACH FORM	DESCRIBE PURPOSE OF USE

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. 1 Date: October 1980

7. MEDICAL ISOTOPES COMMITTEE	
	Names and Specialties Attached; and
X	Duties as in Appendix B; or *(Check One)*
	Equivalent Duties Attached
8. TRAINING AND EXPERIENCE	
	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 plus attached
	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
	Equivalent Procedures Attached
20. THERAPEUTIC USE OF SEALED SOURCES	
	Detailed Information Attached; and
	Appendix L Procedures Followed; or *(Check One)*
	Equivalent Procedures Attached
21. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE GASES (e.g., Xenon – 133)	
X	Detailed Information Attached
22. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL IN ANIMALS	
	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		FILM	Siemens	Monthly
		TLD		
		OTHER (Specify)		
b. FINGER		FILM		
		TLD	Siemens	Monthly
		OTHER (Specify)		
c. WRIST		FILM	Siemens	Monthly
		TLD		
		OTHER (Specify)		

d. OTHER (Specify)

1. Victoreen personal dosimeter with audible alarm (2 each)
2. Direct reading dosimeters (11) each 200 MR

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:

(2) LICENSE FEE ENCLOSED: $ _____

b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)*

Elizabeth K Reed for

(1) NAME *(Type or Print)*
JAMES S. EXPARZA

(2) TITLE
MEDICAL CENTER DIRECTOR

c. DATE

NRC FORM 313M (9-81)

Veterans Administration

Memorandum

Date: September 10, 1986

From: Chief of Staff (11)

Subj: Radiation Safety Committee

To: Medical Center Director (00)

1. Recommend the following be appointed to subject committee:

Chairperson:	Dr. Pieczka, Acting Chief, Nuclear Medicine
Members:	Radiation Safety Officer - Brian Langley CNMT RT (N) BS
	Radiology Service Designee - Ralph Lillie ARRT
	Nursing Service Designee - Mike Hansen RN
	Surgical Service Designee - Dr. V. Muthusamy, Chief Surgery Service
	Pathology Service Designee - Dr. Richard McDowell, Chief Laboratory Service
	HSRO Coordinator - Jessica Kropuenske RRA
	Safety Officer - Frank Maynard, Acting Safety Officer
	AA/COS - Jerald Ochsner

2. The Committee will meet monthly in accordance with Nuclear Regulatory Commission (NRC) mandates. Minutes will be submitted to the Clinical Executive Board.

CHARLES R. BEESON, MD

APPROVED/DISAPPROVED

JAMES S. EXPARZA
Medical Center Director

VA FORM 2105

NRC FORM 313M SUPPLEMENT A (9-81) — 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
Jan K. Pieczka, M.D.	Michigan, SD, Wyoming

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C
Radiology	--	Dec. 1977

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	Northwestern University Chicago, Illinois	180	20
b. RADIATION PROTECTION	Same	100	20
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	Same	100	40
d. RADIATION BIOLOGY	Same	60	
e. RADIOPHARMACEUTICAL CHEMISTRY	Same	40	40

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

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
Tc-99m	2 Ci	Northwestern University	11 years	
I-131	1 mCi	Chicago, Illinois	11 years	Diagnostic
CR-51	100 mCi	VAMC, Hines, Illinois	3 years	
SE-75	250 uCi	VAMC, Hot Springs, SD	10 years	
CO-57	2 mCi		11 years	Treatment
Hg-197			3 months	
XE-133	20 mCi		3.5 years	
P-32			22 months	
CO-60 -	Teletherapy		22 months	

PRECEPTOR STATEMENT (Continue.

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	1	
	TREATMENT OF HYPERTHYROIDISM	1	
Au-198	INTRACAVITARY TREATMENT	1	
Co-60 or Cs-137	INTERSTITIAL TREATMENT		
	INTRACAVITARY TREATMENT		
I-125 or Ir-192	INTERSTITIAL TREATMENT		
Co-60 or Cs-137	TELETHERAPY TREATMENT	300	
Sr-90	TREATMENT OF EYE DISEASE		
	RADIOPHARMACEUTICAL PREPARATION		
Mo-99/ Tc-99m	GENERATOR		
Sn-113/ In-113m	GENERATOR		
Tc-99m	REAGENT KITS		
Other	P-32 Treatment CR-51 RBC Studies Co-58/60 Intestinal Studies I-131 Brain Tumor Localization I-131 Rose Bengal Liver Cr-51 Spleen Hg-197 Renal Imaging	1 5 3 1 1 2 3	

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

Training 6-72 to 6-74
Experience 6-72 to 6-74
520 Hours plus Radiation Therapy
Experience 7-1-76 to present

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

a. NAME OF SUPERVISOR
James L. Quinn III, M.D.

b. NAME OF INSTITUTION
Northwestern University Med School

c. MAILING ADDRESS
301 East Chicago Avenue

d. CITY
Chicago, Illinois 60611

5. MATERIALS LICENSE NUMBER(S)

6. PRECEPTOR'S SIGNATURE
Deceased

7. PRECEPTOR'S NAME (Please type or print)
James L. Quinn III, M.D.

8. DATE

NRC FORM 313M SUPPLEMENT B
(9-81)

GPO 890-913

NRC FORM 313M SUPPLEMENT B
(9-81)

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

Marvin G. Norris, M.D.

STREET ADDRESS

Veterans Administration Medical Center

CITY	STATE	ZIP CODE
Hot Springs	SD	57747

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	8	
	DETERMINATION OF BLOOD AND BLOOD PLASMA VOLUME	5	
	LIVER FUNCTION STUDIES		
	FAT ABSORPTION STUDIES		
	KIDNEY FUNCTION STUDIES		
	IN VITRO STUDIES	85	
OTHER			
I-125	DETECTION OF THROMBOSIS		
I-131	THYROID IMAGING	6	
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	27	
	CARDIAC IMAGING		
	THYROID IMAGING		
	SALIVARY GLAND IMAGING		
	BLOOD POOL IMAGING		
	PLACENTA LOCALIZATION		
	LIVER AND SPLEEN IMAGING	35	
	LUNG IMAGING		
	BONE IMAGING	16	
OTHER			

The preceptor statement on James R. Schuft, M.D., who has been on our license, has never been forwarded to us. He has been added to our license per your amendment (ref. no. 030-10348).

Since that time Dr. Schuft has transferred to our sister hospital at Fort Meade, SD.

We would still like to keep him on our license as he is still within commuting distance of our facility and we are able to utilize him from time to time.

He was previously listed on license no. 4919237-01 at Carbon County Hospital, Rawlins, Wyoming.

NRC FORM 313M SUPPLEMENT A (9-81) — 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
Brian F. Langley, BS CNMT	

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C
Nuclear Medicine Technology Certification Board	Nuclear	Nov. 1979
AART	Nuclear	May 1978

4. TRAINING RECEIVED IN BASIC RADIOISOTOPE HANDLING TECHNIQUES

FIELD OF TRAINING A	LOCATION AND DATE(S) OF TRAINING B	TYPE AND LENGTH OF TRAINING	
		LECTURE/ LABORATORY COURSES (Hours) C	SUPERVISED LABORATORY EXPERIENCE (Hours) D
a. RADIATION PHYSICS AND INSTRUMENTATION	VA Medical Center 4101 Woolworth Ave. Omaha, NE 68105	30	110
b. RADIATION PROTECTION	Same	30	82
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	Same	30	100
d. RADIATION BIOLOGY	Same	30	65
e. RADIOPHARMACEUTICAL CHEMISTRY	Same	30	75

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

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
MO-99	2 Ci			
TC 99m	1 Ci	VA Medical Center	10 years	Diagnostic
I-131	1 mCi	Hot Springs, SD		
CR-51	100 mCi	57747		
CO-57	2 mCi			
CS-137	2 20 mCi			
CO 60	50 mCi			
(See continuation sheet attached)				

*Person to Contact

A.J. Blotcky MS, RSO/Reactor Lab Supervisor
VA Medical Center, Omaha, Nebraska 68105

Continuation Sheet

Item 5 cont.

BA-133	290 mCi
SE-75	300 mCi
I-125	10 mCi
Xe-133 gas	35 mCi
GA-67	10 mCi
Ytterbium-169	
Tl-201	3 mCi

ATTACHMENTS

ITEM 9

APPENDIX C

INSTRUMENTATION

1. Survey meters

   a. Manufacturer's name: NUCLEAR CHICAGO

   Manufacturer's model number: BASE 9112 METER 9120

   Number of instruments available: 1

   Minimum range: 0 mR/hr to 0.2 mR/hr

   Maximum range: 0 mR/hr to 200 mR/hr

   b. Manufacturer's name: REACTOR EXPERIMENTS

   Manufacturer's model number: DIGIMASTER MODEL 801

   Number of instruments available: 1

   Minimum range: 0 mR/hr to 100 mR/hr

   Maximum range: 0 mR/hr to 100 ~~mR/hr~~ R/HR

2. Dose calibrator

   Manufacturer's name: RADX

   Manufacturer's model number: MELETRON WITH AUTOMATIC DATA PRINTER

   Number of instruments available: 1

   (Second dose calibrator is a Squibb CRC 6 A)

3. Instruments used for diagnostic procedures

Type of Instrument	Manufacturer's Name	Model No.
GAMMA CAMERA	SIEMENS	ZLC 750
GAMMA CAMERA	SEARLE	LFOV
GAMMA COUNTER	KALLESTAD	HYDRAGAMMA 16
GAMMA COUNTER	BECKMAN	BIOGAMMA 2
THYROID UPTAKE SYSTEM	ADC MEDICAL	111 S2

4. Other (e.g., liquid scintillation counter, area monitor, velometer)

ITEM 10

CALIBRATION OF SURVEY INSTRUMENTS

Check appropriate items.

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

__X__ 2. Calibration will be performed at two points on each scale used for radiation protection purposes, i.e., at least up to 1 R/hr.

The two points will be approximately 1/3 and 2/3 of full scale. A survey instrument may be considered properly calibrated when the instrument readings are within ± 10 percent of the calculated or known values for each point checked. Readings within ± 20 percent are considered acceptable if a calibration chart, graph, or response factor is prepared, attached to the instrument, and used to interpret readings to within ± 10 percent. Also, when higher scales are not checked or calibrated, an appropriate precautionary note will be posted on the instrument.

3. Survey instruments will be calibrated

_____ a. By the manufacturer

_____ b. At the licensee's facility

(1) Calibration source

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

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

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

__X__ c. By a consultant or outside firm

(1) Name A.J. Blotcky, MS

(2) Location Veterans Administration Medical Center, Omaha, Nebraska

(3) Procedures and sources

__X__ have been approved by NRC and are on file in License No. 26-00138-10

_____ have been approved by an Agreement State; a copy of the Agreement State license, the procedures, and a description of the sources are attached, and the consultant's report will contain the information on

_____ the attached "Certificate of Instrument Calibration."
_____ the consultant's reporting form as attached.

_____ are described in the attachment, and the consultant's report will contain the information on

_____ the attached "Certificate of Instrument Calibration."
_____ the consultant's reporting form as attached.

ITEM 11

CALIBRATION OF DOSE CALIBRATOR

A. Sources Used for Linearity Test

(Check as appropriate)

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

or

__X__ Other* (specify) Calicheck Device

B. Sources Used for Instrument Accuracy and Constancy Tests

Radionuclide	Suggested Activity (mCi)	Activity (mCi)	Accuracy	
Co-57	3-5	.841 mCi		Charts enclosed
Ba-133	0.1-0.5	290 uCi		
Cs-137	0.1-0.2	199 uCi		
Ra-226	1-2			
Co-60		50 uCi		

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

or

_____ Equivalent procedures are attached.

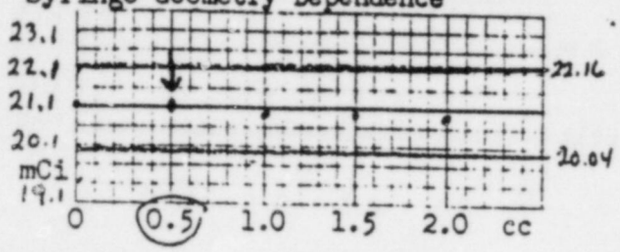
*For licensees who are not authorized for Mo-99/Tc-99m generators, activity must be equivalent to the highest activity used.

No correction factor required for either syringe or vial

Dose Calibrator Geometry and Accuracy

Manufacturer: CAPINTEC Model: CRC 6A S/N: 652 55826 (CRC)

Syringe Geometry Dependence



Vial Geometry Dependence

Date: 4.22.86 Name: B. Caughey CRMS RSO

Accuracy Sources 1986 19__

.290 mCi of ^{133}Ba Model: NEN E-VIAL S/N: 3580479A-02 Calibration date: 4/4/79	first assay: .189 mCi second assay: .189 mCi third assay: .189 mCi average: .189 mCi .182 (.173 - .191)	first assay: ____ mCi second assay: ____ mCi third assay: ____ mCi average: ____ mCi
.199 mCi of ^{137}Cs Model: NEN E-VIAL S/N: 3560180A-50 Calibration date: 1/25/80	first assay: .191 mCi * second assay: .190 mCi third assay: .191 mCi average: .1903 mCi .172 (.1634 - .1806)	first assay: ____ mCi second assay: ____ mCi third assay: ____ mCi average: ____ mCi
.050 mCi of ^{60}Co Model: NEN E-VIAL S/N: 3540579A-49 Calibration date: 5/17/79	first assay: .020 mCi second assay: .020 mCi third assay: .020 mCi average: .020 mCi .020 (.019 - .021)	first assay: ____ mCi second assay: ____ mCi third assay: ____ mCi average: ____ mCi

Name: B. Caughey CRMS

Backup Instrument Date: 4.23-86 RSO

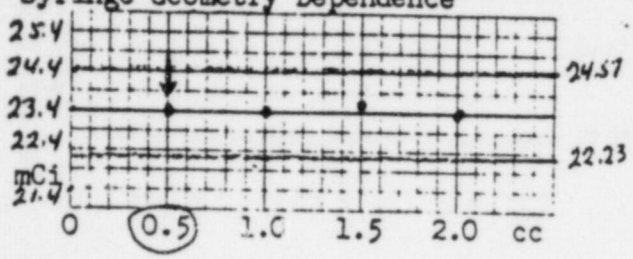
* Manufacturer notified - explained that a new shield needed for CS-137 (Modification)

No correction factor required for either syringe or vial
* We use 10 ml vials.

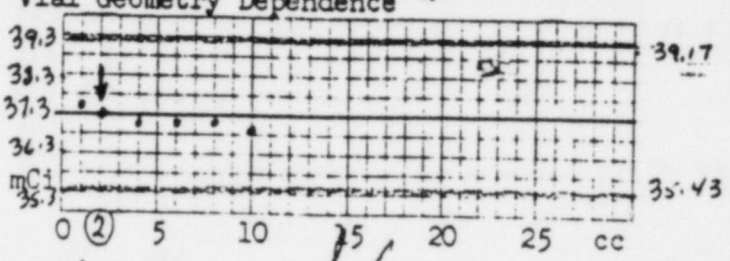
Dose Calibrator Geometry and Accuracy

Manufacturer: Capintec Model: Mellemon S/N: 65255854 (CMR)

Syringe Geometry Dependence



Vial Geometry Dependence *



Date: 4-22-86 Name: P. Langley CHP RSO

Accuracy Sources 1980 19__

.290 mCi of ^{133}Ba Model: NEN E VIAL S/N: 3580479A-02 Calibration date: 4/4/79	first assay: .180 mCi second assay: .179 mCi third assay: .176 mCi average: .1783 mCi .182 (.173 - .191)	first assay: ____ mCi second assay: ____ mCi third assay: ____ mCi average: ____ mCi
.199 mCi of ^{137}Cs Model: NEN E-VIAL S/N: 3560180A-50 Calibration date: 1/25/80	first assay: .174 mCi second assay: .173 mCi third assay: .174 mCi average: .1737 mCi	first assay: ____ mCi second assay: ____ mCi third assay: ____ mCi average: ____ mCi
.050 mCi of ^{60}Co Model: NEN E-VIAL S/N: 3540579A-49 Calibration date: 5/17/79	first assay: .021 mCi second assay: .021 mCi third assay: .021 mCi average: .021 mCi .020 (.019 - .021)	first assay: ____ mCi second assay: ____ mCi third assay: ____ mCi average: ____ mCi

Name: P. Langley CHP RSO

Date: 4-23-86

Primary Instrument

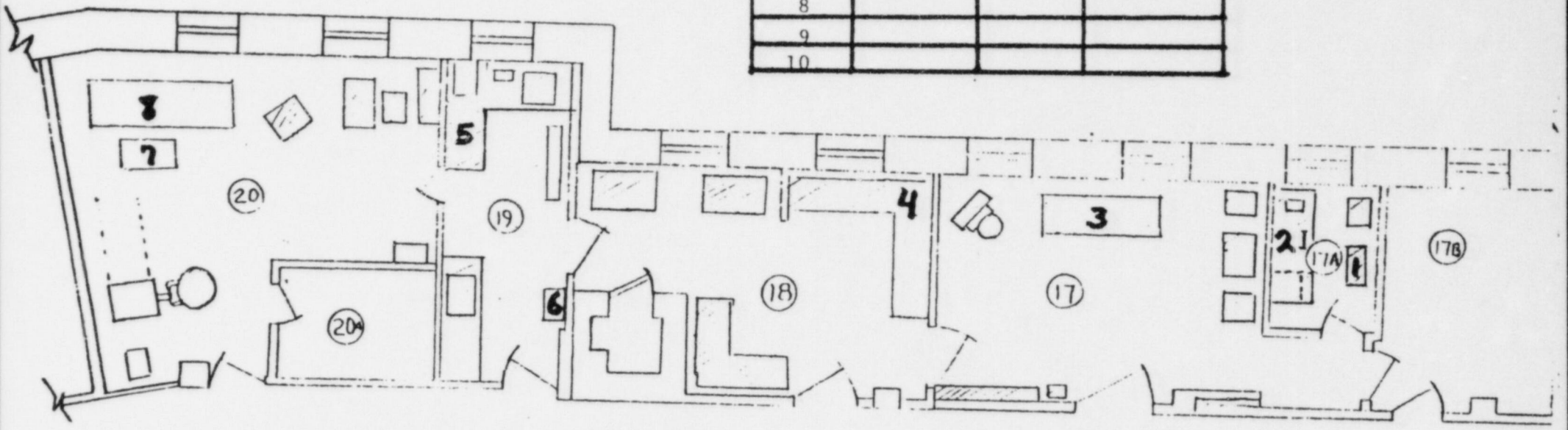
ITEM 11

NUCLEAR MEDICINE AREA
BLDG. 12 GROUND EAST

VETERANS ADMINISTRATION MEDICAL CENTER
HOT SPRINGS, SOUTH DAKOTA

AREA #	GROSS CPM	NET CPM	UCi/100cm^2
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Rm. 20 - Patient Imaging Room
Rm. 19 - Patient Injection Area
Rm. 18 - Office/RIA Lab
Rm. 17 - Patient Imaging Area
Rm. 17A - Lead Lined Isotope Storage Area
Rm. 17B - Physicians Office



SEALED SOURCES				
S/N or ID	SOURCE	GROSS CPM	NET CPM	UCi/100cm^2

DATE: _____

SIGNATURE: _____

INSTRUMENT: _____

INSTRUMENT EFFICIENCY: _____

INSTRUMENT BACKGROUND: _____

INSTRUMENT SETTINGS: _____

CALCULATIONS:

$$\text{NET DPM} = \frac{\text{NET CPM}}{\text{EFFICIENCY}} \qquad \text{UCi/100cm}^2 = \frac{\text{NET DPM}}{2.2 \times 10^6}$$

Veterans Administration

Item 12 Personnel Training Program

Radiation protection training will be conducted as outlined in NUREG - 1134 "Radiation Protection Training for Personnel Employed in Medical Facilities," for all ancillary personnel who work in the Nuclear Medicine area on an occasional basis. This is to include housekeeping personnel, security personnel, secretaries and occasional workers who have cause to be in the Nuclear Medicine area.

Audio-visual material has been put together by the Nuclear Medicine staff for Nursing Service in regard to working with patients who have received radiopharmaceuticals. Nursing personnel are required to review the material on a periodical basis as part of their continuing educational requirements.

Nuclear Medicine staff conduct periodic in-service sessions for themselves to include radiation protection subjects.

In Reply Refer To:

VETERANS ADMINISTRATION MEDICAL CENTER
Hot Springs, South Dakota 57747

MEDICAL CENTER POLICY 115-1
August 1985

NUCLEAR MEDICINE SERVICE

1. Purpose: To establish policy and procedure for Nuclear Medicine Service.

2. Policy:

a. Nuclear Medicine Service provides diagnostic services to hospital and domiciliary patients as authorized by Nuclear Regulatory Commission (NRC). A supplemental listing of diagnostic procedures has been furnished to the professional staff.

b. Radionuclides will be given to outpatient hospital and domiciliary patients under the direct supervision of the Acting Chief, Nuclear Medicine Service, or designee. Radionuclides will be procured and used in strict accordance with conditions stated in the NRC license issued to this Medical Center.

3. Responsibility:

a. Acting Chief, Nuclear Medicine Service provides diagnostic services and other functions related to nuclear medicine.

b. Staff physicians are responsible for requesting diagnostic consultations.

c. Chief, Supply Service, or designee, is responsible for procurement and delivery of radioactive material.

4. Procedures:

a. On the ward, staff physicians will write orders for consultation indicating brief history, pertinent diagnosis, and reason for consult. If a blood volume study is required, Nuclear Medicine Service should be notified at least four (4) days in advance so material can be ordered to perform the test. In addition, a pancreas scan should be ordered a week in advance; a gallium scan should be ordered a week in advance; and ^{131}I thyroid study ordered four (4) days in advance.

b. The ward clerk will prepare SF 513 Consultation Sheet (Consult will be made out to: Acting Chief, Nuclear Medicine (115). Consultation Sheet should be stamped with patient's I.D. and completed with all information requested.

c. In order to provide more efficient service with proper controls and administration of use of radioactive material, the following routing plans have been designed to expedite procurement and insure safe delivery of such material to all users approved by NRC:

(2) Delivery of Parcels

(a) Normal duty hours - Parcels will be delivered to Nuclear Medicine Service by warehouse and signed for by authorized personnel. All parcels are to be checked through warehouse first.

(b) Off-duty hours - All parcels are to be delivered by Medical Center Police Officer to Nuclear Medicine laboratory and will be placed on the fl in Room 17A, Isotope Storage Room.

If parcel is labeled "To Be Refrigerated" it is to be placed in large upright household refrigerator in nuclear medicine room. If parcel is too large to be refrigerated, it can be opened and checked for smaller parcel or parcels inside. These can be removed, inspected for refrigeration and placed in appropriate place.

Unless specifically labeled or instructed, parcels are not to be placed in freezer compartment of refrigerator.

No parcels containing radioactive material will be stored in any other area of the hospital without prior consent of Acting Chief, Nuclear Medicine Service, or Radiation Safety Officer or designee.

Warehouse personnel will be notified of delivery first workday immediately following date of receipt.

(c) Any questions or problems regarding parcels containing radioactive material should be directed to:

Nuclear Medicine Technologist	Ext. 325 (office) 348-2218 (home)
Acting Chief, Nuclear Medicine Service	Ext. 351 (office) 745-6602 (home)

(d) Parcels with a radioactive label II or III (two or three) should be transported to Nuclear Medicine in a cart or wheelchair from the point of delivery. Parcels in these categories should not be hand carried to their point of designation. Parcels will be plainly labeled on the side of each radioactivity package with an appropriate label.

Radioactive packages for delivery labeled I (one) can be hand-carried to the department.

5. Reference: M-2, Part XX, Title 10, Part 20 and Part 30, Code of Federal Regulations and NRC License No. 40-16087.
6. Date of complete reissuance - August 1988
7. Rescission: Center Policy 115-1, dated June 1982
8. Follow-up Responsibility: Acting Chief, Nuclear Medicine Svc (115)

JAMES S. EXPARZA
Medical Center Director

ITEM 16

VETERANS ADMINISTRATION MEDICAL CENTER
Hot Springs, South Dakota 57747

MEDICAL CENTER POLICY 115-2
August 1985

RADIATION EMERGENCY PLAN

1. Purpose: To establish guidelines in the management of radioactive contamination of personnel, equipment or environment at this facility.

2. Policy:

a. All persons involved in handling radioactive material will be knowledgeable of the principles of unnecessary radiation exposure.

b. In all instances where a hospital or domiciliary patient, staff member or citizen of the community is suspected of being involved in contamination by direct or indirect exposure to radioactive material, immediate action will be implemented by Nuclear Medicine Service.

3. Definitions:

a. A radiation emergency exists when one or more staff members, patients or members of the community are accidentally exposed to radiation in excess of those limits established for therapeutic purposes.

b. Plan I is the procedure to be followed if there are two or less radiation victims.

4. Responsibility:

a. Chief, Nuclear Medicine Service, will assume responsibility for the management of emergencies arising within this facility or if citizens of the community are directed to this facility with radiation exposure.

b. In the absence of Chief, Nuclear Medicine Service, the Radiation Safety Officer or his designee will be alerted to provide information to O.D., or Chief of Staff, if after regular duty hours.

5. Procedure:

PLAN I - Radioactive Contamination Accident

A. The Radiation Emergency Alert: Contact O.D., who in turn contacts Chief, Nuclear Medicine Service, or Radiation Safety Officer or Radiation Safety Officer's designee.

Chief, Nuclear Medicine Service: J. K. Pieczka, M.D., ext. 351 or 325 during working hours. After working hours call 745-6602.

Radiation Safety Officer: A. Blotcky, VAMC, Omaha, NE, 402-346-8800, ext. 3002.

Radiation Safety Officer's designee: Brian Langley, ext. 325 during working hours. After working hours call 348-2218.

When a radiation accident occurs, O.D. should contact the Chief, Nuclear Medicine Service and he, in turn, calls the Radiation Safety Officer or designee and gives the following information:

(1) Location of accident

(2) Number of people involved.

(3) Approximate level and type of contamination on the patient and his clothing, and whether this contamination is reasonably fixed or loose. (Include Protective Equipment recommended for medical personnel). Describe the level of contamination in lay terms, if it is possible.

(4) An estimate of the extent of injury.

B. Emergency Procedures

(1) If routine life-saving maneuvers are necessary, they should be initiated before arrival of radiation experts (e.g., the institution of I.V. fluids, stoppage of acute bleeding, maintaining an airway, etc.)

(2) The patient or patients should be administered to either in the room where the contamination occurred or in the Decontamination area, Room B3, until the level and type of contamination is ascertained.

(3) Support personnel at this state should wear rubber gloves, gowns, and masks until the problem is defined.

(4) As soon as the patient can be moved, he should be taken to Room B3.

(5) If emergency surgery is necessary, he should be taken to the Operating Suite, Room 260.

(6) Radiation monitoring and decontamination equipment is available in Nuclear Medicine and should be used to define the problem.

(7) Further treatment will be directed by the Chief, Nuclear Medicine and/or Radiology Service.

PLAN II - Severe Radiation Accident

This plan is to be activated if more than two accident victims are involved.

A. The Radiation Emergency Alert: Contact O. D., who in turn contacts Chief, Nuclear Medicine Service, or Radiation Safety Officer or Radiation Safety Officer's designee.

Chief, Nuclear Medicine: J. K. Pieczka, M.D., ext. 351 or 325 during working hours. After working hours call 745-6602.

Radiation Safety Officer: A. Blotcky, VAMC, Omaha, NE, 402-346-8800, ext. 3002.

Radiation Safety Officer's designee: Brian Langley, ext. 325 during working hours. After working hours call 348-2218.

When a radiation accident occurs, O.D. should contact the Chief, Nuclear Medicine Service and he, in turn, calls the Radiation Safety Officer or designee and gives the following information:

(1) Location of accident.

(2) Number of people involved.

(3) Approximate level and type of contamination on the patient and his clothing, and whether this contamination is reasonably fixed or loose (including Protective Equipment recommended for medical personnel). Describe the level of contamination in lay terms if it is at all possible.

(4) An estimate of the extent of injury.

B. The person alerted in A above will see to it that the following additional personnel are alerted as he deems necessary:

(1) Hospital Director (ext. 200)

(2) Nursing Supervisor (ext. 314)

(3) Security Officer on duty (ext. 338)

(4) Chief of Security (ext. 338)

(5) Building Management (ext. 256)

(6) Engineering (ext. 230)

(7) Chief of Staff (ext. 250)

C. Responsibilities

(1) Responsibilities of Hospital Director:

(a) Direct overall operations

(b) Contact Chief, Nuclear Medicine, who will coordinate all team efforts.

(c) Notify Nuclear Regulatory Commission
Daytime: 817-466-8100 (Region IV) (see Att B)
Nights and Holidays same

(2) Responsibilities of Nursing Service:

(a) Alert Emergency Staff as to arrival of radiation victims in Room B3.

(b) Assign one specific nurse to assist the Physician.

(c) Physician and nurse to don protective equipment as recommended by Radiation Safety Officer or his designee.

(3) Responsibilities of Security Department:

(a) Officer - Inside

(1) Lay floor signs in the following order inside the door of the DeCon station going out.

(a) Remove protective clothing.

(b) Remove protective footwear.

(c) Check shoes here and street shoes beyond this point.

(2) Put up "Keep Out" radiation barricades in the following areas:

(a) Corridor leading to Room B3.

(b) Corridor leading to Room 260, Surgical Suite

(b) Officer - Outside

(1) Patrol the area where radiation barricades are posted.

(2) If any personnel accidently get into the barricaded (restricted) area, they are to remain there and not leave. The officer will notify by a telephone by the station (DeCon) to inform them that there is a person(s) in the restricted area. UNDER NO CIRCUMSTANCES WILL ANYONE LEAVE OR ENTER THE RESTRICTED AREA UNTIL CLEARED BY THE PERSON IN CHARGE OF THE DECON STATION.

(4) Responsibility of Building Management:

(a) Place 5 gallon cans under sink in Room B3 connecting hoses to sink drain.

(b) Place two large yellow waste containers (stored in Nuclear Medicine) in Room B3.

(c) See that two 55 gallon drums are made available to hold contaminated liquids.

(d) The Chief, Building Management, or his designee, will be responsible for supplying additional material from his department.

(5) Responsibilities of Engineering:

(a) See that the plumbing under the sink in Room B3 is prepared and ready to receive decontamination solutions.

(b) Be available to assist Building Management in areas if needed.

D. Protection of Members of Radiation Emergency Team

(1) Before entering the DeCon Room, B3, all team members will don protective clothing, respiratory protection equipment and dosimeters, when prescribed by Radiation Protection.

(2) Radiation Protection will establish dose rates for team members and limit their whole body exposures to 300 millirem.

(3) If the situation requires greater personnel exposures, hospital personnel will be limited to those maximum exposures permitted radiation workers.

(4) Upon completion of their services, they will remove protective clothing.

(5) They must pass through a monitoring control point before entering clean areas and donning personal clothing.

(6) Follow-up health surveys through Employee Health Service will also be initiated for all members of the team. These surveys would include either a whole body count or urinalysis bioassay when appropriate.

E. Reception of Radiation Casualties

(1) General

(a) Contaminated victims will be met in the room where the contamination occurred and under the direction of the Radiation Safety Officer and will be taken to the DeCon Room, B3.

(b) Other personnel who enter the room after the accident or who have even the remotest chance of being contaminated will remain in this area until released by the Radiation Safety Officer or his designee.

(c) The Admission Physician will evaluate the extent and degree of injury and determine the extent of treatment necessary. Normally, the medical assistance will assume priority over decontamination efforts.

(d) Decontamination procedures will be immediately instituted in DeCon Room. Surgical care can also be given there. Refer to Appendix II for Decontamination Procedures.

(3) Hospital Preparation for Handling Victims Contaminated

Prior to arrival of the victim, the following should be accomplished:

(a) Mobile equipment, unnecessary supplies and records should be removed from Room B3. Cabinets and other bulky equipment should be covered with plastic which will be taped to the floor.

(b) Shut off air conditioning and ventilators insofar as practical. Cover exhaust ducts in Room B3.

(c) Set up sink plumbing for decontamination solution. (See "Responsibilities for Maintenance", Page 4).

(d) Assemble protective clothing, monitoring equipment and decontamination materials. All items are on the radiation cart which will be moved outside the controlled area by Security.

(e) Assign self-reading ionization chambers to team members.

(f) Establish check-out station and post area.

(g) Provide waste containers lined with large plastic bags for contaminated wastes.

(4) Procedure for handling Victims Contaminated

(a) Until released by Radiation Protection, the DeCon Room, B3, will be considered a controlled area once a contaminated person arrives.

(b) Patients will be immediately and directly sent to the DeCon Room, B3, where the Admitting Physician will evaluate the extent and degree of injury, and determine the extent of treatment necessary.

(c) Medical Treatment and decontamination procedures will be immediately instituted in the DeCon Room. Radiation Protection will assist medical personnel as requested. Refer to Appendix II for decontamination procedures.

F. Disposition of Patients

Following decontamination, the patient's condition will be evaluated by a physician who shall determine the need for:

(1) Movement to the operating room or other service areas of the hospital.

(2) Hospitalization (in this instance, the patient will be placed in a private room and in reverse isolation).

(3) Discharge.

(4) The Radiation Safety Officer will approve the movement of all persons from the controlled area. Victims who cannot be adequately decontaminated and cannot be removed from the controlled area because of extensive contamination, will receive all medical treatment in the controlled area.

G. Decontamination of Facilities

(1) A team will decontaminate those hospital areas contaminated.

(2) All contaminated liquids, clothing, dressings, etc., will be placed in suitable containers in the autopsy room for later disposal by the decontamination team.

(3) A survey of the hospital's Radiation Safety Officer will prove satisfactory prior to opening sealed areas for general use.

6. Date of Complete Reissuance: August 1988

7. Rescission: Center Policy 115-2, dated November 1983

8. Follow-up Responsibility: Acting Chief, Nuclear Medicine Service (115)

JAMES S. EXPARZA
Medical Center Director

attachments

VETERANS ADMINISTRATION MEDICAL CENTER
Hot Springs, South Dakota 57747

MEDICAL CENTER POLICY 115-4
March 1986

RADIATION SAFETY FOR EMPLOYEES OUTSIDE NUCLEAR MEDICINE

1. PURPOSE: To provide guidelines for personnel outside Nuclear Medicine concerning radiation safety.

2. POLICY: All efforts will be made to limit employee exposure to ionizing radiation. ALARA concept will be applied.

3. RESPONSIBILITIES: Radiation Safety Officer will be responsible for periodic instruction.

4. PROCEDURE: Employees in regular contact with patients and not employed in Nuclear Medicine Service will be made aware of the following:

a. We have long stressed that radiation exposure to nursing and other staff members is very small. Patients that return to the ward after having a nuclear medicine procedure pose no threat to staff in terms of radiation exposure. We do, however, employ the ALARA concept in regard to radiation safety. The ALARA concept states that all measures should be taken to reduce the level of radiation exposure to "as low as reasonably achievable."

b. With the ALARA concept in mind, we would like to present several simple principles that will reduce radiation exposure. Time, distance, and shielding all play an important role in reducing exposure. Since shielding is not a viable alternative and usually used only when handling high levels of radioactive material, we will address time and distance.

(1) Time - The laws of physics say that the longer one stands in a field of radiation the more radiation exposure one will receive. Hence, any time spent in a field of radiation should be kept at a minimum. Plan ahead the work that needs to be done.

(2) Distance - The laws of physics also say that the closer one stands to a source of radiation the more exposure he will receive. Therefore, avoid close proximity to a radiation source. A distance of three feet is considered an adequate distance to keep to reduce exposure. If you must get close to a patient, plan the work that you need to do to minimize the time doing it.

c. Remember that many of the radiopharmaceuticals that are injected into the patient will be excreted in the urine. No special precautions are needed. Urine can be disposed of into the sewer system as you would any other urine specimen. Gloves should be worn when necessary and good hand-washing is recommended.

d. The isotopes that are used in Nuclear Medicine are administered in low doses and have very short half lives. Ninety-nine per cent of all patients having nuclear medicine procedures will no longer be a source of radioactivity after 24 hours have lapsed.

APPENDIX I

Emergency Cart Supplies (are stored in Room 17 in Nuclear Medicine)

Radiation Material Tags
Cotton Swabs
Filter Paper Swabs
Notebook
Radiation Area Signs
Radiation Label Tape
Rubber Gloves and Aprons in X-ray Dept. - Room C-31
Absorbent Pads
Plastic Gloves
Plastic Bags (small & large)
Boots, spare (2 each)
Meter, radiation, CDV 700 0-50 mr/hr (each) (Digimaster, Texas Nuclear, CDC Survey Meters)
Radiac Wash (1 gal)
Dosimeter 0-20 mr (6 each)
Dosimeter Charger-Reader (1 each)
Books: Basic Radiation Protection Criteria (NCRP Report 39)
Management of Persons Accidentally Contaminated with Radionuclides (NCRP Report 65)

APPENDIX II

DECONTAMINATION PROCEDURES

1. Prevent Spread of Contamination

The Radiation Safety Officer, or his designee, should be called for assistance as soon as possible whenever a spill occurs. The first consideration after personnel safety is to decontaminate. Many factors must be considered, including tracking by persons, movement by air currents (hoods, fans, etc.), water, dusting, mopping, and other physical actions. To confine it, decontaminate the spill from the outside toward the center (see Table I).

2. Make a Plan

Successful decontamination calls for planned action. A spur-of-the-moment action or attempt to decontaminate can do more harm than good. The best thing to do after a spill is to make a thorough plan of the steps to be taken in the decontamination procedure.

3. Monitoring

Make full use of instruments and available assistance. Each step of the decontamination should be monitored. One person should be kept clean to operate the instruments and do other monitoring. When the instruments become contaminated, any progress is hopeless. Protective clothing, footwear, gloves and assault masks should be used as needed.

4. Records

Complete records should be made of each action. Copies should be sent to the Radiation Safety Officer, or his designee. In most cases, the Radiation Safety Officer, or his designee, will be involved so a joint report can be filed.

5. Waste Disposal

Provisions must be made for disposal for cleaning solutions and contaminated articles. In some instances, it may be judged better to dispose of a contaminated article rather than to attempt to decontaminate it.

TABLE I

Contaminated Area	Decontaminating Agent	Remarks	Maximum Permissible Levels of Contamination
Skin and Hands	Mild soap and water	Wash 2-3 min. and monitor Do not wash over 3-4 times.	Alpha 150 dis/min/100 cm^2

TABLE I (CONTINUED)

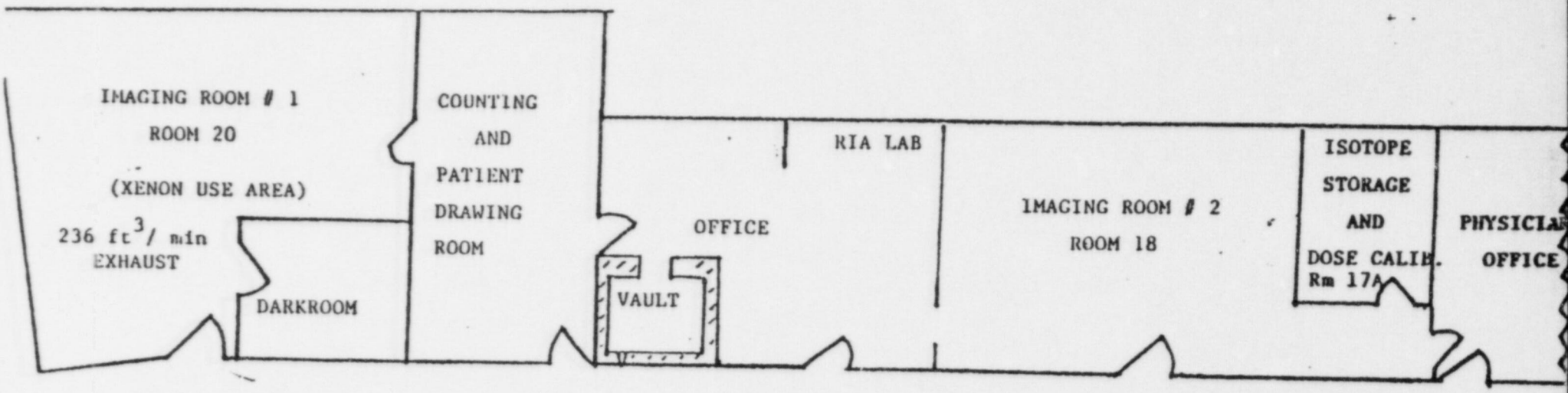
Contaminated Area	Decontaminating Agent	Remarks	Maximum Permissible Levels of Contamination
Skin and Hands (cont'd)	If necessary, follow by soft brush, heavy lather and tepid water.	Use light pressure with heavy lather. Wash 2 min., 3 times. Rinse and monitor. Use care not to scratch or erode the skin. Apply lanolin or hand cream to prevent chapping.	This is approximately ½ the inhalation level in terms of total dis/min/day. 1/5 of this material will be inhaled. Additional possible exposure by ingestion is also considered.
Wounds (cuts and breaks in the skin)	Running tap water. Report to Medical Officer and RSO as soon as possible.	Wash the wound with large volumes of running water immediately (within 15 sec.) Spread the edges of wound to permit flushing action by the water.	Keep wound contamination as low as possible. No MPL can be set.
Injestion by Swallowing	Immediately induce vomiting. Drink large quantities of liquids to dilute the activity.	Urine and fecal analysis will be necessary to determine amount of radionuclies in the body.	

ITEM 21

PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE GASES (Xe-133)

Detailed information attached

NUCLEAR MEDICINE SERVICE AREA



NOTES:

1. Isotope Storage Room 17A is a lead lined room which is used for isotope storage, isotope preparation, and dose calibration. The room contains a lead lined work bench with a sliding lead shield, numerous lead lined drawers for storage of radioactive material, a lead lined sink and numerous lead bricks. The room also contains a refrigerator and a work table along with a radiopharmaceutical quality control analyzer and two calibrated dose calibrators and a survey meter. There is one door and one window in the room. The room contains one incoming air duct and one outgoing duct of greater volume, which is ducted to the outside.

2. The utilization area Room 20 has no windows and two doors. The ventilation system in the room has been modified to create a negative pressure when Xenon is being used.The room also contains a darkroom.One door leads directly to the hallway and the other door to a counting area and patient drawing area.

PROCEDURES AND PRECAUTIONS FOR USE OF XENON - 133

1. Quantities to be Used

   a. Patient Information

      (1) Four (4) studies per week
      (2) Twenty (20) millicuries of Xenon - 133 per patient

   b. Desires possession limit one (1) curie

2. Use and Storage Areas

   a. Use area

      Refer to attached diagram of our Nuclear Medicine Service. The imaging room (Room 20) is the area in which Xenon - 133 will be used. It is 1923 ft^3 and is located in the Nuclear Medicine area on the ground floor of the hospital.

   b. Storage area

      Xenon will be stored in its original container in Room 17A, Isotope storage area, until such time as it is used. At time of use, the dose will be withdrawn from the vial in Room 20, the Xenon use area. The complete amount will be withdrawn and entered into the Xenon delivery system. All systems will be turned on before withdrawing the dose to insure proper exhaust inthe room. Only unit dose vials will be used for each patient, one (1) vial per patient dose.

   c. Ventilation

      (1) Use area (Room 20)

         The ventilation system is designed to create a negative pressure in the room. When the ventilation system is activated, dampers shut off all supply air and the exhaust fan exhausts at the rate of 236 ft^3 / min.

      (2) Storage area

         The isotope storage Room (17A) is vented to the outside with a negative pressure created in the room. The room is 611 ft^3 with an exhaust rate of 300 ft^3/min. and an air supply of 90 ft^3 / min.

3. Procedures for Routine Use

   a. Face masks will be used to prevent loss of Xenon - 133 gas during the patient study.

4. Emergency Procedures

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

a. Camera Room (Room 20)

Discontinue administration to the patient and assure that all Xenon has been washed out of patient. Remove the patient from the room and all other individuals. Turn on the Xenon trap and make sure all doors are closed and the hallway door locked. The room will not be reopened until there has been a minimum of 10 complete room air changes. The current exhaust system provides over 7 complete air changes per hour.

b. Isotope Storage area (Room 17A)

The room will be evacuated and the door closed and locked. The room will not be reopened until there has been a minimum of 10 complete room air changes. The current exhaust system provides 30 complete room air changes per hour. Neither room will be reopened for use until the radiation level at the floor in the room, as determined by a Digimaster survey meter, is less than 0.1 MR/HR (essentially background) and the Gamma Camera background count has returned to normal.

5. Air Concentration of Xenon - 133 Gas in Restricted Areas

a. Isotope Use Area (Room 20) - Assumptions

The unit dose vials are sealed with rubber stoppers and crimped aluminum closures and are not prone to leakage. However, it will be assumed that there will be a 0.5% loss in the Xenon Dispenser loading procedure. For the purposes of calculating, a 20% escape fraction will be used as a more realistic loss when dealing with older patients who may not be cooperative.

b. Calculations

(1) Use Rate (A)

80 MCi/wk = 80,000 uCi/wk

(2) Loss Rate (f)

0.5 per cent

(3) Total Loss (A x f)

80,000 x 0.005 = 400 uCi/wk

Air Flow Rate (V) = 236 ft^3 /min.
= 236 ft^3 /min. x 60 min. x 40 hr.
= 5.66×10^5 ft^3 /wk.
= 5.66×10^5 ft^3 /wk. x 2.832×10^4 ml/ft^3
= 1.603×10^{10} ml/wk

Average concentration (C)

$$C = \frac{A \times f}{V} = \frac{400\,\mu Ci/wk}{1.603 \times 10^{10}\ ml/wk} = 2.50 \times 10^{-8}\,\mu Ci/ml$$

c. Use Area (Room 20) Assumptions

(1) The Ventil-Con II is reported by Radx to lose approximately 1% per day by diffusion through membranes and the Ventil-Con II is normally loaded with 50 millicuries of Xenon Xe133 Gas.

(2) One out of 20 patients will disconnect from the administration apparatus and exhale entire lung contents into the room.

(3) The Radx Xenon Trap activates a warning system when the concentration in the exhaust port exceeds $1 \times 10^{-2}\,\mu Ci/ml$. It is assumed for this calculation that the exhaust concentration is at this level for the washout period of each patient. The trap pumps at the rate of 5 liters/minute, and the average washout time is 10 minutes.

It should be emphasized that this is a maximum figure and that the dynamics of Xenon - 133 absorption 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.

d. Calculations

Ventil-Con II -

(1) Use Rate (A) = 50,000μCi in System
(2) Loss Rate (f) = 1 percent per day
(3) Total loss (A x f) = 50,000μCi x 0.01 x 5
= 2,500μCi/wk

Patients -

(1) Use Rate (A) = 20,000μCi/patient x 4 patients/week
(2) Loss Rate (f) = 5 percent of patient doses
(3) Total Loss (A x f) = 20,000μCi x 4 patients/week x 0.05/patients
= 4000μCi/wk

Xenon Trap -

(1) Use Rate (A) = 4 patients/week
(2) Loss Rate (f) = 5×10^3 ml/min. x 10 min. x ($1 \times 10^2\,\mu Ci/ml$)/patient

(3) Total Loss (A x f) = 4 patient/week x [5 x 10^3 ml/min x 10 min x (1 x 10^{-2} μCi/ml)/patient]

= 2000 μCi/wk

Total Loss $(A \times f)_t$

$(A \times f)_t$ = 2500 μCi/wk
4000 μCi/wk
2000 μCi/wk
Total 8500 μCi/wk

Air Flow Rate (V): 236 ft^3/min

V = 236 ft^3 /min. x 2.832 x 10^4 x 60 min./hr x 40 hr/wk
= 1.604 x 10^{10} ml/wk

Average Concentration (C):

$$C = \frac{(A \times f)}{V}t = \frac{8500\ \mu Ci/wk}{1.604 \times 10^{10}\ ml/wk} = 5.30 \times 10^{-7}\ \mu Ci/ml$$

The Use Area (Room 20) is below the Maximum Permissible Concentration (MPC) limit of 1.5 x 10^{-5} μCi/ml for a restricted area as set forth in Section 20.103 of 10 CFR Part 20.

6. Methods of Xenon - 133 Disposal

a. Concentration in Unrestricted Areas

The Xenon - 133 lost into the Use Area (Room 20) as described in Items 5b and 5d respectively, will be exhausted into the atmosphere through a vent in the side of the wall of Room 20 to the outside which is an unrestricted area.

(1) Xenon - 133 - Exhausted to the atmosphere - Contribution (f) from:

Use Area - preparation (Room 20)

f = 400 μCi/wk x 52 wk = 2.08 x 10^4 μCi/yr

Ventil-Con II

f = 2,500 μCi/wk x 52 wk = 13.0 x 10^4 μCi/yr

Patient disconnections

f = 4,000 μCi/wk x 52 wk = 20.8 x 10^4 μCi/yr

Xenon trap

f = 2000 μCi/wk x 52 wk = 104 x 10^4 μCi/yr

Total Contribution (f_t):

$f_t = 2.08 \times 10^4 \mu Ci/yr$
$13.00 \times 10^4 \mu Ci/yr$
$20.80 \times 10^4 \mu Ci/yr$
$10.40 \times 10^4 \mu Ci/yr$
$46.28 \times 10^4 \mu Ci/yr$
$= 4.63 \times 10^5 \mu Ci/yr$

(2) Air Flow Exhaust Rate (Use Area - Room 20)

$V_t = 236\ ft^3/min$

$V_t = 236\ ft^3/min \times 2.832 \times 10^4\ ml/ft^3 \times 60\ min/hr \times 24\ hr/d \times 365\ d/yr$
$= 3.51 \times 10^{12}\ ml/yr$

(3) Average Concentration (C)

$$C = \frac{f_r}{V_t} = \frac{4.63 \times 10^5 \mu Ci/yr}{3.51 \times 10^{12} \mu Ci/yr} = 1.32 \times 10^{-7} \mu Ci/ml$$

The Unrestricted Area is below the MPC limit of $3 \times 10^{-7} \mu$ Ci/ml as set forth in Section 20.106 of the 10 CFR Part 20.

b. Absorption onto Charcoal Traps

(1) 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 $1 \times 10^{-2} \mu$Ci/ml. The exhaust will empty into the Use Room (Room 20) and has been considered in previous calculations.

(2) Saturated filter cartridges will be plugged and placed in storage behind a minimum of 0.25 inch (6 mm) lead shielding in the Isotope Storage Room (Room 17A) in the lead lined work station storage cabinet for a period of not less than 20 half-lives. Since the cartridge is plugged and completely sealed, it is not anticipated that it will contribute to the Xenon - 133 air concentration.

(3) The alarm system on the Radx Xenon Trap will be calibrated, and then tested for proper operation weekly, using the following procedure supplied by the manufacturer.

Alarm Calibration

1. Locate the alarm check point label located on the left hand door.

2. Using a Cesium Cs 137 standard between 40 and 150 μCi the alarm is calibrated as follows:

Calculate the activation distance of the Cesium Cs 137 standard by using the following formula:

$$\text{Activation Distance (AD)} = [\sqrt{3.3 \times \text{Cs} - 137 \text{ STD}\mu\text{Ci}}] - 7$$

Example: Cesium Cs 137 STD is 50μCi

$$\begin{aligned} \text{AD} &= [\sqrt{3.3 \times 50}] - 7 \\ &= [\sqrt{165}] - 7 \\ &= 12.8 - 7 \\ &= 5.8 \text{ cm.} \end{aligned}$$

3. Place the center of the Cesium Cs 137 standard at the AD calculated above by placing a ruler perpendicular to the alarm check point.

   The alarm should activate within the following acceptance limits:

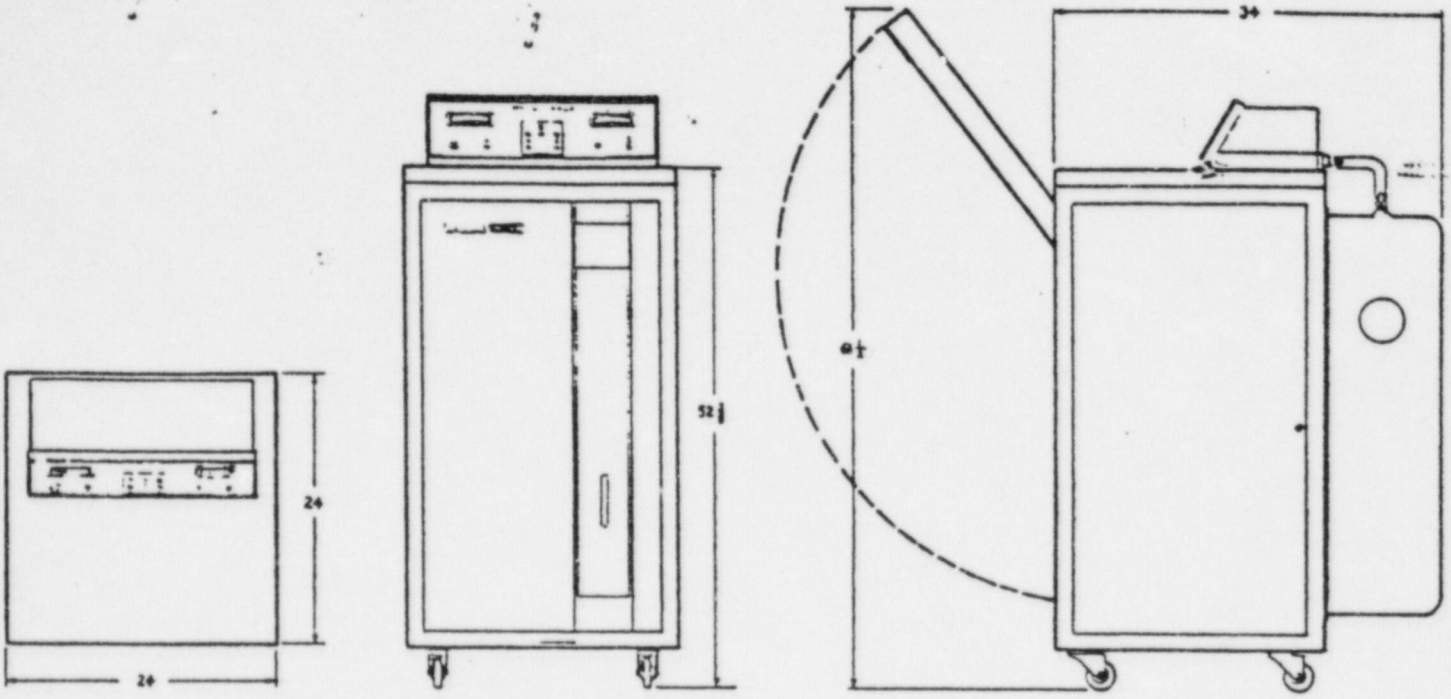
   AD ± 0.5 cm. for distances to 10 cm.

   AD ± 1.0 cm. for distances greater than 10 cm.

4. Move the Cesium Cs 137 standard back 1.0 cm. from the AD point, and the alarm should stop.

RADX

VENTIL-CON II
Controlled Gas Delivery System



Now Available With Built-in Xenon Trap

Features/Specifications

NEW...

Built-in Xenon Trap – The Radx Ventil-Con II is now available with a built-in Xenon Gas Trap with the exclusive detector alarm system. The trap uses the new 8-cylinder vertical activated charcoal cartridge pack (to eliminate channelling). The entire cartridge pack storage area is shielded with 1/4 inch lead equivalent to handle ^{133}Xe Gas.

Detector/Alarm – Model 142 comes equipped with an exhaust port mounted, end window GM tube, that activates an audio-visual alarm when the concentration of Xenon-133 in the exhaust port exceeds 1×10^{-2} uCi/ml.

Expandable Interface – Both models equipped with a trap (141 and 142) come with an expandable interface that attaches to the Ventil-Con II console. The expandable interface acts as a temporary holding reservoir since the trap pumps air at 5 liters/minute and people usually breathe at a higher rate.

Moisture Trap – The Xenon Trap in the Ventil-Con II has a large capacity silica gel desiccant jar. The silica gel is normally blue and turns clear when it becomes saturated. The desiccant may be reconstituted by heating.

CUSTOM DESIGN ...

Head Valve – A two position valve system is incorporated into the Ventil-Con II, which allows switching of the patient from stabilization, to rebreathing, to washout. The head valve has less than 25 ml of dead space in both rebreathing and washout. It also has a built-in bolus injection port for high concentration injections of xenon gas directly to the patient.

Mobile – The Ventil-Con II is completely self-contained as a mobile caster mounted console. With the new built-in trap, bedside ventilation studies with a mobile gamma camera are now practical.

Spirometer – The Ventil-Con II has a 10 liter horizontal rolling diaphragm spirometer. The expansion/contraction factor of the ball bearing mounted spirometer piston is negligible, the entire system offering a resistance of less than 0.2 inches of water to normal breathing. All airway plumbing is fabricated of non-kink polyurethane tubing which has been demonstrated to be relatively insoluble to xenon. Other compounds such as soft PVC will dissolve and transmit significant quantities of ^{133}Xe. The spirometer volume is displayed on an analog meter located on the control panel.

Shielding – The Ventil-Con II is completely shielded with 1/8 inch lead equivalent.

Uniform Gas Mixture – The Ventil-Con II incorporates a recirculation pump to insure a homogeneous

gas mixture. Equilibrium is reached within minutes of being charged.

Concentration – Concentration is continuously monitored by an inline GM tube and displayed as mCi/liter on an analog meter located on the control panel.

Oxygen Replenishment – Three modes of oxygen replenishment are provided (supplied by an external O_2 source). These modes are:

1. **Auto** – Automatically replaces oxygen used during rebreathing.
2. **Manual** – Allows oxygen to be added to the spirometer by manually operating the momentary oxygen solenoid switch.
3. **Emergency Oxygen Assist** – Delivers oxygen directly to the patient and is activated by a momentary switch at the head valve.

Delivery Arm – The delivery arm recesses into the cabinet for increased mobility. The arm is 28 inches long, continuously adjustable up to 60 inches in height for convenience in studying bedridden patients without increased dead space. The arm is shielded with 5/32 inch lead equivalents.

Carbon Dioxide Trap – The Ventil-Con II incorporates a rechargeable CO_2 trap using soda lime granules. The granules are normally white, turn purple when saturated with CO_2 and are a visual indicator that the CO_2 trap needs recharging.

Xenon Gas Storage – The Ventil-Con II is designed in such a fashion that the only xenon lost during a study is that which is in the patient's lungs at the start of washout. The Xenon Concentration Meter and autoclavable bacteriological filter allows reuse of the xenon gas mixture on subsequent patients.

Masks – A variety of masks are available for use with the Ventil-Con II. All masks and tubing are autoclavable.

General Specifications

Power Requirements – 110 volt, 60 Hz single phase, chassis ground

Dimensions – Height – 51 inches
Width – 24 inches
Depth – 24 inches
Weight – (Approximate)
Model 141 – 350 lbs.
Model 142 and 143 – 450 lbs.

Export Packed: 555 lbs.

Special Application – The Radx Ventil-Con II may be modified for Xenon-133 gas administration to determine Regional Cerebral Blood Flow by the inhalation technique of Obrist, et. al.[1]

[1]Obrist, W. D. et al. "Determination of Regional Cerebral Blood Flow by Inhalation of Xenon-133." Circulation Research, XX, 124-134, January, 1967.

Radx No.	Description	Price
141	Ventil-Con II Rebreathing System only	$6225.00
142	Ventil-Con II Rebreathing System with built-in Xenon Trap and Expandable Interface	$7480.00
143	Ventil-Con II Rebreathing System with built-in Xenon Trap, Expandable Interface and ^{133}Xe Detector/Alarm Warning System	$7950.00

All of the above include the following:
(1) Adult Mouthpiece with headstrap
(1) Face Mask Tubing – 8"
(1) Nose depressor
(1) Quart soda lime granules
(1) Installation and instruction manual

In addition, catalog numbers 142 and 143 are supplied with:
(1) 2 lbs. silica gel desiccant
(1) Expandable Interface

Terms: Net 30 days F.O.B. Houston, Texas
Prices effective October 1, 1981

104	Soda Lime Granules – 1 Case 12-3 pound (resealable) canisters	$85.00
105	Autoclavable Bacteriological Filter	50.00
108	Infant Mask (requires item 114)	23.00
109	Adult Mouthpiece with headstrap	23.00
110	Adult Face Mask (requires item 116)	30.00
114	Infant Face Mask Harness	15.00
116	Adult Face Mask Harness	11.00
118	Chart Recorder Paper – Single Channel (12 rolls)	200.00
131	Cerebral Blood Flow modification: Expanded Function	700.00
132	5-1/2" Face Mask Tubing (Ventil-Con II only)	12.00
133	8" Face Mask Tubing (Ventil-Con II only)	15.00
148	Breathing Port Adapter Ventil-Con	15.00
149	Breathing Port Adapter Ventil-Con II or Xena-Con	15.00
160	NEN Gun Adapter	15.00
115	Swivel Joint Adapter	38.00
169	Oxygen Cylinder Holder, Size "E"	65.00
170	Mobility Handles for Ventil-Con II and XenaCon	50.00
164	Vertical Cartridge Pack – 8-cylinder	295.00
126	Silica Gel Desiccant – 2 lbs.	20.00

Maintenance – Routine replacement of the soda lime granules and renewal of the silica gel desiccant (models 142 and 143) is all the maintenance your Ventil-Con II will require. Complete procedures are outlined in the instruction manual.

Radx Warranty – Radx warrants the Ventil-Con II to be free from all defects in material and workmanship for a period of one year from date of shipment. Radx Corporation's liability shall be limited to the repair or replacement of the defective material or component at its option.

Prices and specifications subject to change without notice. Printed in U.S.A.

RADX CORP
P. O. BOX 19164 • HOUSTON, TEXAS 77024 • 713/468-9628
1390 West Belt Drive • Houston, Tx. 77043

ATTACHMENT A

VETERANS ADMINISTRATION MEDICAL CENTER
Hot Springs, SD 57747

MEDICAL CENTER POLICY 115-1
November 1986

NUCLEAR MEDICINE SERVICE

Please make the following changes:

Page 3, paragraph (2) (b); add: Door should be secured by relocking subsequent to off-duty hours delivery and storage of radioisotopes in this room.

for JAMES S. EXPARZA
Medical Center Director

ATTACHMENT B

VETERANS ADMINISTRATION MEDICAL CENTER
Hot Springs, SD 57747

MEDICAL CENTER POLICY 115-2
November 1986

RADIATION EMERGENCY PLAN

Please make the following changes:

Page 3, paragraph C (1) (c); change: Daytime: 817-860-8100 (Region IV)

for JAMES S. EXPARZA
Medical Center Director