FORM NRC-313M 7-77 10 CFR 30	U.S. NUCLEAR REGULATORY COMMISSION APPLICATION FOR MATERIALS LICENSE – MEDICAL	

INSTRUCTIONS - Complete items 1 through 25 if this is an initial application or an application for renewal of a license. Use supplemental sheets where necessary. Item 25 must be completed on all applications and signed. Mail two copies 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 NRC Materials License. A NRC Materials License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the License 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 25 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
Nuclear Medicine Service
New Castle Road
Butler, Pennsylvania 16001

TELEPHONE NO.: AREA CODE (412) 287 4781

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

Anna Polizio, M. D.

TELEPHONE NO.: AREA CODE (412) 287 4781

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

a. ☐ NEW LICENSE
b. ☒ AMENDMENT TO LICENSE NO. 37 16034 01
c. ☒ RENEWAL OF LICENSE NO. 37 16034 01

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

Anna Polizio, M. D.
Carl Bean, M. D.

5. RADIATION PROTECTION OFFICER (Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Supplement A.)

Anna Polizio, M. D.

6. RADIOACTIVE MATERIAL FOR MEDICAL USE

RADIOACTIVE MATERIAL LISTED IN:	MARK ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS (In millicuries)
10 CFR 31.11 FOR IN-VITRO STUDIES	X	10 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	2000 mCi
10 CFR 35.100, SCHEDULE A, GROUP IV	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP V	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP VI		

ITEM	MARK ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS (In millicuries)
IODINE-131 AS IODIDE FOR TREATMENT OF HYPERTHYROIDISM AND CARDIAC DYSFUNCTION	X	100 mCi
PHOSPHORUS-32 AS SOLUBLE PHOSPHATE FOR TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA AND BONE METASTASES	X	100 mCi
PHOSPHORUS-32 AS COLLOIDAL CHROMIC PHOSPHATE FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.	X	43 mCi
GOLD-198 AS COLLOID FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.		
IODINE-131 AS IODIDE FOR TREATMENT OF THYROID CARCINOMA	X	500 mCi
XENON-133 AS GAS OR GAS IN SALINE FOR BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES.	X	500 mCi

7.A. RADIOACTIVE MATERIAL FOR USES NOT LISTED IN ITEM 6.a. (Small sealed sources (up to 3m Ci) 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
WE DO NOT USE SOURCES MORE THAN 3		mCi	

FORM NRC-313M
7-77

INFORMATION REQUIRED FOR ITEMS 7 THROUGH 23

Submit a detailed description of all the information requested in Items 7 through 23. Begin each item on a separate sheet. Identify the item number and the date of the application in the lower right hand corner of each page. Two copies of each appended sheet should be submitted with the application.

7. MEDICAL ISOTOPES COMMITTEE.

   a. Committee's Duties and Responsibilities.

   b. Meeting Frequency.

   c. Name and Specialty of Each Committee Member.

8. TRAINING AND EXPERIENCE.

   a. Authorized User(s). *(Each physician must complete Supplements A and B.)*

   b. Radiation Safety Officer. *(Complete Supplement A, if other than a physician already listed.)*

9. INSTRUMENTATION. *(List by manufacturer's name and model number.)*

   a. Survey Instruments.

   b. Dose Calibrator.

   c. Diagnostic Instruments.

   d. Other *(e.g. liquid scintillation counter, area monitor.)*

10. CALIBRATION OF INSTRUMENTS.

   a. Methods.

   b. Frequency.

   c. Standards (Radionuclide and Activity).

11. FACILITIES AND EQUIPMENT. *(Complete description and diagram.)*

12. PERSONNEL TRAINING PROGRAM AND FREQUENCY.

13. PROCEDURES FOR ORDERING AND RECEIPT OF RADIOACTIVE MATERIAL.

14. PROCEDURES FOR SAFELY OPENING PACKAGES CONTAINING RADIOACTIVE MATERIAL.

15. GENERAL LABORATORY RULES FOR THE SAFE USE OF RADIOACTIVE MATERIALS.

16. EMERGENCY PROCEDURES, INCLUDING NAMES AND TELEPHONE NUMBERS OF PERSONNEL TO BE NOTIFIED.

17. AREA SURVEY PROCEDURES.

18. WASTE DISPOSAL PROCEDURES.

19. THERAPEUTIC USE OF RADIOPHARMACEUTICALS.

   a. Procedures

   b. Precautions.

   c. Personnel Instructions.

20. THERAPEUTIC USE OF SEALED SOURCES.

   a. Procedures.

   b. Precautions.

   c. Personnel Instructions.

21. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE GASES. *(e.g., xenon-133)*

22. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL IN ANIMALS.

23. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL SPECIFIED IN ITEM 6.B.

MEDICAL ISOTOPES COMMITTEE

A. Responsibility:

The Committee is responsible for:

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

2. Ensuring that all use of radioactive material is conducted in a safe manner and in accordance with NRC regulations and the conditions of the license.

Duties:

The Committee shall:

1. Be familiar with all pertinent NRC regulations, the terms of the license, and information submitted in support of the request for the license and its amendments.

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

3. Establish a program to ensure that all individuals whose duties may require them to work in the vicinity of radioactive material (e.g., nursing, security and housekeeping personnel) are properly instructed as required by Section 19.12, of 10 CFR Part 19.

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

5. Prescribe special conditions that will be required during a proposed use of radioactive material such as requirements for bioassays, physical examinations of users and special monitoring procedures.

6. Review the entire radiation safety program at least annually to determine that all activities are being conducted safely and in accordance with NRC regulations and the conditions of the license. The review shall include an examination of all records, reports from the radiation safety officer, results of NRC inspection, written safety procedures and management control system.

MEDICAL ISOTOPES COMMITTEE

A. Duties: (Cont'd)

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

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

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

B. Meeting Frequency:

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

C. Name and Speciality of Each Committee Member:

A. M. Polizio, M. D., Acting Chief, Nuclear Medicine Service, Chairman
C. B. Bean, M. D., Chief, Radiology Service, Acting Chairman
J. B. Holder, M. D., Chief, Laboratory Service, Member
E. J. Thompson, M. D., Chief, Medical Service, Member
Member of Hospital Administration — Appointed on rotating basis by Hospital Director

ITEM 7
JAN. 22, 1979

FORM NRC-313M-SUPPLEMENT 3
(7-77)
10 CFR 35

U. S. NUCLEAR REGULATORY COMMISSION

PRECEPTOR STATEMENT

Supplement 3 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

ANNA M. POLIZIO, M. D.

STREET ADDRESS

NUCLEAR MEDICINE SERVICE
VETERANS ADMINISTRATION HOSPITAL

CITY | STATE | ZIP CODE

BUTLER PA. 16001

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	250	
	DETERMINATION OF BLOOD AND BLOOD PLASMA VOLUME	15	
	LIVER FUNCTION STUDIES	0	
	FAT ABSORPTION STUDIES	0	
	KIDNEY FUNCTION STUDIES	10	
	IN VITRO STUDIES	300	
OTHER			
I-125	DETECTION OF THROMBOSIS	6	
I-131	THYROID IMAGING	50	
P-32	EYE TUMOR LOCALIZATION	0	
Se-75	PANCREAS IMAGING	10	
Yb-169	CISTERNOGRAPHY	6	
Xe-133	BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES	50	
OTHER			
Tc-99m	BRAIN IMAGING	300	
	CARDIAC IMAGING	10	
	THYROID IMAGING	60	
	SALIVARY GLAND IMAGING	0	
	BLOOD POOL IMAGING	5	
	PLACENTA LOCALIZATION	0	
	LIVER AND SPLEEN IMAGING	100	
	LUNG IMAGING	95	
	BONE IMAGING	110	
OTHER			

ITEM 8
JAN. 22, 1979

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	6	
P-32 (Colloidal)	INTRACAVITARY TREATMENT	1	
I-131	TREATMENT OF THYROID CARCINOMA	1	
	TREATMENT OF HYPERTHYROIDISM AND CARDIAC CONDITION	4	
Au-198	INTRACAVITARY TREATMENT	0	
Co-60 or Cs-137	INTERSTITIAL TREATMENT	0	
	INTRACAVITARY TREATMENT	0	
I-125 or Ir-192	INTERSTITIAL TREATMENT	0	
Co-60 or Cs-137	TELETHERAPY TREATMENT	0	
Sr-90	TREATMENT OF EYE DISEASE	0	
	RADIOPHARMACEUTICAL PREPARATION		
Mo-99/ Tc-99m	GENERATOR	10	
Sn-113/ In-113m	GENERATOR	0	
Tc-99m	REAGENT KITS	30	
Other			

3. DATES AND TOTAL NUMBER OF HOURS RECEIVED IN CLINICAL RADIOISOTOPE TRAINING
November and December 1976, January 1977
August, September, October 1977
May 78 through June 10,1978
Approximately 300 hours.

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

a. NAME OF SUPERVISOR
Dr. J.F. Rockett, MD.

b. NAME OF INSTITUTION
Baptist Memorial Hospital

c. MAILING ADDRESS
899 Madison Ave.

CITY
Memphis Tenn. 38146

d. MATERIAL LICENSE NUMBER(S)
RHS- R-7932-L3 (Tenn)

5. PRECEPTOR'S SIGNATURE
John F Rockett

Dr. J.F. ROCKETT

7. PRECEPTOR'S NAME (Please type or print)
John F Rockett

8. DATE
25 August 78

FORM NRC-313M-SUPPLEMENT B
(7-77)
10 CFR 35

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

AIDA M. POLIZIO, M. D.

STREET ADDRESS

NUCLEAR MEDICINE SERVICE
VETERANS ADMINISTRATION HOSPITAL

CITY | STATE | ZIP CODE

BUTLER PA. 16001

KEY TO COLUMN C

PERSONAL PARTICIPATION SHOULD CONSIST OF:

1-Supervised examination of patients to determine the suitability for radiotracer 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 continuation may be submitted in duplicate on a plain sheet.) D
I-131 or I-125	DIAGNOSIS OF THYROID FUNCTION	562	
	DETERMINATION OF BLOOD AND BLOOD PLASMA VOLUME	42	
	LIVER FUNCTION STUDIES	9	
	FAT ABSORPTION STUDIES	--	
	KIDNEY FUNCTION STUDIES	15	
	IN VITRO STUDIES	1069	
OTHER			
I-125	DETECTION OF THROMBOSIS	7	
I-131	THYROID IMAGING	188	
P-32	EYE TUMOR LOCALIZATION	54	
Se-75	PANCREAS IMAGING	6	
Yb-169	CISTERNOGRAPHY	13	
Xe-133	BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES	7	
OTHER			
Tc-99m	BRAIN IMAGING	1830	
	CARDIAC IMAGING	16	
	THYROID IMAGING	291	
	SALIVARY GLAND IMAGING	10	
	BLOOD POOL IMAGING	21	
	PLACENTA LOCALIZATION	0	
	LIVER AND SPLEEN IMAGING	1451	
	LUNG IMAGING	868	
	BONE IMAGING	1262	
OTHER	Generalized Tumor Loc. (^{67}Ga)	66	

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 sheet.) D
P-32 (Soluble)	TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA, AND BONE METASTASES	9	
P-32 (Colloidal)	INTRACAVITARY TREATMENT		
I-131	TREATMENT OF THYROID CARCINOMA	2	
	TREATMENT OF HYPERTHYROIDISM AND CARDIAC CONDITION	53	
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	26	
Sn-113/ In-113m	GENERATOR	0	
Tc-99m	REAGENT KITS	54	
Other			

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

July, 1976-June 30, 1977 and July, 1977-June 30, 1978 -- 4160 hours

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

a. NAME OF SUPERVISOR

Martha McDonald, M.D.

b. NAME OF INSTITUTION

University of Tennessee

c. MAILING ADDRESS

865 Jefferson, Room 150C

d. CITY

Memphis, Tennessee 38163

e. MATERIALS LICENSE NUMBER(S)

R7919-L4

5. PRECEPTOR'S SIGNATURE

Martha McDonald MD

7. PRECEPTOR'S NAME (Please type or print)

Martha McDonald, M.D.

8. DATE

August 18, 1978

ITEM 8
JAN. 22, 1979

FORM NRC-313M-SUPPLEMENT A (8-76) — 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
Anna Polizio, M.D.	New York, Florida, Maryland

3. CERTIFICATION

SPECIALTY BOARD (A)	CATEGORY (B)	MONTH AND YEAR CERTIFIED (C)
The American Board of Radiology	Radiology	December 10, 1976

4. TRAINING RECEIVED IN BASIC RADIOISOTOPE HANDLING TECHNIQUES

FIELD OF TRAINING (A)	LOCATION AND DATE(S) OF TRAINING (B)	TYPE AND LENGTH OF TRAINING: LECTURE/LABORATORY COURSES (Hours) (C)	TYPE AND LENGTH OF TRAINING: SUPERVISED LABORATORY EXPERIENCE (Hours) (D)
a. RADIATION PHYSICS AND INSTRUMENTATION	1. Gen. Radiology Residency, Radiology Dept., Sinai Hospital, Baltimore, Md. 7/1/73-7/1/76 2. Nuclear Medicine Residency Univ. of Tennessee, Dept. of Nuclear Medicine, Memphis, Tenn. 7/1/76-7/1/78	1. 200 2. 100 300	50 24 74
b. RADIATION PROTECTION	As above	1. 80 2. 80 160	24 24 48
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	As above	1. 20 2. 20 40	10 10 20
d. RADIATION BIOLOGY	As above	1. 20 2. 20 40	10 10 20
e. RADIOPHARMACEUTICAL CHEMISTRY	University of Tennessee	48	15

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

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

ITEM 8
JAN. 22, 1979

TRAINING AND EXPERIENCE

A. Authorized User:

Anna Maria Polizio, M.D.

Born: February 3, 1940
Place: Lwow, Poland (city now belongs to U.S.S.R.)

Home Address: 366-G Whitestown Road
Butler, Pennsylvania 16001
Phone: (412)285-1276

Business Address: Veterans Administration Medical Center
Nuclear Medicine Service
New Castle Road
Butler, Pennsylvania 16001
Phone: (412)287-4731; Ext. 305

April 16, 1963 - Graduate of Medical Academy; Wroclaw, Poland
1963-1965 — Rotating Internship; Wroclaw, Poland
1965-1966 — Rotating Internship; Jewish Memorial Hospital, New York, N.Y.
1966-1967 — Radiology Residency; Veterans Administration Medical Center, Manhattan, N. Y.
1967-1971 — General Practice in Poland
1971-1972 — Not working; childbirth
1973-1976 — Resident & Chief Resident — Radiology Residency at Sinai Hospital, Baltimore, Maryland
1976-1978 — Nuclear Medicine Residency; Nuclear Medicine Department; University of Tennessee, Memphis, Tennessee

Licensure: Education Council for Foreign Medical Graduates; #51681; February 9, 1966

New York State - September 6, 1973; #117786
Maryland " - July 18, 1974
Florida " - July 11, 1975; #25851

American Board of Radiology - December 10, 1976

Member of Society of Nuclear Medicine

B. Radiation Safety Officer:

Anna Maria Polizio, M.D.

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INSTRUMENTATION

. Dose calibrator

Manufacturer's name: Abbott Capintec Radioisotope Dose Calibrator

Manufacturer's model number: CRC-4

Number of instruments available: 1

. Diagnostic instruments

Type of Instrument	Manufacturer's Name	Model No.
Pho/Gamma LFOV Scintillation Camera System w/Data Store Gamma Microdot Image	G. D. Searle & Co.	#75006A
Pho/Gamma Whole Body Scinti-scan Table	G. D. Searle & Co.	#3191
Nuclear Associates Lung Ventilation w/Gas Trap	Nuclear Associates	#36-001
Thyroid Uptake Probe	G. D. Searle & Co.	#4405
Manual Well System	G. D. Searle & Co.	#4454
Auto Gamma Scintillation Counting System	G. D. Searle & Co.	#1085

INSTRUMENTATION

A. Survey meters

. Manufacturer's name: Interex Alpha, Beta, Gamma (Cutie Pie) Survey Meter

Manufacturer's model number: #17-111

Number of instruments available: 1

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

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

. Manufacturer's name: Interex Beta, Gamma, Sidewindow G.M. Survey Meter

Manufacturer's model number: #17-112 (with #17-123- Portable Loudspeaker Attach.

Number of instruments available: 1

ranges: _____

Minimum range 0 mr/hr to 300 mr/hr

Maximum range 0 mr/hr to 30,000 mr/hr

INSTRUMENTATION

A. Survey meters (Cont'd)

. Manufacturer's name: G. D. Searle & Co. Radiacmeter

Manufacturer's model number: #9121 w/Alarm System

Number of instruments available: 1

Minimum range: 0.2 mr/hr to 2000 mr/hr

Maximum range: 0.2 mr/hr to 2000 mr/hr

. Manufacturer's name: _____

Manufacturer's model number: _____

Number of instruments available: _____

ranges: _____

Minimum range _____ mr/hr to _____ mr/hr

Maximum range _____ mr/hr to _____ mr/hr

CALIBRATION OF INSTRUMENTS

Calibration of Survey Meters:

Calibration of survey meters will be performed by Dr. Y. Hsu, Physicist, License #37-01230-03, Oakland Veterans Administration Hospital, Pittsburgh, Pennsylvania.

A. Calibration Sources:

1. For the high energy end, the source used is a 100 mCi Cesium-137 obtained from the Nuclear Associates, Inc. It is encapsulated at one end of a control rod and enclosed in a heavy-duty shielded container. It is approximately a point source. The source is kept in either of 2 positions: stored or exposed. In the "exposed" position, the source faces a 45° port at the side of the shield, and the field can vary from 2 mR/h to 1 R/h at different position from the source. The source is moved from the "stored" to the "exposed" position merely raising the control rod remotedly via a cable. For the safety, the source cannot be removed from its shield except by the manufacturer. The calibrating personnel will not stand in the direct beam and he will stay behind a 1" thick lead screen when the source is in the "exposed" position.

   The source and the survey meter to be calibrated are placed at least 2.5 feet above the ground and about 1 foot from the source.

   The source strength was specified as 37 mR/h at 30 in. on 2/24/76 by the manufacturer. The radioactive decay law will be used to calculate the output at other times after the specified date. The inverse square law will be used to calculate the exposure rate at distances farther than 1 foot. Various exposure rates can also be obtained by using lead attenuators placed in front of the 45° port.

2. The frequency of calibration for each survey meter is at least annually.

3. Two (2) reading points will be taken on each scale; approximately 1/3 and 2/3 of full scale, respectively.

4. The readings will be plotted on a log-log scale and the graph will be attached to the meter.

B. A reference check source of Cs-137 will be also read at the time of the above calibration. The reading will be taken with the check source placed in specific geometry relative to the detector.

   A reading of this reference check source will be taken.

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

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

   This calibration may be done as a relative intercomparison with an energy independent instrument and uncalibrated low energy sources.

5. Records of the calibration and above A. and B. 2. and 3. will be maintained.

CALIBRATION OF INSTRUMENTS

Diagnostic Instruments:

Manufacturer's directions will be followed for calibration and maintenance.

PHO/GAMMA LFOV

A. Daily reference checks with collimator off (intrinsic resolution).

1a) $^{99m}TcO_4$ point source peak calibration.
b) Field uniformity.
c) Sensitivity of the camera.

2a) Cobalt 57 flood source - 2mCi, peak calibration.
b) Bar phantom resolution.

B. Monthly collimator resolution

Nuclear Chicago pulse height analyzer (single-channel).
Monthly ~~Daily~~ reference checks with ^{129}I 0.023 uCi reference standard.
Daily ~~Monthly~~ calibration checks with ^{137}Cs 0.57 uCi reference standard.

C. Searle Thyroid Uptake Probe

Weekly reference checks with ^{137}Cs 0.57 uCi reference standard or before use.

ITEM 10
JAN. 22, 1979

CALIBRATION OF DOSE CALIBRATOR

1. Instrument is checked daily for balance and with Cs^{137} reference source and recorded. Check is repeated during day if sample readings are not within 10% of anticipated assay. Instrument adjustment, recalibration, or repair will be done if this test shows a variation greater than 5%.

2. Instrument linearity is performed quarterly from a first elution source from a new Mo^{99}/Tc 99m generator as follows:

   a. The Tc^{99m} vial is assayed in dose calibrator with background subtracted and net activity recorded.

   b. Hourly assays are performed during duty hours and recorded for a 48 hour period.

   c. Calculated activity for time period is also determined and recorded.

   d. Net activity is recorded on graph paper and submitted to Consulting Physicist, Dr. Y. Hsu, License No. NRC 37-01230-03, for percent of accuracy.

3. Accuracy checks are also performed annually by Consulting Physicist and quarterly by Chief Technician with Co^{57}, Co^{60} and Cs^{137}. Reference sources as follows:

   a. Each source is assayed at the appropriate setting and net activity is recorded.

   b. This step is repeated for a total of 10 determinations and results are averaged.

   c. Average activity is compared with certified activity at time of decay and logged with percent of accuracy and error.

4. Geometric variation for depth of chamber is performed as follows:

   a. Standard Cs^{137} reference source is placed in chamber, assayed from 25 cm. depth to 0 and recorded.

   b. Curve is then plotted on graph paper and calculated to determine region of 5% accuracy and optimal counting position.

Applied HEALTH PHYSICS inc.
2986 Industrial Blvd. • Box 197 • Bethel Park, Pa. 15102 • Phone 412 • 563-2242

September 17, 1979

PACKAGING INSTRUCTIONS

Gentlemen:

Effective October 1, 1979, all absorbed liquid, all solid material, scintillation vials, and/or animal carcasses must be packaged in the manner outlined on the attached sheets. Please be advised that these are the minimum requirements.

The procedure for packaging animal carcasses parallels ANSI Standard N 14.3, "Packaging and Transportation of Radioactively Contaminated Biological Materials".

You are cautioned that mixing of radioactive waste types within a single container is not permitted.

These instructions may be used to meet the requirements of Question 2 of the NRC Bulletin 79-19.

Should you have any questions, please do not hesitate to call.

Sincerely yours,

APPLIED HEALTH PHYSICS, Inc.

Kurt M. Myers

Kurt M. Myers

KMM/lag

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Return to
115
Please

November 14, 1980

Mr. John R. Cook
Mail Stop SS-396
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

SUBJ: Releases of Radioactive Materials from Facilities -
NMSS Questionnaire 80-1

Dear Mr. Cook:

We are submitting the following information per your request:

1. Xenon-133 was released at this facility during the period January 1979 thru January 1980.

NUCLIDE:	Xenon-133
RELEASE PERIOD:	Jan. 1979 thru Jan. 1980
AVERAGE CONCENTRATION (uCi/cc):	0.1×10^{-7}
AVERAGE AIR FLOW RATE (cfm):	300

2. Estimated air flow volume per year:

$$20.4 \times 10^{12} \text{ ml/year}$$

3. Total air flow multiplied by average radionuclide concentration:

$$0.1 \times 10^{-7} \frac{\text{uCi}}{\text{ml}} \times 20.4 \times 10^{12} \frac{\text{ml}}{\text{y}} = 0.1 \times 20.4 \times 10^{5} \frac{\text{uCi}}{\text{y}} =$$

$$2.04 \times 10^{5} \frac{\text{uCi}}{\text{y}} = 200.4 \frac{\text{mCi}}{\text{y}}$$

Note: Our facility performs approximately one (1) ventilation lung scan per week or about 4-5 ventilation scans per month, which amounts to total release of about 50 mCi of Xenon-133 gas to the air during the period January 1979 thru January 1980.

529/00

PACKAGING SCINTILLATION VIALS

1. CONTAINER MUST BE DOT APPROVED 17H DRUM EITHER 30 OR 55 GALLON.
2. CONTAINER MUST BE LINED WITH A 4 MIL PLASTIC LINER AND SEALED AT THE TOP WHEN CONTAINER IS PACKED.
3. PLACE APPROXIMATELY 3" OF ABSORBENT AT THE BOTTOM OF THE CONTAINER. VIALS AND ABSORBENT MUST BE PLACED IN THE CONTAINER IN LAYERS NOT EXCEEDING 6" IN DEPTH. BETWEEN EACH LAYER AT LEAST 1" OF ABSORBENT MUST BE PLACED. THE TOP LAYER MUST BE APPROXIMATELY 3" OF ABSORBENT.
4. THE VIALS ARE NOT TO BE OPENED.
5. THE CONTAINER MUST BE FILLED WITH A TWO-TO-ONE RATIO OF ABSORBENT TO LIQUID IN THE VIALS.
6. APPROVED ABSORBENTS ARE:

   PERLITE (MEDIUM GRADE)
   DIATOMACEUS EARTH (MEDIUM GRADE)
   SUPER FINE (DIATOMITE)
   SPEEDI DRY

PACKAGING ABSORBED LIQUIDS

1. Container must be a DOT approved 17H drum either 30 Gallon or 55 Gallon.
2. Container must be lined with a 4 mil plastic liner and sealed at the top when container is packed.
3. Container must be filled with a two-to-one ratio of absorbent to liquid layered in approximately one foot layers to ensure even dispersion.
4. Approved absorbents are:

   Perlite (Medium Grade)
   Diatomaceus Earth (Medium Grade)
   Pel-E-Cel
   Super Fine (Diatomite)
   Speedi Dry

PACKAGING SOLID WASTE

1. CONTAINER MUST BE A DOT APPROVED 17H DRUM EITHER 30 GALLON OR 55 GALLON

2. CONTAINER MUST BE LINED WITH A 4 MIL PLASTIC LINER AND SEALED AT THE TOP WHEN CONTAINER IS PACKED.

PROCEDURES FOR ORDERING AND RECEIPT OF RADIOACTIVE MATERIAL DURING ON-DUTY HOURS

The Chief Nuclear Medicine Technologist will place all orders for radioactive material and will ensure that the requested materials and quantities are authorized by the license and that possession limits are not exceeded.

All packages containing radioactive material during normal working hours are to be delivered unopened immediately to the Nuclear Medicine Department to be opened only by Nuclear Medicine personnel.

.....

RECEIPT OF PACKAGES CONTAINING RADIOACTIVE MATERIAL DURING OFF-DUTY HOURS

Any packages containing radioactive material that arrive between 4:30 P.M. and 7:30 A.M. or on weekends or holidays shall be signed for by the security guard on duty and taken immediately to the Nuclear Medicine Department. Unlock the door, place the package in the Hot Lab immediately behind the door on the floor, and relock the door.

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

RADIATION SAFETY OFFICER:	ANNA POLIZIO, M.D.
OFFICE PHONE:	412-287-4781
HOME PHONE:	412-285-3941
CHIEF NUCLEAR MEDICINE TECHNOLOGIST:	JULIA M. BROWN, R.T.
OFFICE PHONE:	412-287-4781
HOME PHONE:	412-287-7326

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PROCEDURES FOR OPENING PACKAGES
CONTAINING RADIOACTIVE MATERIAL

1. Visually inspect package for any sign of damage (e.g., wetness, crushed). If damage is noted, stop procedure and notify Radiation Safety Officer.

2. Measure exposure rate at 3 feet from package surface—record. If >10 mR/hr—stop procedure and notify Radiation Safety Officer.

3. Measure surface exposure rate and record. If >200 mR/hr—stop procedure and notify Radiation Safety Officer.

4. Put on gloves.

5. Open the outer package (following manufacturer's directions, if supplied) and remove packing slip. Open inner package to verify contents (compare requisition, packing slips, and label on bottle) check integrity of final source container (inspect for breakage of seals or vials, loss of liquid, discoloration of packing material). Check also that shipment does not exceed possession limits.

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LABORATORY RULES FOR THE USE OF RADIOACTIVE MATERIAL

1. Wear laboratory coats, or other protective clothing in areas where radioactive materials are used.

2. Wear disposable gloves while handling radioactive materials.

3. Wash hands after handling radioactive materials and before leaving area.

4. Use syringe shields for preparation of patient doses and administration to patients.

5. Do not eat, drink, smoke or apply cosmetics in any area where radioactive material is stored or used.

6. Never pipette by mouth.

7. Assay each patient dose in the dose calibrator prior to administration. Do not use any doses that differ from the prescribed dose by more than 10%.

8. Personnel are to wear film badges at all times in areas where radioactive materials are stored or used. Technologists will wear both film badges and TLD's.

9. Radioactive waste to be disposed only in specially designated receptacles.

10. Radioactive material to be transported in shielded containers.

11. Monitor Hot Laboratory, preparation and injection area and Scanning Room at the end of each day. Decontaminate if necessary.

12. All radioactive solutions are to be kept in covered containers with an identifying label stating date, compound, radionuclide and activity.

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EMERGENCY PROCEDURES

Minor Spills:

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

2. PREVENT THE SPREAD: Cover the spill with absorbent paper.

3. CLEAN UP: Use disposable gloves and remote handling tongs. Carefully fold the absorbent paper and pad. Insert into a plastic bag and dispose of in the radioactive waste container. Include all other contaminated materials such as disposable gloves.

4. SURVEY: With a G.M. Survey Meter, check the area around the spill, your hands and clothing for contamination.

5. REPORT: Report incident to the Radiation Safety Officer.

Major Spills:

1. CLEAR THE AREA: Notify all persons not involved in the spill to vacate the room.

2. PREVENT THE SPREAD: Cover the spill with absorbent pads, but do not attempt to clean it up. Confine the movement of all personnel potentially contaminated to prevent the spread.

3. SHIELD THE SOURCE. If possible, the spill should be shielded, but only if it can be done without further contamination or without significantly increasing your radiation exposure.

4. CLOSE THE ROOM. Leave the room and lock the door(s) to prevent entry.

5. CALL FOR HELP. Notify the Radiation Safety Officer immediately.

6. PERSONNEL DECONTAMINATION. Contaminated clothing should be removed and stored for further evaluation by the Radiation Safety Officer. If the spill is on the skin, flush thoroughly and then wash with mild soap and lukewarm water.

Radiation Safety Officer: Dr. Anna Polizio, M.D.
Office Phone: (412) 237-4781
Home Phone : (412) 285-1276

Chief Nuclear Medicine Technologist: Julia M. Brown
Office Phone: (412) 237-4781
Home Phone : (412) 794-4779

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SURVEY PROCEDURES

A. All elution, preparation and injection areas will be surveyed daily with a G-M survey meter and decontaminated if necessary.

B. Laboratory areas where only small quantities of radioactive material are used (less than 100 uCi) will be surveyed monthly.

C. The weekly and monthly survey will consist of:

1. A measurement of radiation levels with a survey meter sufficiently sensitive to detect 0.1 mR/hr.

2. A series of wipe tests to measure contamination levels. The method for performing wipe tests will be sufficiently sensitive to detect 100 dpm.

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

1. Location, date, and type of equipment used.

2. Name of person conducting the survey.

3. Drawing of area surveyed, identify relevant features such as active storage areas, active waste areas, etc..

4. Measured exposure rates, keyed to location on drawing.

5. Detected contamination levels, keyed to locations on drawing.

6. Corrective action taken in the case of contamination or excessive exposure rates, reduced contamination levels or exposure rates after corrective action, and any appropriate comments.

E. Area will be cleaned if the contamination level exceeds 100 dpm/ 100 cm^2.

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

BACKGROUND LEVEL NOT TO EXCEED 100 dpm (10^{-4} μCi)/100 cm.^{2}.

MAXIMUM EXPOSURE RATE NOT TO EXCEED 2mR IN AREAS OCCUPIED BY NON-RADIATION WORKERS.

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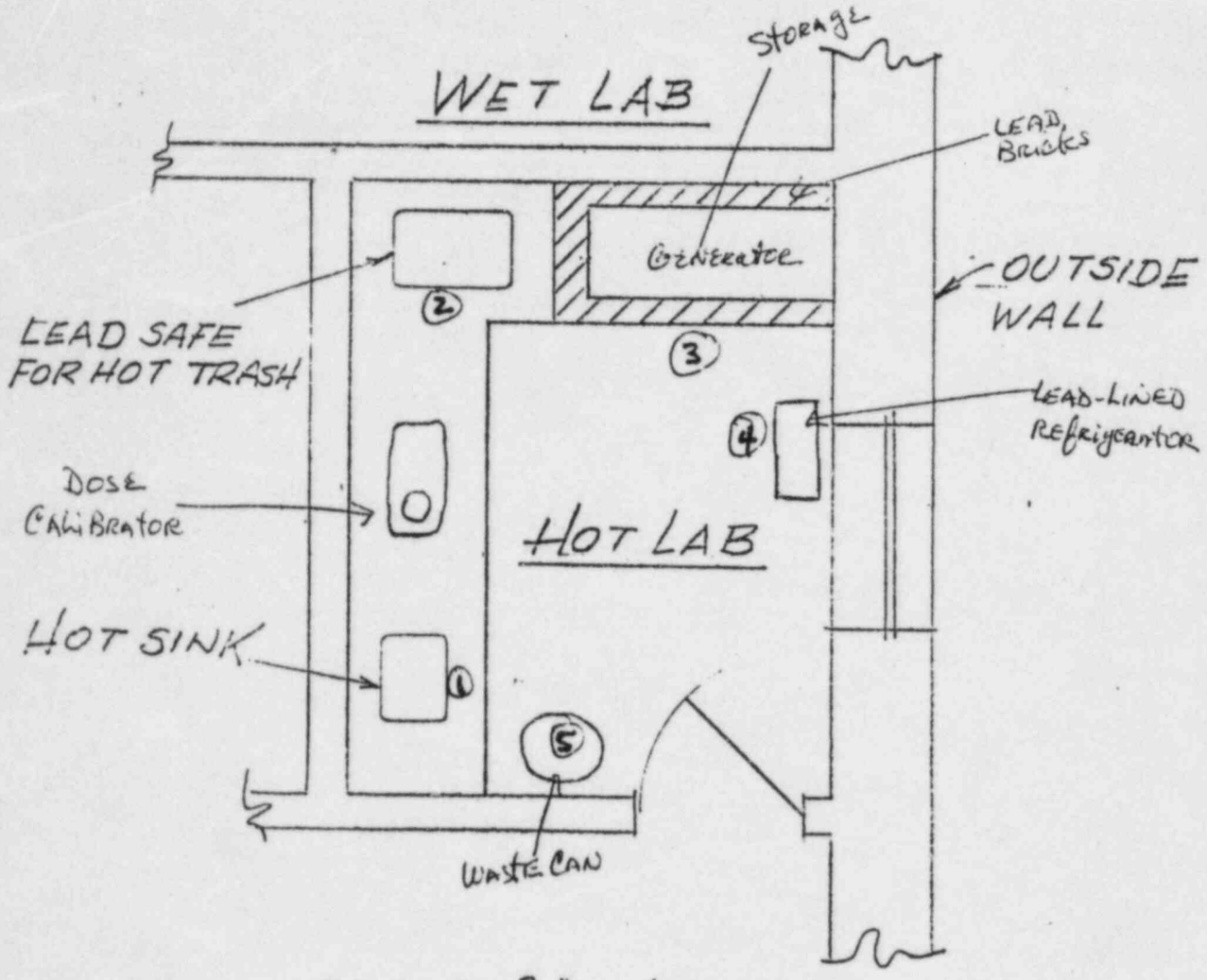
Daily Survey



SCALE: $\frac{3}{8}$" = 1'-0

1- Hot Sink
2 - Lead Safe
3 - Generator and Storage
4 - Lead-Lined Refrig.
5 - Waste Can

NUCLEAR MEDICINE
BLDG. #1 - BSM'T. "C" UNIT
VA. HOSP. BUTLER, PA.

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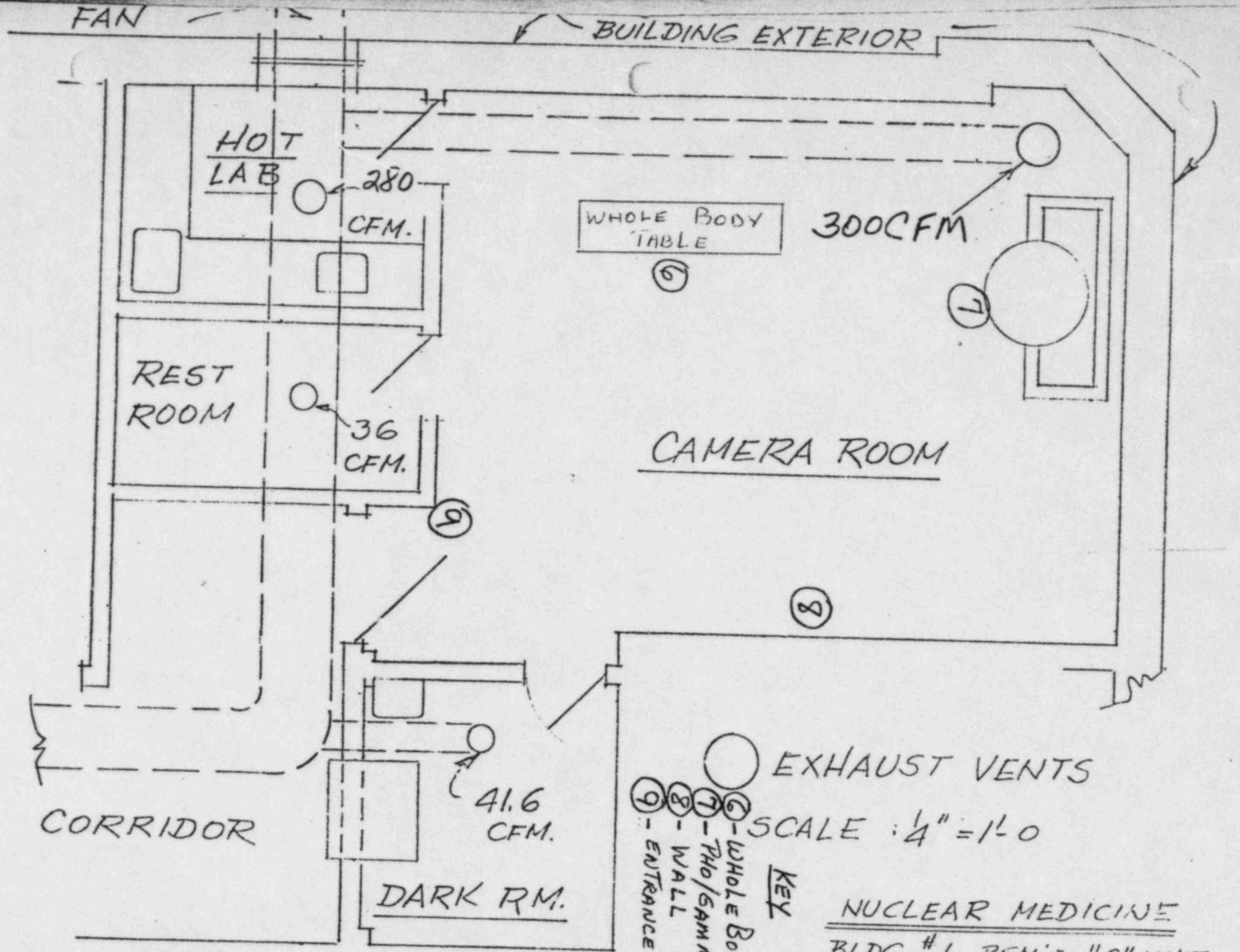


NUCLEAR MEDICINE

BLDG. #1 - BSM 1. "C" UNIT

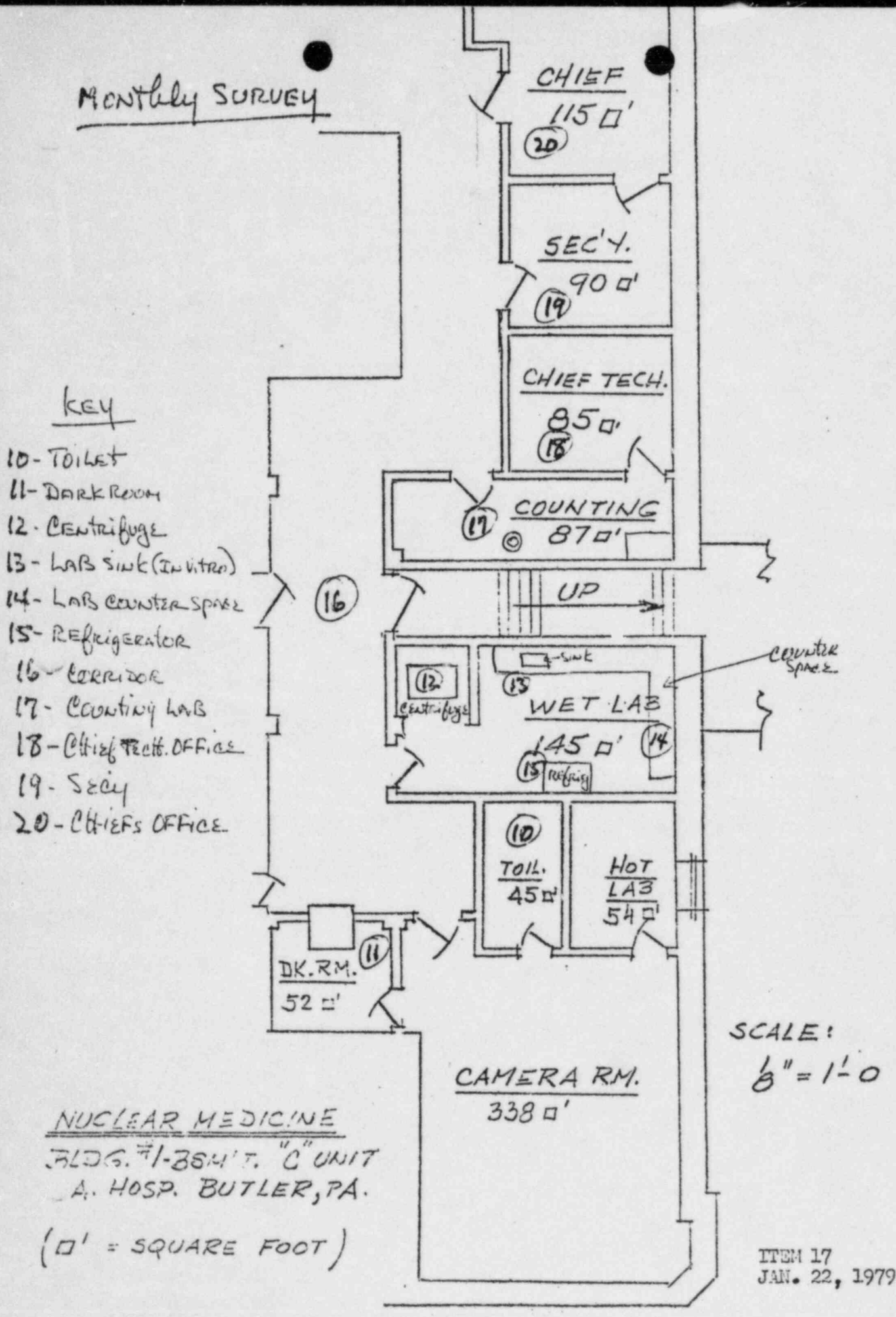
VA. HOSP. BUTLER, PA

DAILY SURVEY

ITEM 17

JAN. 22, 1979

Monthly Survey



KEY

10 - Toilet
11 - Dark Room
12 - Centrifuge
13 - Lab Sink (In Vitro)
14 - Lab Counter Space
15 - Refrigerator
16 - Corridor
17 - Counting Lab
18 - Chief Tech. Office
19 - Sec'y
20 - Chiefs Office

SCALE:
1/8" = 1'-0

NUCLEAR MEDICINE
BLDG. #1-BSMT. "C" UNIT
A. HOSP. BUTLER, PA.

(□' = SQUARE FOOT)

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WASTE DISPOSAL PROCEDURES

I. Decanted 125 Iodine liquid waste from in vitro procedures will be disposed of in the sanitary sewer system in accordance with Section 20.303 of 10 CFR Part 20.

Pertinent calculations are included below:

100 Cts = 10^{-4} microcuries (.0001)
39644 ÷ 100 = 396.44 x .0001 = .039644 microcuries

Allowable 4 x 10^{-5} = .00004
10 times 1 microcurie = 10 microcuries daily

A. Maximum activity used in our lab per day:

.039644 microcuries maximum/tube daily and maximum 100 tubes/day would be:

.039644 x 100 = 3.9644 microcuries daily which would be well within 10 microcuries limit daily.

B. Activity diluted by the average daily quantity of sewage released into the sewer:

Sewage Outflow:

1 gallon/3.5 sec = 24685.7 gallons/day = 93435374.5 ml/day.
Maximum daily activity released into sewage = 3.96 microcuries.
Maximum average concentration of daily activity in water equals

$$\frac{3.96 \text{ microcuries}}{93435374.5 \text{ ml}} = 4.2 \times 10^{-8} \text{ microcuries/ml} = 16.2 \times 10^{-8}/\text{ml}$$

May 1982 Apr 26

which is below permissible limits allowing concentration of 4 x 10^{-5} microcuries/ml of water.

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

Held for decay until radiation levels as measured with a low-level survey meter and with all shielding removed, have reached background levels. All radiation labels will be removed or obliterated and the generators disposed of as normal trash. If, at any time, this method is not feasible, the generators will be sent back to the manufacturer.

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III. Other solid waste and liquid waste will be:

Disposed of by commercial waste disposal service. The commercial waste disposal service used will be:

ADCO Servie, Inc
State of Washington

NRC License No. 37-09135-01

ITEM 18
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Xenon Lung Function Unit Model #36-001 manufactured by Nuclear Associates will be used for lung ventilation studies, with "Nonex" Xenon Gas Trap Model #36-022 and "Xen Alert" Room Air/Trap Monitor Model #36-751.

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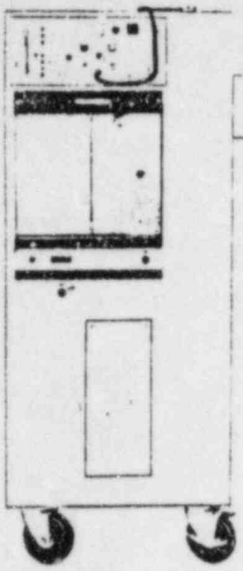


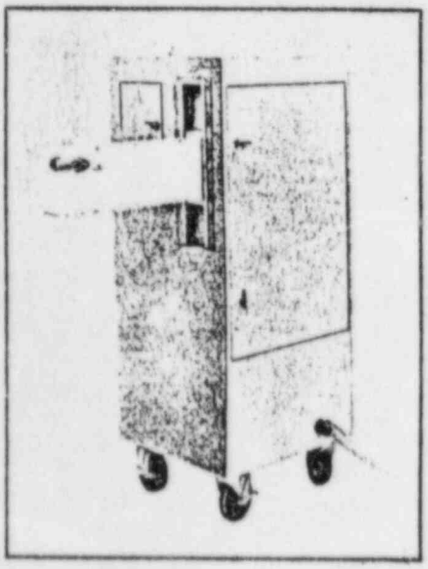
^{133}Xe Lung Function Unit

- Automatically provides a homogeneous gas mixture for patient.
- Permits resistance-free breathing in both equilibrium and washout cycles.
- 7.5-liter spirometer and kymograph provide accurate data display.
- Self-contained xenon and oxygen. Also accepts an external xenon source.
- Arm-mounted mouthpiece adjusts vertically from 40" to 50" above floor.
- Fully shielded. Cart-mounted for mobility.

The Xenon-133 Lung Function Unit is a fully-automated, self-contained system that enables the clinician to perform pulmonary function studies efficiently and with minimum effort. It has the same basic capabilities as more-sophisticated systems, and it includes many features not found elsewhere.

The Lung Function Unit can perform single breath, equilibrium, washout, and oxygen uptake studies routinely. Effluent gas is trapped in the system and expelled only on the operator's command. Xenon/air mixtures are withdrawn from the system automatically. Accidental gas release is eliminated by an automatic shutdown/washout mode.

Operation is by means of a hand-held remote controller that is attached to a 10-foot coil cord. The technician can administer to the patient and index the system as desired while operating the gamma camera.



Rear View of Lung Function Unit showing rear access door, adjustable arm, and xenon syringe-injection port (next to mouthpiece).

SPECIAL FEATURES

Homogeneous gas mixtures are fed to the patient automatically, and oxygen can be added at any time. Total dead space is minimized within the internally-occluded system.

Resistance-free breathing in all patient cycles is provided by a pump that constantly circulates the homogeneous gas mixture past the mouthpiece.

Self-contained xenon and oxygen supply. The instrument accepts a standard, internally-mounted cylinder of xenon gas and a standard oxygen bottle with regulator. Radioactive gas may also be administered through an exterior gas inlet or through a serum cap located on the adjustable arm. This cap allows the direct injection of xenon gas by syringe, permitting the patient to accept either a bolus of xenon or a homogeneous mixture.

7.5-liter spirometer and kymograph chart recorder provide optimum data display of inspired/expired air volume on an easy-to-read 10" chart. Kymograph speeds of 30, 60 and 1200 mm/minute permit a variety of display presentations.

Vertically-adjustable mouthpiece is located on a lead-shielded, counter-weighted arm which moves from 40" to 50" above the floor. This long 21" arm permits an interference-free view of the patient and allows the instrument to be positioned next to the gamma camera.

Fully lead shielded. When the system is loaded with 70 mCi of xenon-133 gas, the radiation level at any external surface is equivalent to background.

Complete mobility. Silent, ball-bearing rubber casters (5" D.) assure exceptional ease of movement. Two of the casters have wheel locks.

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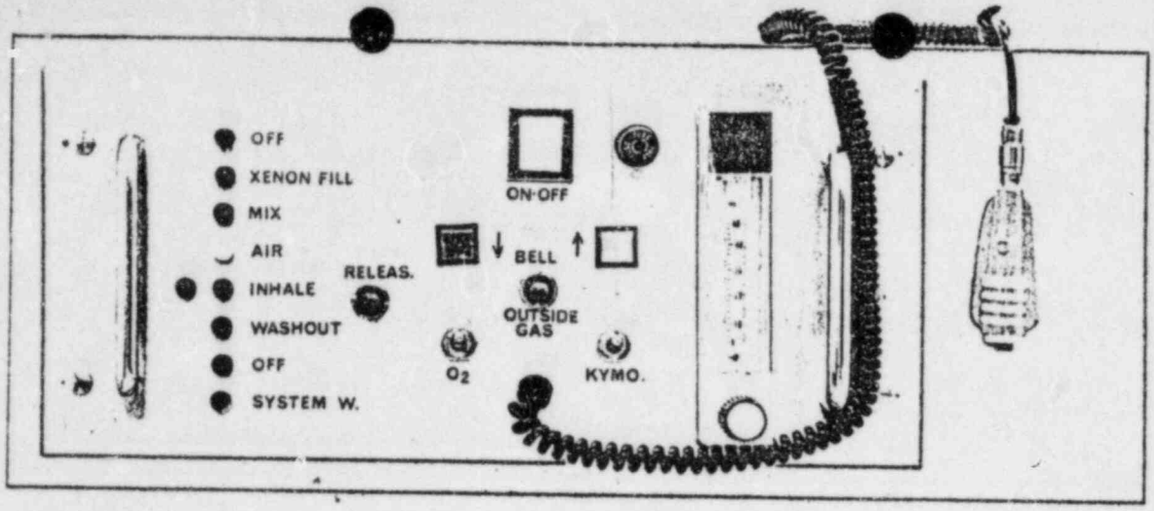


Control Panel showing automatic and manual control functions, oxygen flowmeter, and hand-held remote controller.

Automatic Functions

The automatic functions, indexed by a remote hand switch, are in the following sequence:

OFF—Unit is off.

XENON FILL—Xenon is filled from an internal cylinder, external cylinder, or xenon gun.

MIX CYCLE—Gas in the system is mixed by a blower.

PATIENT AIR—Patient is positioned and breathes ambient air (through the system) to adjust to the mouthpiece and system.

INHALE—Initiated as the patient exhales completely. Upon inhalation, the patient is automatically placed in the closed-circuit spirometer system. A second indicator light signals the technician to start time/count data acquisition, and the 3-speed kymograph is automatically switched on. The system maintains this steady-state condition until the operator moves to the washout cycle. Oxygen is fed from an internally-mounted bottle and is regulated to maintain a sufficient oxygen supply to the patient. An internally-mounted, removable CO_2 soda lime absorber is included.

PATIENT WASHOUT—Patient inhales ambient air and washes out through the system. When the camera indicates that the patient is sufficiently free of xenon, the operator moves to the "OFF" position.

OFF—Patient is removed from the system.

SYSTEM WASHOUT—An internal blower flushes the entire system rapidly and guarantees that no residual xenon-133 remains.

The system is now ready for the next study.

Sequential functions can be overridden at any time by means of the remote controller. The patient can become acclimated to the system (before the analysis begins) by breathing ambient air through the unit. The shielded arm (with mouthpiece) is adjustable from 40" to 50" above floor level to accept adult and adolescent patients.

Manual Control Functions

RAISE BELL—Fills the system with air via pump. Momentary switch operation.

LOWER BELL—Adjusts the bell volume to the clinician's requirements. Momentary switch operation.

OXYGEN REGULATOR & FLOW VALVE—Provides O_2 replenishment (or O_2 fill) to the spirometer system. Precision flowmeter (with needle valve) regulates the O_2 supply.

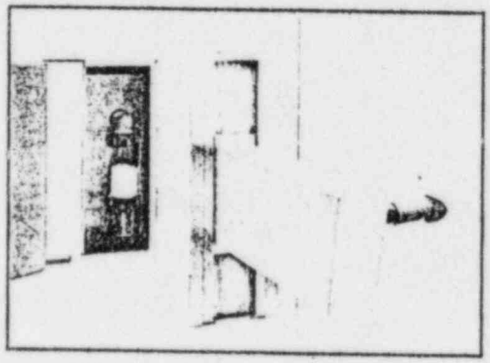
EXTERNAL GAS INLET—Used to charge the system with xenon from an external source or to admit a sterilizing agent (i.e., ethylene oxide).

KYMOGRAPH — MANUAL ON-OFF SWITCH — For use in other than the automatic mode.

AUTO SHUT-OFF—Turns off the unit in case of bell over-fill, and actuates an audible alarm.

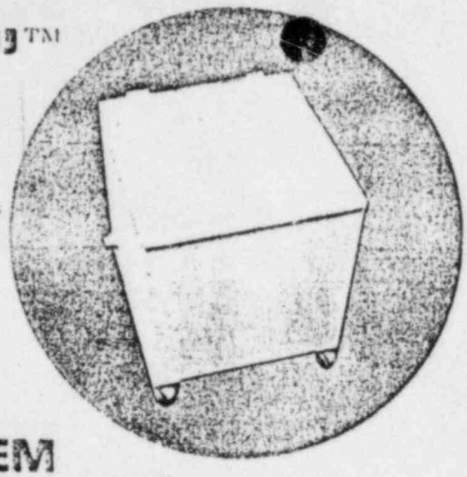
BELL OVER-FILL RELEASE—Releases the bell and places the unit automatically in the washout mode.

FILL CAP—For adding xenon into the system with a xenon gun. Port is located next to mouthpiece.

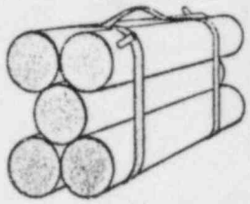


Side View of Lung Function Unit showing replaceable CO_2 absorber and adjustable arm with disposable mouthpiece.

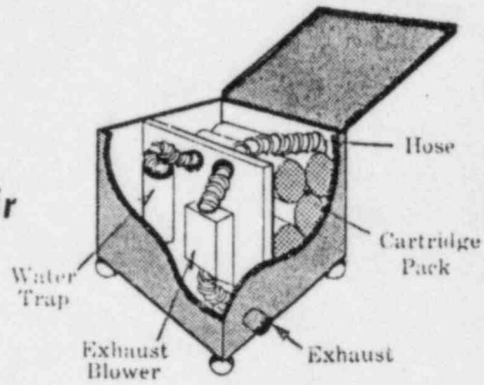
The "NONEX"™ XENON GAS TRAP*



Cartridge Pack



TURNS YOUR XENON CONTROL PROBLEM AROUND



Removes radioactive xenon from exhaled air

- **Ideal alternative to costly external vent systems.**
- **Compatible with any ^{133}Xe gas handling system.**
- **Fully shielded, self-contained, mobile.**

*TM Nuclear Associates Inc. *Patent Pending*

The efficient removal and containment of radioactive gases from exhaled air used in nuclear-medical studies is facilitated through the use of the "Nonex" Xenon Gas Trap.

The trap is designed specifically to adsorb inert radioactive gases such as ^{133}Xe. It removes ^{133}Xe from any exhaust flow, yielding an effluent concentration less than 1×10^{-5} μCi/cm^3* throughout the useful life of its disposable filter cartridges. The 5-cartridge tandem pack provides a low-velocity flow path and sufficient dwell time to effectively strip the xenon gas from the effluent stream. A charcoal adsorbent, especially formulated for xenon removal, guarantees high efficiency.

Exhaled air is drawn by a vacuum pump through five fixed charcoal-filter cartridges. The ^{133}Xe remains in the cartridges and decays. Cartridge life is dependent upon usage; a nomogram relates usage to lifetime. Typically, 20 mCi of ^{133}Xe per day with a 50-liter washout, five days per week, anticipates a cartridge life of approximately six months.

Competitive systems use a single filter cartridge having a limited adsorbtive lifetime which, when exhausted, cannot be conveniently replaced. **The 5-cartridge tandem pack in the "Nonex" can be changed in seconds.**

This self-contained mobile trap can be integrated into any ^{133}Xe system or may be used independently as a patient exhalation unit with the use of a disposable face mask. It is fully shielded with a ⅛" lead barrier surrounding the cartridge pack, making external radiation levels negligible. An internal cartridge on the input line, when filled with a desiccant, serves as a water trap. The unit may be used as a convenient seat for the upright patient or may be easily rolled on its casters beneath an imaging table for supine studies.

Low cost, simple operation, and high efficiency make the "Nonex" Trap an ideal alternative to costly exhaust systems.

Mounted on four 2" casters for easy, silent mobility. Includes a disposable face mask, on-off switch, water trap, and 5-liter/minute vacuum pump. 115V, 60 Hz. 15" L x 15" W x 15¼" H. Net weight 105 lbs.

36-022	"Nonex" Xenon Gas Trap	$745.00
02-711	Replacement Disposable Face Mask and connecting hose ....Dozen	15.00
36-026	Replacement Cartridge Pack	250.00

*Maximum permissible concentration in a controlled area, per Title 10 CFR 20, Appendix B, Table I, Column 1.

NUCLEAR ASSOCIATES, INC.
Subsidiary of
RADIATION-MEDICAL PRODUCTS CORP.
35 URBAN AVE. • WESTBURY, N. Y. 11590 • (516) 333-9344

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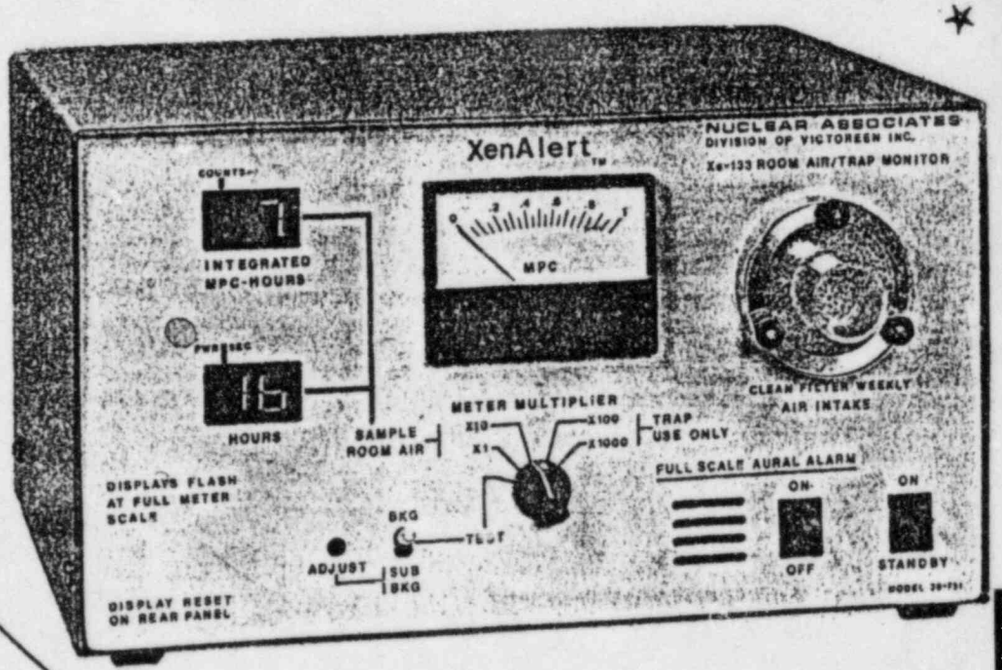
UNIQUE NEW "XenAlert"™

Xenon-133 Room Air/Trap Monitor*

The only instrument
that monitors exposure rate,
continuously integrates and displays the
xenon concentration of room air, in multiples of the
Maximum Permissible Concentration (MPC)[1],
and also monitors the effluent
from xenon gas traps.

- Large meter reads directly in MPC units.
- Digital register shows integrated MPC-Hours.
- Audio and visual alarms alert personnel to hazardous xenon concentrations.
- Fully-shielded counting chamber.
- Compatible with all xenon-dispens administration and trapping systen



* Patent Pending

™ Nuclear Associates

(1) The Code of Federal Regulations† clearly limits permissible ^{133}Xe exposure to 1 MPC for 40 hours per week for 13 weeks. This MPC-Hours limitation is continuously updated and displayed by the "XenAlert" Monitor.

† 10 CFR, Part 20, Sec. 20.103 and Appendix B, Table 1.

NUCLEAR ASSOCIATES

Division of VICTOREEN, INC.

VICTOREEN

100 Voice Road • Carle Place, N.Y. 11514
(516) 741-6360

ITEM 21
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5-97

"XenAlert" Xenon-133 Room Air/Trap Monitor

Now, concentrations of xenon-133 in room air *and* gas trap effluent can be quantitatively monitored continuously and accurately with the unique "XenAlert" Monitor. Unlike preset, non-integrating devices, the "XenAlert" eliminates tedious and complex calculations by automatically computing total exposure (in MPC-Hours units) and exposure rate (in fractions of MPC). Xenon monitoring has never been easier!

ROOM AIR MONITORING

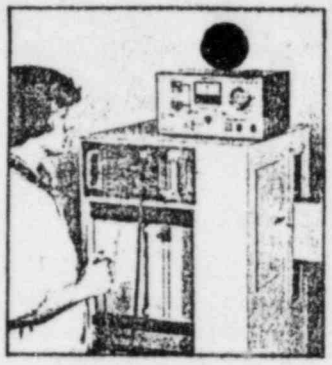
To continuously monitor and integrate room air concentration, the "XenAlert" is positioned near the xenon administration system and the imaging equipment. Room air is drawn into the counting chamber. The air samples are counted, and the air is exchanged about three times per minute. An analog meter continuously displays MPC units while two digital registers display integrated MPC-Hours and total hours (running time) respectively. When the ^{133}Xe room air concentration exceeds full scale (X1 or X10 positions), the digital registers flash on and off as a warning to personnel. In addition, an audible alarm can be activated.

At the end of each work day, the "XenAlert" is switched to the stand-by mode. Data acquisition is suspended, but accumulated data is held in memory. In the morning (or whenever a xenon study is to be performed) the "XenAlert" is re-activated and data accumulation continues. At the start of each work week, the "XenAlert" is reset to zero and the procedures are repeated.

The "XenAlert's" unique features allow personnel to assess their xenon exposure quantitatively. An accidental release of xenon, such as from a broken vial or an uncooperative patient, may temporarily raise the ^{133}Xe room air concentration well above 1 MPC. The degree to which the NRC limits have been reached, however, depends on the amount of activity released and the time required for the room's exhaust system to exchange the restricted area's air. The "XenAlert" takes these factors into account with the display of MPC hours. Personnel are immediately aware of both the MPC concentration to which they were exposed and the total integrated MPC hours, in terms of NRC-regulated exposure limits.

Additional "XenAlert" Features

- ★ **Background Subtract Circuit.** Permits subtraction of background radiation to assure maximum accuracy when counting ^{133}Xe.
- ★ **Total Hours Register.** Displays total hours of xenon data accumulation.
- ★ **Power Indicator.** Light-emitting diode flashes once per second to indicate data accumulation.
- ★ **Integration Disable Circuit.** Suspends MPC-Hours and Hours data accumulation during gas trap monitoring, assuring that the digital registers will display only room air integration values.
- ★ **Emergency Alarm.** Loud alarm is activated automatically when 80 MPC-Hours have been accumulated.



"XenAlert" monitors room air during lung function study.

"XenAlert" displays gas trap output directly in MPC units.

GAS TRAP MONITORING

The "XenAlert" greatly simplifies the monitoring of effluent air from any xenon trap. Setting the analog meter multiplier to X100 or X1000 displays 10^{-3} μCi/ml or 10^{-2} μCi/ml full scale. Concentrations approaching the latter level at the trap's exhaust port can result in a xenon room air concentration approaching 1 MPC. Therefore, the monitor alerts personnel to the gas trap's effectiveness and the need for a replacement filter.

Specifications

Detector: 5-cm (2") diam. pancake thin-window GM tube.
Accuracy: Better than 20%.
Reproducibility: Better than 5%.
Calibration Factors: X1 = 10^{-5} μCi/ml; X10 = 10^{-4} μCi/ml; X100 = 10^{-3} μCi/ml; X1000 = 10^{-2} μCi/ml.
Counting Chamber: Shielded with 9.5 mm (⅜") lead.
Air Exchange System: Centrifugal blower exchanges air 3 times per minute.
Air Intake Port: 2.5 cm (1") diameter front-panel port with re-usable particulate-matter filter.
MPC Meter: Analog with ranges of 1, 10, 100 and 1000 MPC, full scale.
Time Constants: 40 sec on X1, 4 sec on X10, 0.4 sec on X100, and 0.04 sec on X1000.
MPC-Hours Register: 0-99; 2-digit light-emitting diode (LED).
Hours Register: 0-99; 2-digit light-emitting diode (LED).
Visual Alarm: LED registers flash at 1/sec rate at full-scale meter reading in X1 or X10 ranges.
Audio Alarm: Intermittent tone. User-selectable to alarm at 1 MPC or 10 MPC level.
Emergency Audio Alarm: Continuous tone on reaching 80 MPC-Hours (integration and data accumulation continue to 99 hours).
Background Subtract Circuit: Activated by moving range switch to Test position. Allows meter display of background count rate or internal subtracted background count rate. Enables user to adjust subtracted background.
Reset Function: Rear-panel pushbutton resets MPC-Hours and Hours displays to zero.
Standby Function: Switch terminates data accumulation when xenon studies are not in progress. Prior accumulated data remains held in memory.
Memory Storage Circuit: Retains accumulated data during momentary power losses.
Power: 115V, 60 Hz, 25W (230V, 50 Hz on special order).
Size: 17 cm (6.7") high x 31 cm (12.2") wide x 27 cm (10.6") deep.
Weight: Net 23 kg (50 lbs.).

36-751 "XenAlert" ^{133}Xe Room Air/Trap Monitor....$1600.00

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XENON^{133} VENTILATION

I. Preparation before patient arrives:

1. Make sure spirometer tank is filled with distilled H2O. (Make sure tank drain is closed.) Free iodine radical (Lugols Sol.) can be added to maintain sterility (spirometer tank H2O should be changed at 1 month intervals).

2. Open rear door and make sure all hose connections are intact.

3. Turn unit on by depressing momentary ON/OFF switch.

4. Using remote hand control, advance system to "OFF" position (top light).

5. Turn kymograph switch ON (up position) and insert pen thru hole on pen carriage. Do not use pressure on pen - should have just light marking on paper.

6. Depress momentary bell button (Green) and add 4 liters of air to spirometer system.

7. Open left side panel and make sure O2 tank fittings and hose are O.K.

8. Place O2 switch on front panel on "ON" position (up).

9. Open valve on O2 regulator to about 2 to 2½ PSI - check on flowmeter for about 150 cc/min.

10. Add O2 to spirometer system - 1 LITER to a total of 5 liters. (4 liters air, 1 liter O2.)

11. Turn O2 OFF and flowmeter OFF.

12. Load gun with vial 20 mCi Xenon^{133} vial and #18 needle.

13. Have camera set up on Xenon^{133} with 20% window set for count and preset it for 100K. Deo spectrum with Xenon source.

14. Close all rooms during Xenon study.

II. Patient Imaging:

1. Patient in room with back to collimator (parallel). Use sponge pad between patient and camera.

2. With instrument in "OFF" position, insert #18 G. needle of cartridge gun into diaphragm on instrument arm at an angle and inject Xenon^{133} by depressing plunger and depressing bulb 3 times. Advance system to mix and allow to mix for at least 2 minutes.

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III. Restricted Area Calculation:

A = Maximum microcuries per week

V = Air flow volume

F = Escape fraction

Maximum amount of $Xenon^{133}$ gas to be used per week - 10 patients receiving 20 mCi each would equal 200 mCi total.
Therefore, when converted to microcuries

$A = 2 \times 10^5$ microcuries/week
Escape fraction = 0.25
F = 0.25

Total measured air flow velocity is 300 cubic feet/min.
Therefore, V - 300 cubic feet/min. x $6.797 \times 10^7 = 2.0391 \times 10^{10}$ ml

$$\frac{A}{V} \times F = \frac{2 \times 10^5 \text{ microcuries/40 hr. week}}{2.0391 \times 10^{10} \text{ ml/40 hr. week}} \times 0.25 =$$

0.245×10^{-5} microcuries/ml (which is below MPC limit of 1×10^{-5} microcuries/ml.)

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3. Instruct patient that you will ask him to inhale, then exhale and hold it for a few seconds, and on second inhalation he will hold his breath as long as he can, indicating the termination by raising his left hand.

4. After Xenon mix, place patient on system with system on "AIR." Insert mouth piece and nose clip and check for any breathing difficulty - if O.K., proceed with instructions to patient.

5. As patient holds breath for a few seconds on expiration advance system to inhale and as click sounds as patient takes second inspiration and holds breath start camera count immediately - try for 100K if possible.

6. After 100K total counts or as long as patient can hold breath - take film. When patient starts expiration turn 02 switch on, start kymograph and turn flowmeter on. If noted on kymograph that patient is not getting enough 02, increase flowmeter rate until graph is stable. Take 1 minute films until patient equilibrates.

7. After equilibration advance system to "washout," turn flowmeter off, 02 off, kymograph off, and trap switch on. Set camera on automatic and preset time to 60 seconds. Take films every 60 seconds and record counts until patient is relatively free of Xenon.

8. Advance unit to OFF position, remove patient from system and have patient wait in waiting room for perfusion study.

9. Advance system to system washout and allow to flush for 5 to 10 minutes. At this time sterilizing agent can be utilized by employing the external gas fill switch located on front panel.

10. After washout is complete, advance system to OFF, turn unit OFF - turn 02 regulator OFF and 02 main valve OFF.

11. During the procedure the doors will be closed and the exhaust system will be turned on.

PROCEDURES AND PRECAUTIONS FOR USE OF
RADIOACTIVE MATERIAL SPECIFIED IN ITEM 6.B.

Not applicable

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PROCEDURES AND PRECAUTIONS FOR USE OF
RADIOACTIVE MATERIAL IN ANIMALS

Not applicable

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24. PERSONNEL MONITORING DEVICES

	TYPE (Check appropriate box)	SUPPLIER	EXCHANGE FREQUENCY
a. WHOLE BODY	[X] FILM	Searle Diagnostics Inc.	Monthly
	[ ] TLD		
	[ ] OTHER (Specify)		
b. FINGER	[ ] FILM		
	[X] TLD Technologists	Searle Diagnostics Inc.	Monthly
	[X] OTHER (Specify) Technologists--Wrist Badge	Searle Diagnostics Inc.	Monthly
c. OTHER (Specify)			

25. FOR PRIVATE PRACTICE APPLICANTS ONLY

a. HOSPITAL AGREEING TO ACCEPT PATIENTS CONTAINING RADIOACTIVE MATERIAL

NAME OF HOSPITAL (Not applicable)

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, Part 30, 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)*

LICENSE FEE CATEGORY:

(2) LICENSE FEE ENCLOSED: $

b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)*

(1) NAME *(Type or Print)*

(2) TITLE

c. DATE