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

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

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

Wilmington Medical Center
Att. Dr. Allston Morris, M.D.
501 W. 14th St.
Wilmington Delaware 19899

TELEPHONE NO.: AREA CODE (302) 428 2596

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

Delaware Division
501 W. 14 St.
Wilmington Delaware 19899
Wilmington General Division
201 S. Broom St.
Wilmington, Delaware 19805

2. PERSON TO CONTACT REGARDING THIS APPLICATION

Edward Torvik

TELEPHONE NO.: AREA CODE (302) 428 4595

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

a. ☐ NEW LICENSE
b. ☐ AMENDMENT TO LICENSE NO. _____
c. ☒ RENEWAL OF LICENSE NO. 07-12153-02

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

See Attached Item 4

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

Edward Torvik, Sc.D.

6.a. RADIOACTIVE MATERIAL FOR MEDICAL USE

RADIOACTIVE MATERIAL LISTED IN:	ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS (In millicuries)
10 CFR 31.11 FOR IN VITRO STUDIES	X	
10 CFR 35.100, SCHEDULE A, GROUP I	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP II	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP III	X	5000
10 CFR 35.100, SCHEDULE A, GROUP IV	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP V	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP VI	X	2000

ADDITIONAL ITEMS:	MARK ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS (In millicuries)
IODINE-131 AS IODIDE FOR TREATMENT OF HYPERTHYROIDISM	X	200
PHOSPHORUS-32 AS SOLUBLE PHOSPHATE FOR TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA AND BONE METASTASES		
PHOSPHORUS-32 AS COLLOIDAL CHROMIC PHOSPHATE FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS	X	
GOLD-198 AS COLLOID FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.		
IODINE-131 AS IODIDE FOR TREATMENT OF THYROID CARCINOMA	X	500
XENON-133 AS GAS OR GAS IN SALINE FOR BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES	X	500

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
Cesium-137	Sealed Source	150	Calibration of Survey Instrument
Uranium (Depleted in Uranium-235)	Cadmium plated	175 kilograms	Shielding for Clinac-4 linear accelerator
Nicket-63	Metal sealed source	15	Electron Capture Detector Cell Hewlett Packard Model No. 18713A

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	
X	Names and Specialties Attached; and
	Duties as in Appendix B; or *(Check One)*
X	Equivalent Duties Attached
8. TRAINING AND EXPERIENCE	
	Supplements A & B Attached for Each Individual User; and See License No. 07-12153-02
	Supplement A Attached for RSO See License No. 07-12153-02
9. INSTRUMENTATION *(Check One)*	
	Appendix C Form Attached; or
X	List by Name and Model Number
10. CALIBRATION OF INSTRUMENTS	
	Appendix D Procedures Followed for Survey Instruments; or *(Check One)*
X	Equivalent Procedures Attached; and
	Appendix D Procedures Followed for Dose Calibrator; or *(Check One)*
X	Equivalent Procedures Attached
11. FACILITIES AND EQUIPMENT	
X	Description and Diagram Attached
12. PERSONNEL TRAINING PROGRAM	
X	Description of Training Attached
13. PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL	
X	Detailed Information Attached
14. PROCEDURES FOR SAFELY OPENING PACKAGES CONTAINING RADIOACTIVE MATERIALS *(Check One)*	
X	Appendix F Procedures Followed; or
	Equivalent Procedures Attached

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

24. PERSONNEL MONITORING DEVICES

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

d. OTHER (Specify)

25. FOR PRIVATE PRACTICE APPLICANTS ONLY

a. HOSPITAL AGREEING TO ACCEPT PATIENTS CONTAINING RADIOACTIVE MATERIAL

NAME OF HOSPITAL
Wilmington Medical Center

MAILING ADDRESS
P. O. Box 1668

CITY: Wilmington | STATE: DE | ZIP CODE: 19899

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

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

26. CERTIFICATE

(This item must be completed by applicant)

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

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

(1) LICENSE FEE CATEGORY: 7-B

(2) LICENSE FEE ENCLOSED: $150.00

b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)*
Allston J. Morris, M.D.

(1) NAME *(Type or Print)*
Allston J. Morris, M.D.

(2) TITLE
Vice President for Medical Affairs

c. DATE
July 27, 1982

PRIVACY ACT STATEMENT

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

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

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

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

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

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

Item 4. Individual Users: The following listed individuals were authorized users under License Number 07-12153-02, Amendment No. 32. Dr. Robert W. Frelick, M.D. has been deleted from this list because he is no longer on the medical staff of the Wilmington Medical Center.

Ekkehard S. Schubert, M.D.

Robert L. Meckelnburg, M.D.

Vidya Sagar, M.D.

Donald C. Tilton, D.O.

Carlo A. Cuccia, M.D.

Viroon Donavanik, M.D.

7. MEDICAL ISOTOPE COMMITTEE:

Names and Specialities Attached:

Robert L. Meckelnburg, M.D., Chairman	Nuclear Medicine
Allston J. Morris, M.D.	Vice President for Medical Affairs
P. John Pegg, M.D.,	Pathology
Josephine Piccone, Ph.D.	Consulting Physicist
James Taylor, M.D.	Radiologist
Robert N. Arm, D.M.D.	Dental Clinac
Olin S. Allen, M.D.	Radiology
Edward Torvik., Sc.D.	Radiation Safty Officer
Thomas Larkin	Director of Ancillary Services
Lynda Carpenito, R.N.	Nursing
Carlo Cuccia, M.D.	Radiation Therapy
Vidya Sagar, M.D.	Nuclear Medicine
Joseph Casella, M.D.	Pathology
Joseph Solge, Jr., R.T.	Radiation Safety Technologist
Nelia Thomas, R.T.	Nuclear Medicine
Timothy F. Wozniak, M.D.	Oncologist

A-2.1 THE COMMITTEE ON IONIZING RADIATION shall consist of at least five members and shall include the Directors respectively of the Departments of Radiation Therapy and Radiology, the Director of the Isotope Laboratory, the Director of the Department of Pathology or his designate, a radiation physicist, and a medical oncologist. The committee shall meet at least quarterly and keep minutes of its proceedings for submittal to staff council. In addition the committee may call for consultation from other members of the Staff as needed. The Chairman of the Committee on Cancer shall be an ex officio member of the committee on Ionizing Radiation, and the Chairman of the Committee on Ionizing Radiation shall similarly be an ex officio member of the Committee on Cancer. The Radiation Safety Officer, if not the physicist member, shall also be a member of this committee.

The functions of this committee shall be as follows:

(1) Inform the Credentials Committee which physicians are qualified and adequately trained in the use of radium and radioactive substances.

(2) Make recommendations to the Staff Council concerning the use of all forms of ionizing radiation within the Medical Center, whether for diagnostic or therapeutic use. The committee shall also review and comment on training programs within the Center related to ionizing radiation.

(3) Maintain a continous study of safety and control of the use of radium and isotopes for diagnostic and therapeutic use within the Center.

(4) Make recommendations to the Chief Administrative Officer of the Center concerning equipment, space, facilities, and other administrative matters relating to ionizing radiation.

(5) Monitor compliance with appropriate state and federal regulatory standards and report these matters regularly to administration and to Staff Council.

(6) The Committee will review the Medical Center's radiation safety program annually. This will be done no later than the end of the first calendar quarter.

REVISED
6/24/74

May 1982 WILMINGTON MEDICAL CENTER

Item 9.

Name of Instrument	Number Available	Radiation Detected	Sensitivity	Model No.	Used to:
G.M. Survey Meters					
Picker	1	Beta/gamma	3 linear ranges 0-50 mR/hr.		Survey & monitor
Victoreen	1	"	7 linear ranges 0-100 mR/hr.	491	"
Victoreen	1	"	3 linear ranges 0-50 mR/hr.		"
Eberline	4	"	4 linear ranges 0-200 mR/hr.	E-530	"
Victoreen	1	"	3 linear ranges 1-100 mR/hr.	493	"
Ion-chamber Survey Instruments					
Eberline	2	"	Log scale 0-1000 mR/hr.	PIC-3	"
Victoreen Radector III	2	"	0.1-100 mR/hr. 0.1-100 R/hr. 0.1-100 kR/hr.		"
Mech-Tronics Single Channel Analyser with sodium iodide well crystal Radiation Detector	1	gamma			leak test sealed sources

ITEM 9 7-28-82

9

WILMINGTON MEDICAL CENTER

NUCLEAR MEDICINE

EQUIPMENT

GENERAL DIVISION

1982

EQUIPMENT	MODEL NUMBER
PICKER DYNA CAMERA 4	615-235
CLEON WHOLE-BODY SCANNER	760
NUCLEAR ASSOCIATES XENON LUNG FUNCTION UNIT	06163
PICKER UPTAKE UNIT PROBE SCALER WELL	
SQUIBB DOSE CALIBRATOR	CRC-6A
NUCLEAR ASSOCIATES VICTOREEN XENALERT ROOM AIRTRAP MONITOR	36-751
HOOD, LAMINAR FLOW SYSTEM LABCONCO INCORPORATED	47702
PAKO MODEL XU AUTOMATIC PROCESSOR	

9 Item 9.

WILMINGTON MEDICAL CENTER

NUCLEAR MEDICINE

EQUIPMENT

DELAWARE DIVISION

1982

EQUIPMENT	MODEL NUMBER
SIEMENS PHO/GAMMA CAMERA V	76407
SIEMENS SCINTIVIEW (MICRO DOT)	3196
SIEMENS PHO/GAMMA L.E.M. (MOBILE)	6475
SIEMENS SCINTISTORE (MOBILE) DATA STORAGE	3189
TECHNICARE GAMMA/CAMERA LFOV	SIGMA 438
TECHNICARE 450 COMPUTER	VIP 450
NUCLEAR ASSOCIATES XENON LUNG FUNCTION UNIT	36-002
PICKER UPTAKE UNIT (SPECTROSCALER 3A) (DUAL RATE COMPUTER) (DUAL CHANNEL ANALYZER) (PROBE AND STAND)	600145
CARDIAC STRESS SYSTEM (ENGINEERING DYNAMICS CORPORATION)	3407
NUCLEAR ASSOCIATES VICTOREEN XENALERT ROOM AIR TRAP MONITOR	36-751
BRATTLE PHYSIOLOGICAL SYNCHRONIZER	202
KODAK RAPID PROCESSING X-OMAT PROCESSOR	
SQUIBB CRC DOSE CALIBRATOR PRINTER COMPUTER	CRC-17 CRC-PV CRC-17U
SQUIBB CRC DOSE CALIBRATOR	CRC-6A
WELL COUNTER - THE NUCLEUS	1000

Item 10. Calibration of Instruments:

Calibration of survey meters shall be performed using the Victoreen Model 681, Small Instrument Calibrator, containing a 93.4 millicurie (9-2-77) cesium-137 source.

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

2. The calibration procedure used for any particular instrument will be the one listed by the manufacturer in their operational manual. Whenever possible, survey instruments will be calibrated at approximately one-third and two thirds of full scale reading for each scale selection.

3. Instruments will be considered in calibration as long as measured exposure rate and calculated rate differ by less than 10 percent for each point checked. Also, when higher scales are not checked or calibrated, an appropriate precautionary note will be posted on the instrument.

4. All radiation survey instruments will be calibrated in the Physics Lab. of the Department of Radiation Therapy, located in the basement of the Wilmington General Division. When survey instrument calibrator is in use the primary beam will be directed toward the outside, underground wall. The individual performing instrument calibration will wear a lithium fluoride ring dosimeter on his left hand and film badge dosimeter on shirt collar, left hand side. When not in use the survey instrument calibrator will be placed in the Radium Storage Room behind 5/8 inch lead shielding. A floor plan of the calibration area and also dose rates existing around the instrument calibration source when source is in the "ON" position is included.

Calibration of Gamma Cameras, Well Counters:

The method, frequency and standards used for calibrating the gamma cameras and well counters will be the ones recommended by the manufacturer.

CALIBRATION OF SURVEY INSTRUMENTS

Check appropriate items.

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

_____ 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

X a. By the manufacturer when instrument is sent in for repairs

X b. At the licensee's facility

(1) Calibration source

Manufacturer's name Technical Operations, Inc. Radiation Products Division
Model no. Model 681 (Victoreen)
Activity in millicuries 93.4 (9-2-77)
or
Exposure rate at a specified distance 0.02989 Roentgens per hour at 1-meter
Accuracy +/- 3 percent
Traceability to primary standard NBS

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

or

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

_____ c. By a consultant or outside firm

(1) Name _____

(2) Location _____

(3) Procedures and sources

_____ have been approved by NRC and are on file in License No. _____

_____ 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.

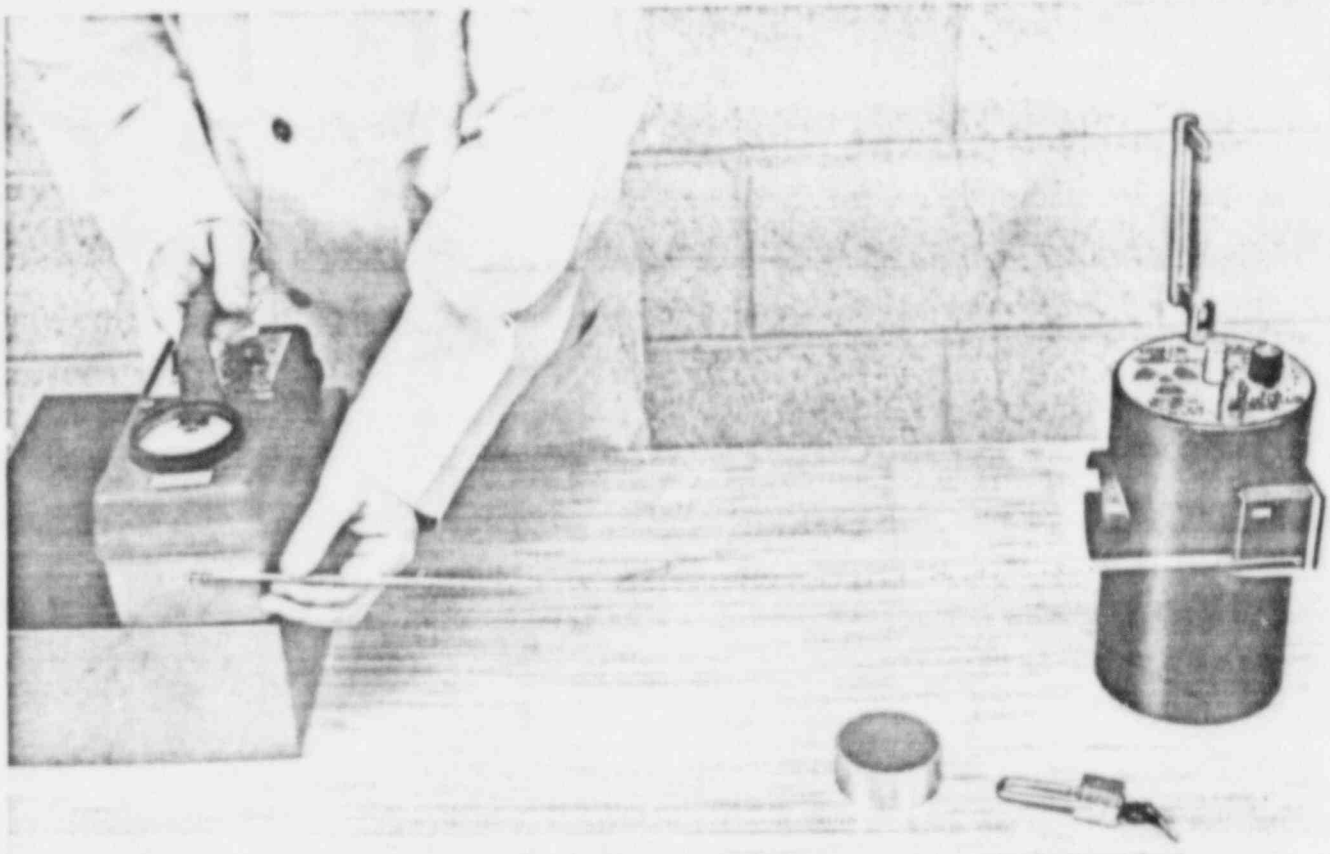
_____ are described in the attachment, and the consultant's report will contain the information on

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

TECHNICAL DATA

VICTOREEN
Victoreen Instrument Division,
10101 Woodland Avenue,
Cleveland, Ohio 44104
SHELLER-GLOBE CORPORATION

MODEL 681 . . . SMALL INSTRUMENT CALIBRATOR



Features

- Radiation Fields For 2 mR/Hr To 1500 mR/Hr.
- Automatic Exposure Timer.
- Long Half-Life, Non-Removable ^{137}Cs Source.
- Safe and Easy To Use.

The Model 681 Small Instrument Calibrator gives the user the capability of calibrating his portable survey instruments on their normally used ranges. It does away with the expense, inconvenience and use-time lost when sending instruments to an outside calibration service. The Model 681 is safe and easy to use and can be locked to prevent unauthorized use.

Form: 3262-4-75
Litho U.S.A.

MODEL 681 . . . SMALL INSTRUMENT CALIBRATOR

TECHNICAL INFORMATION

The Model 681 consists of a 100 mCi ^{137}Cs source permanently attached to a movable rod which is installed in a lead shield casting. The assembly is enclosed in a cylindrical steel weldment which is 5 inches in diameter (12.7cm) and 8-1/2 inches high (21.6 cm). The entire unit weighs only 31 pounds (14.1 Kg). The shipping weight is 40 pounds (18.4 Kg).

The source can be placed in two positions, either stored or exposed. In the fully shielded stored position the radiation level at the surface of the container is less than 140 mR/hr, at 6 inches away from the container it is 20 mR/hr and at 3-1/2 feet the radiation level is less than 0.5 mR/hr. In the exposed position the source is placed in front of a port which provides a 45° conical beam, horizontally oriented. The radiation level in this beam can vary from less than 2 mR/hr to over 1.5 R/hr, depending on the distance from the port. A 20:1 attenuator is provided with the Calibrator to permit low level calibrations to be made at a reasonable distance. For safety, the Calibrator includes a preset timer which limits the source's exposure period. The timer can be set to a maximum of 15 minutes. At expiration of the preset time period the source automatically drops into the stored position.

A steel tape measure is permanently attached to the side of the Calibrator and so positioned that it can be used to measure the distance from the source to the instrument being calibrated. This data is then used to determine the actual level of radiation at the instrument.

A key lock prevents any unauthorized use of the equipment. A convenient carrying handle is provided. The overall dimensions of the Model 681 are 12-1/4 inches high (31.1 cm), 6 inches wide (15.2 cm) and 5-1/2 inches deep (14.0 cm).

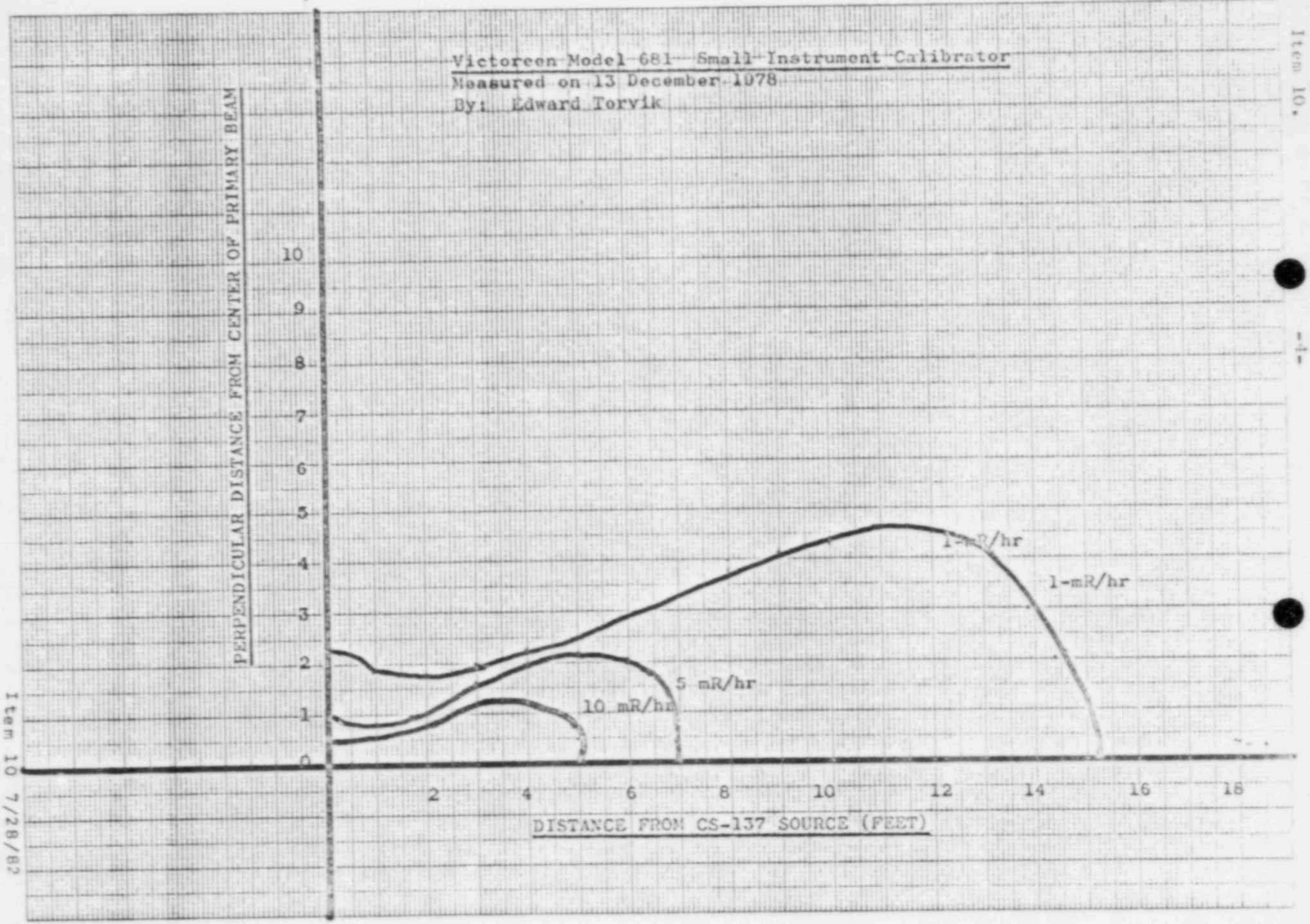
Before the unit can be shipped, Victoreen must have written documentation proving the purchaser is licensed to possess 100 mCi of ^{137}Cs. Victoreen will assist the purchaser in obtaining the license by providing appropriate information on the Model 681 which the purchaser can then submit with his license application.

VICTOREEN

ITEM 10 7-28-82

WILMINGTON MEDICAL CENTER

Victoreen Model 681 Small Instrument Calibrator
Measured on 13 December 1978
By: Edward Torvik



Item 10.

Item 10 7/28/82

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EXTERNAL CONTAMINATION OR LEAKAGE

DATE 9-13-77 MICROCURIES <.005 BY T.R.

DATE 9-21-77 MICROCURIES <.005 BY T.R.

TECHNICAL OPERATIONS INC.

Technical Operations, Incorporated

Radiation Products Division
Burlington, Massachusetts 01803

GAMMA RAY SOURCE CALIBRATION

Isotope	Test No.	Date Measured
Cs 137	0577	9-2-77

Source Identification	Roentgens/Hr. at 1 Meter	Curies
S-253	.0289	.031
	.0293 on mo. 2, 1978	

The gamma-ray emission of the sealed source herein described was intercompared with the radiation from a reference standard cobalt-60 source whose intensity had been established relative to a National Bureau of Standards calibrated cobalt-60 source. Comparison was made either with an uncollimated plastic-lined ionization chamber encased in a 3-mm thick aluminum container sealed against atmospheric pressure, or with an NBS-calibrated Victoreen R-meter whose readings were compensated for atmospheric pressure and temperature. All readings were corrected for air scattering and absorption. The source was measured with its axis of symmetry parallel with/perpendicular to the line joining source and detector. The reported output is believed to be accurate within ± 3 percent, the stated uncertainty of the reference NBS sources. Precision is believed to be better than ± 1 percent.

Signed Robert R. Bentley

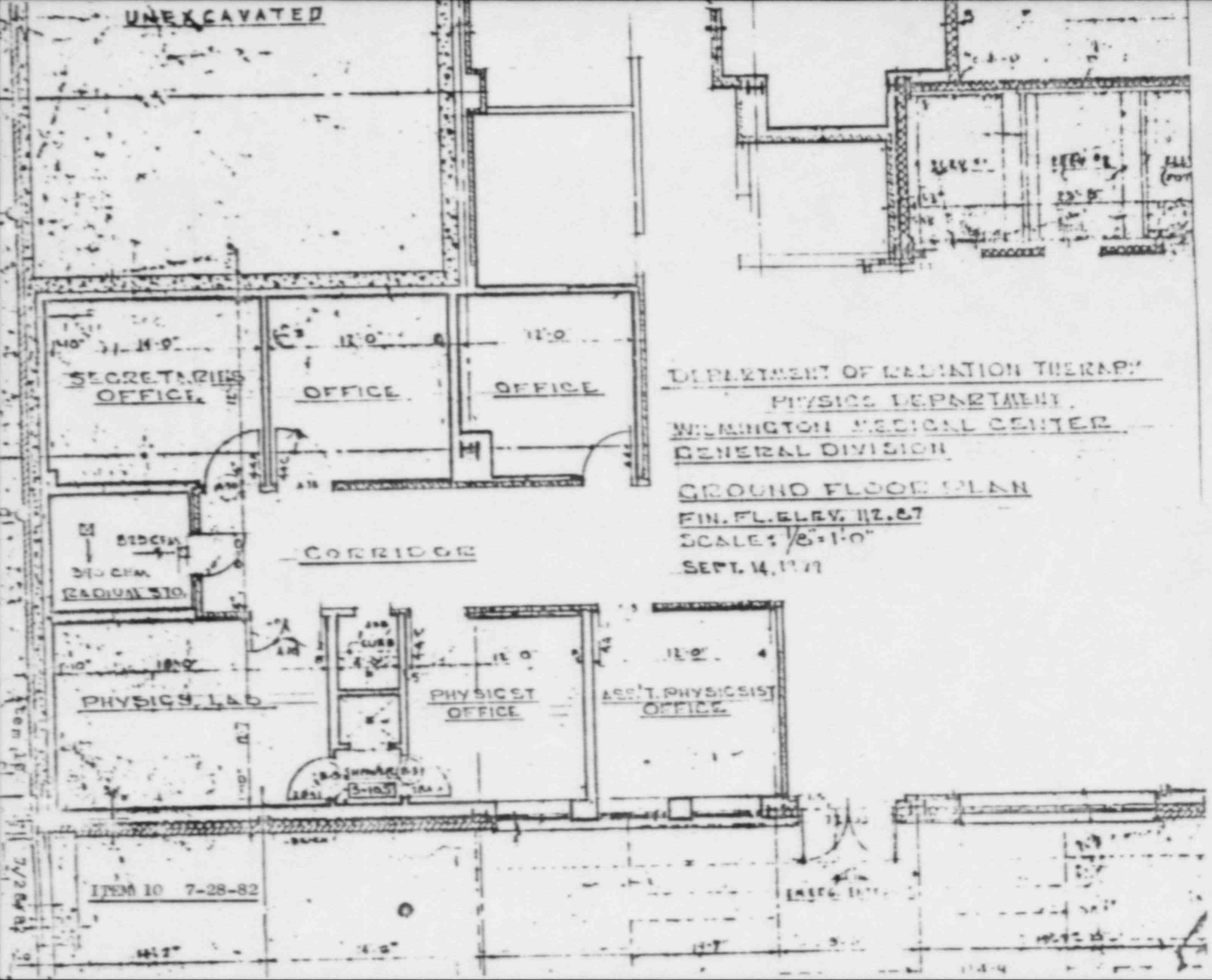
Calibration performed for: Wilmington Medical Ctr.
Mod. 726 S/N 150 Chestnut & Broom
Wilmington, Delaware

Source decay correction factors

Cobalt-60		Iridium-192		Cesium-137
years	mos	weeks	days	years
1.000	1.000	1.000	1.000	1.000
.877	.989	.937	.991	.977
.768	.978	.877	.981	.955
.674	.967	.821	.972	.933
.590	.957	.769	.963	.912
.518	.946	.721	.954	.892
.454	.936	.675	.945	.871
.398	.926	.632	.937	.852
.349	.916	.592		.832
.306	.905	.554		.813
.268	.895	.519		.795
.235	.886	.486		.777
.206	.877	.455		.759
5.26y		74.0d		30.2y
1.30		0.55		0.32

Item 10.

Item 10. 7/28/82


UNEXCAVATED
SECRETARIES OFFICE
OFFICE
OFFICE
CORRIDOR
RADIUM SIO.
PHYSICS LAB
PHYSICIST OFFICE
ASS'T. PHYSICSIST OFFICE
DEPARTMENT OF RADIATION THERAPY
PHYSICS DEPARTMENT
WILMINGTON MEDICAL CENTER
GENERAL DIVISION
GROUND FLOOR PLAN
FIN. FL. ELEV. 112.67
SCALE: 1/8"=1'-0"
SEPT. 14, 1977
ITEM 10 7-28-82

METHODS FOR CALIBRATION OF DOSE CALIBRATOR

A. Test for the following:

1. Instrument constancy (daily)
2. Instrument accuracy (at installation and annually thereafter)
3. Instrument lindarity (at installation and quarterly thereafter)
4. Geometrical variation (at installation)

B. After repair or adjustment of the dose calibrator, appropriate tests will be repeated, depending upon the nature of the repairs.

C. Test for Instrument Constancy

Instrument constancy means that there is a reproducibility, within an acceptable stated degree of precision, in measuring a constant activity over time. A ^{57}Co source will be assayed using a reproducible geometry before each day's use of the instrument. The results of these assays will compared to a posted plot on semilog graph paper of net activity versus the day of the year for the source used. The procedure is as follows:

1. Assay the reference source using the appropriate instrument setting.
2. Measure the background level at the same setting and calculate the net activity by subtracting out the background level.
3. Log in the value obtained in the calibration book after comit with the value indicated on the decay graph, allowing a variation of $\pm$ 5.0 percent of the predicted activity.
4. Variations greater than $\pm$ 5.0 percent from the predicted activity indicate the need for instrument repair or adjustment.
5. Investigate higher than normal background levels to determine their origin and to eliminate them if possible by decontamination, relocation, etc.

D. Test for Instrument Linearity

The linearity of the dose calibrator should be ascertained over the entire range of activities employed. This test will use a vial of ^{99m}Tc whose activity is equivalent to the maximum anticipated activity to be assayed. Procedure as follows:

1. Assay the ^{99m}Tc vial in the dose calibrator, and subtract background level to obtain net activity in millicuries.
2. Repeat step 1 at time intervals of 6, 24, 30, and 48 hours after the initial assay.
3. Using the 30-hour activity measurement as a starting point, calculate the predicted activities at 0, 6, 24, and 48 hours using the following table:

Dose calibrator calibration cont.

Assay Time (hrs.)	Correction Factor
0	31.633
6	15.853
24	1.995
30	1.0
48	0.126

4. On log-log coordinate graph paper, plot the measured net activity (for each time interval) versus the calculated activity (for the same time interval).
5. The activities plotted should be within ± 5.0 percentof the calculated activity if the instrument is linear and functioning properly. Errors greater than ± 5.0 percent indicate the need for repair or adjustment of the instrument.
6. If instrument linearity cannot be corrected, it will be necessary in routine assays to use either (a) an aliquot of the eluate that can be accurately measured or (b) the graph constructed in step 4 to relate measured activities to calculated activities.

E. Test for Instrument Accuracy

Check the accuracy of the dose calibrator for ^{137}Cs, ^{57}Co, and either ^{133}Ba or ^{60}Co, using appropriate reference standards whose activities have been calibrated by comparisons with standard sources that have been assayed by NBS and documented. Procedure as follows:

1. Assay the reference standard in the dose calibrator at the appropriate setting, and subtract the background level to obtain the net activity.
2. Repeat step 1 for a total of three determinations, and average the results.
3. The average activity determined in step 2 should agree with the certified activity of the reference source within ± 5.0 percent after decay corrections.
4. Repeat the above steps for each radionuclide used routinely for this test for the instrument in question.
5. Keep a log of these calibration checks.
6. Calibration checks that do not agree within ± 5.0 percent indicate that the instrument should be repaired or adjusted. If this is not possible, then a calibration factor should be calculated for use during routine assays of radionuclides.
7. At the same time that the instrument is being initially calibrated in the department with the reference standards, place a long-lived sourcein the calibrator, set the instrument, in turn, at the various radionuclide settings used and record the readings. These values may later be used to check instrument calibration at each setting (after correcting for decay of the long-lived source) without requiring more reference standards. Keep a log of these initial and subsequent readings.

Dose calibrator calibration cont.

F. Test for Geometrical Variation

There may be significant geometrical variation in activity measured as a function of sample volume or configuration, depending on the volume and size of the ionization chamber used in the dose calibrator. The extent of geometrical variation should be ascertained for commonly used radionuclides and appropriate correction factors computed if variations are greater than $\pm$ 2.0 percent. When available from the manufacturer, certified data on geometrical variations may be used in lieu of these measurements.

To measure variation with volume of liquid, a 30-cc vial containing 2 mCi of ^{57}Co or other appropriate -adionuclide in a volume of 1 ml will be used.

1. Assay the vial at the appropriate instrument setting, and subtract background to obtain net activity.
2. Increase the volume of the liquid in the vial insteps to 2, 4, 8, 10, 20, and 25 ml by adding the apporpriate amount of water or saline. After each addition, gently shake vial to mix contents and assay as in step 1.
3. Select one volume as a standard (such as the volume of reference standard used for performing the test for instrument accuracy), and calculate the ratio of measured activities for each volume to the reference volume activity. This represents the volume correction factor (CF).
   Ex.: If activities of 2.04, 2.02, and 2.00 mCi are measured for 4, 8, and 10 ml volumes and 10 ml is the reference volume selected,

$$4 \text{ ml Volume CF} = \frac{2.00}{2.04} = 0.98$$

4. Plot the correction factors against the volume on linear graph paper. Use this graph to select the proper volume correction factor for routine assay of that radionuclide and calculate true activity as follows:

True Activity = Measured Activity x Correction Factor

Facilities and Equipment:

Nuclear Medicine Hot Lab and Storage Room:

At the Wilmington General Division and Delaware Division the Molybdenum-99/Technetium-99_m generators are placed in lead enclosures that have been designed to contain that particular generator.

All diagnostic radionuclide doses are prepared by the nuclear medicine technologist while standing behind a lead L-block with a plastic viewing window.

Lead syringe shields, vial shields and long handled tongs are provided in both nuclear medicine facilities for use by technologist.

Radium Storage Room:

The Radium Storage Room is located in the Department of Radiation Therapy, Wilmington General Division. All brachytherapy sources are prepared for patient use by a member of the physics section. All applicators are prepared by physicist or radium curator while standing behind a two (2) inch thick L-Block with leaded glass window. These L-Blocks (two) have been designed to provide shielding for personnel working with Radium-226 needles and capsules.

Long handled hemostats, storage and transport containers, long handled carts are also located in this room for use by Department of Radiation Therapy personnel.

Fume Hood:

A fume hood has been installed at the Wilmington General Division, in the Thyroid Uptake Room of the Nuclear Medicine Section. Air flow rates are measured at intervals not to exceed six (6) months.

Portable Shielding:

Portable Shielding is utilized for patients undergoing brachytherapy. This radiation shielding is placed between patient's bed and entrance door to the room. Each brachytherapy patient is placed in a private room.

Xenon-133 Rooms:

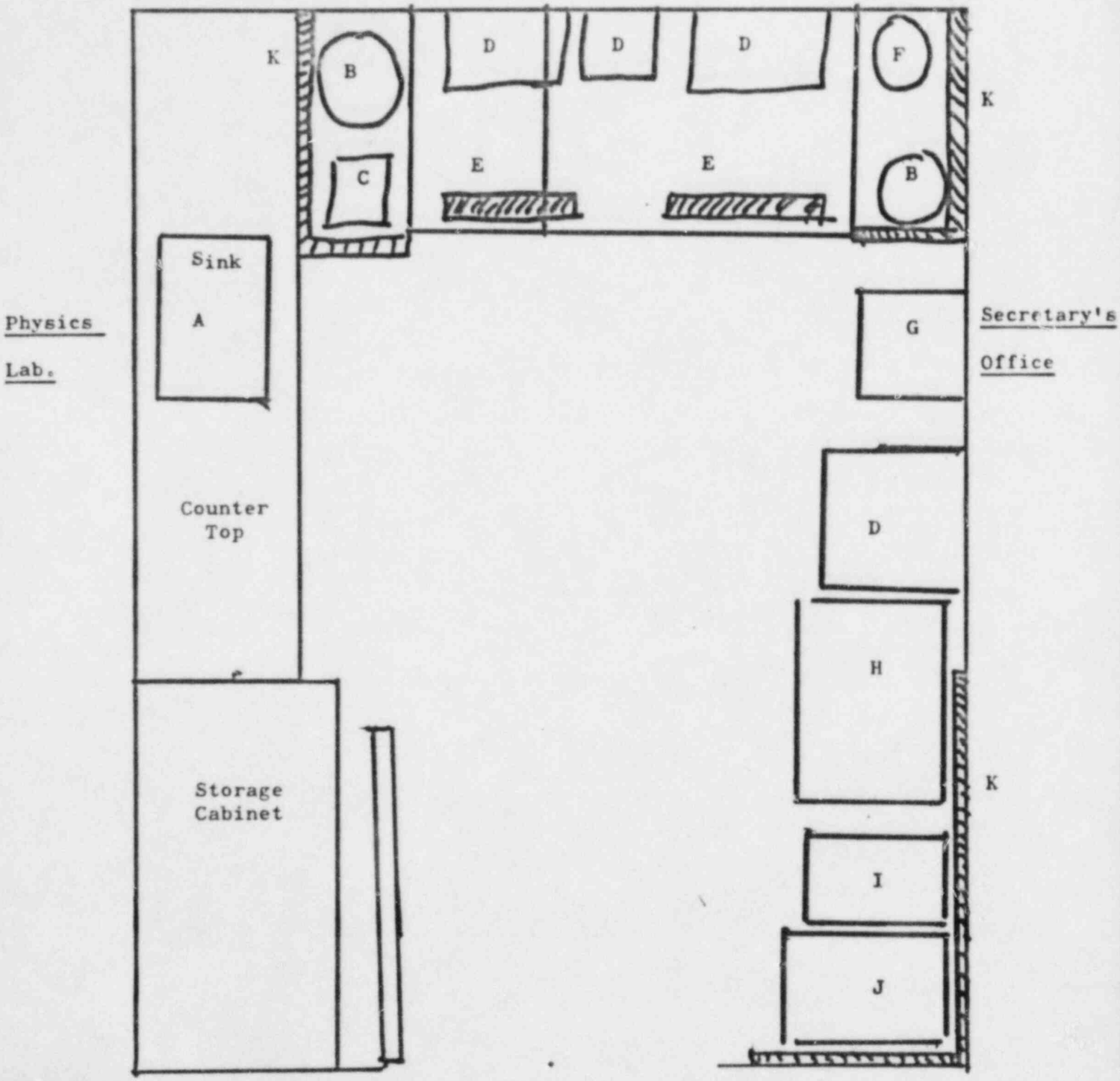
Both divisions have XenAlert (Nuclear Associates) in the room in which Xenon-133 studies are performed. Air flow rates are measured at intervals not to exceed six (6) months.

WILMINGTON MEDICAL CENTER

General Division

Figure I

Radium Storage Room



Item 11 7/28/82

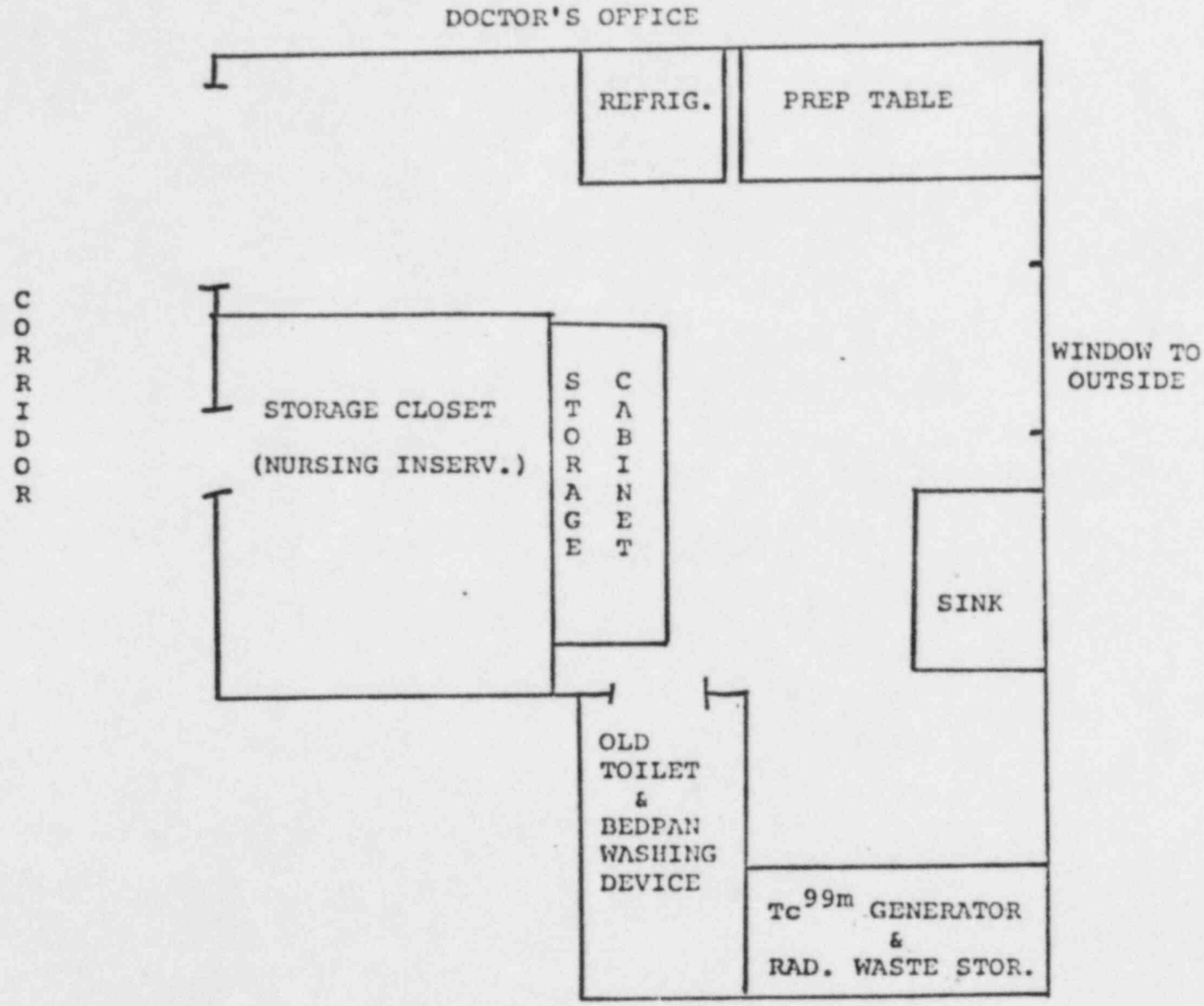
11-b

WILMINGTON MEDICAL CENTER
WILMINGTON GENERAL DIVISION

April 1982

NUCLEAR MEDICINE LABORATORY
Third floor, North wing

"Hot lab"

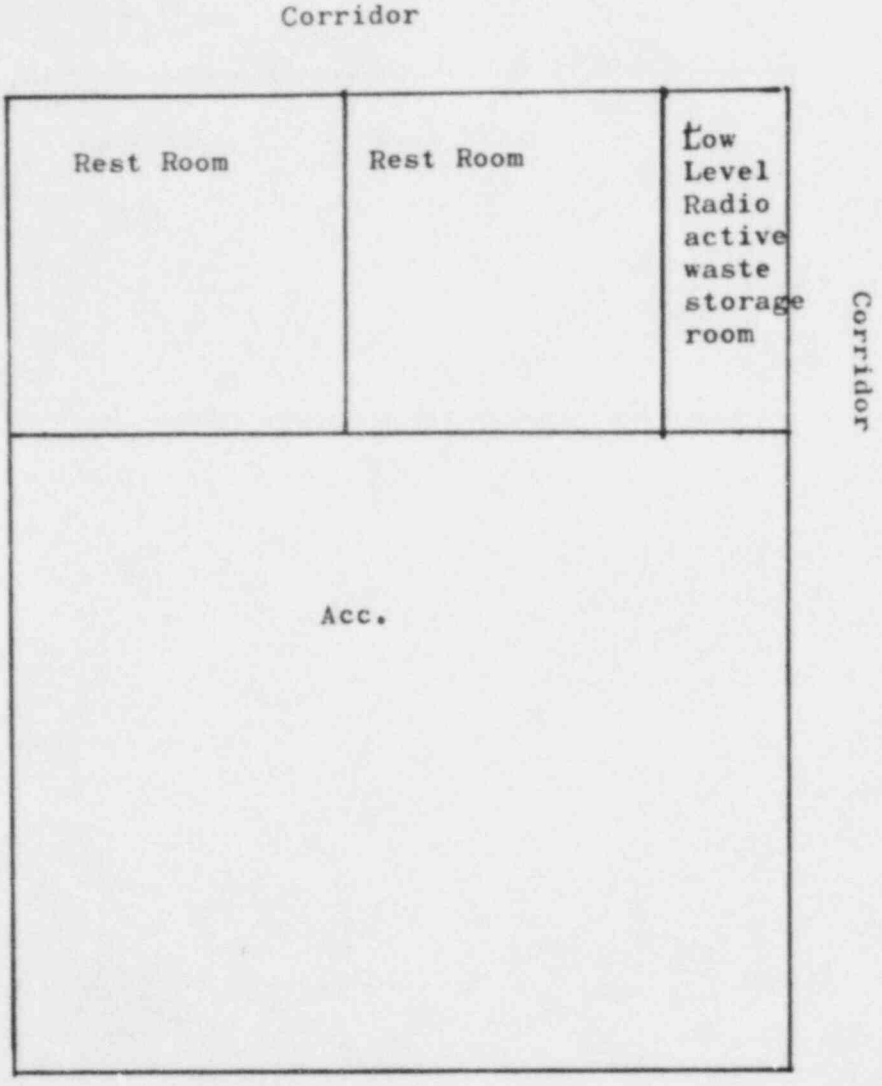


CYTOGENETICS LABORATORY

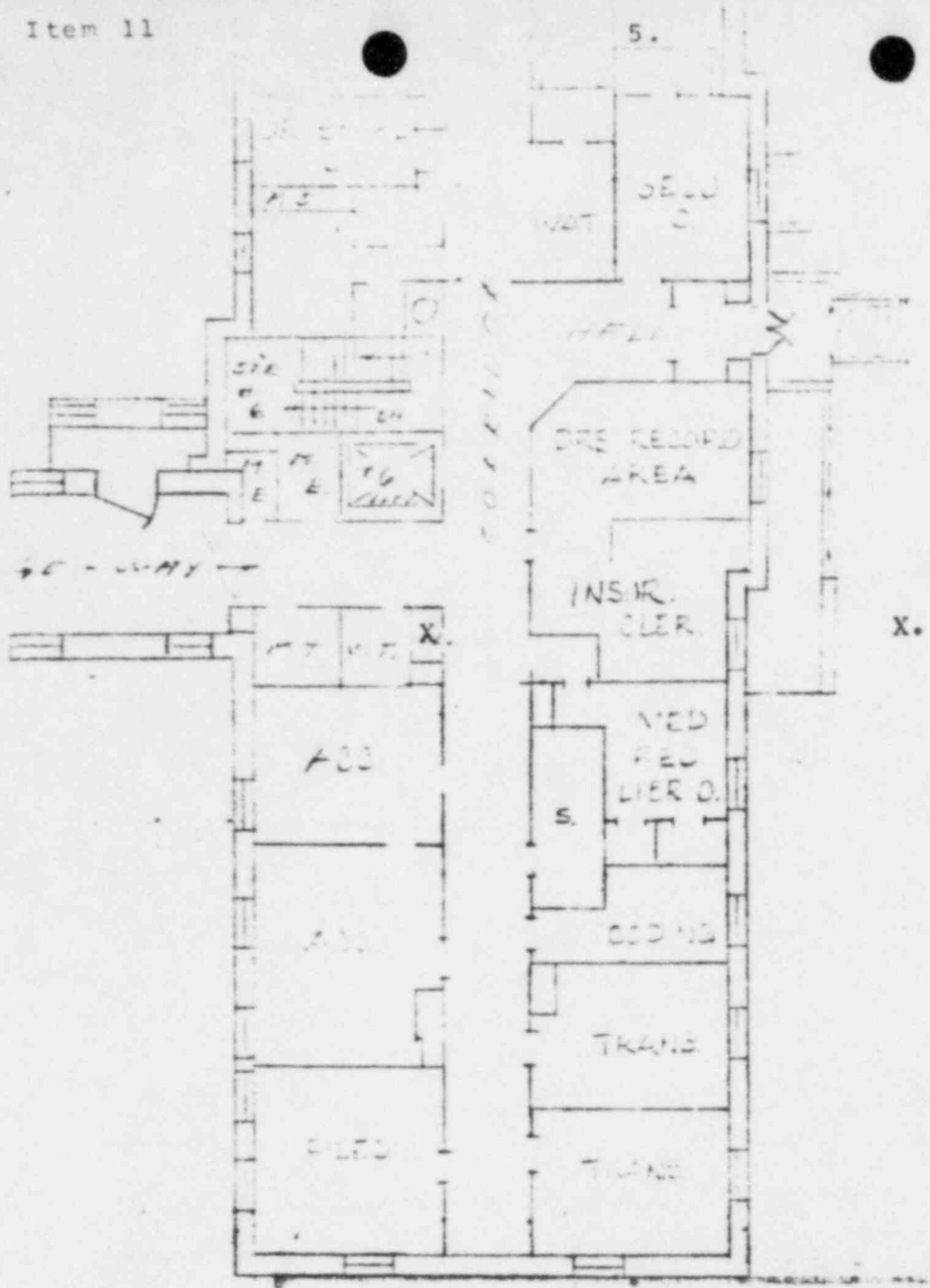
Nuclear Medicine Section

Wilmington General Division

Low Level Radioactive Waste
Storage Room



Item 11 7/28/82



X. Low Level Radioactive Waste Storage Room

NO	BY	DATE	REVISION

WILMINGTON GEN

FIRST FLOO

S., W., N. & MAI

WILMINGTON MEDIC

PLANNING & FACILITIES

501 W. 14TH ST. - WIL

APPROVALS — INITIALS / DATE

ADM. VICE PRESIDENT

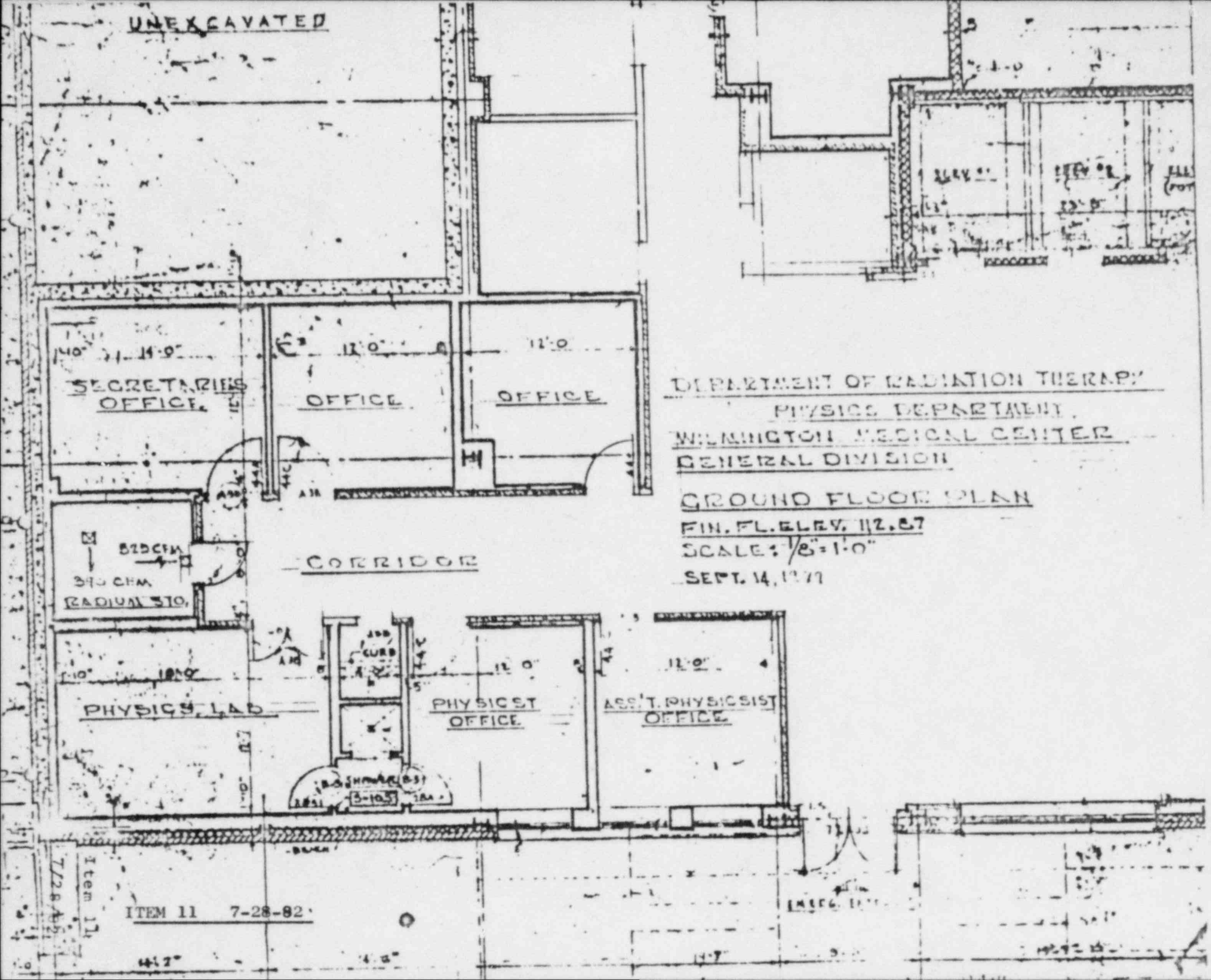
EXECUTIVE DIRECTOR

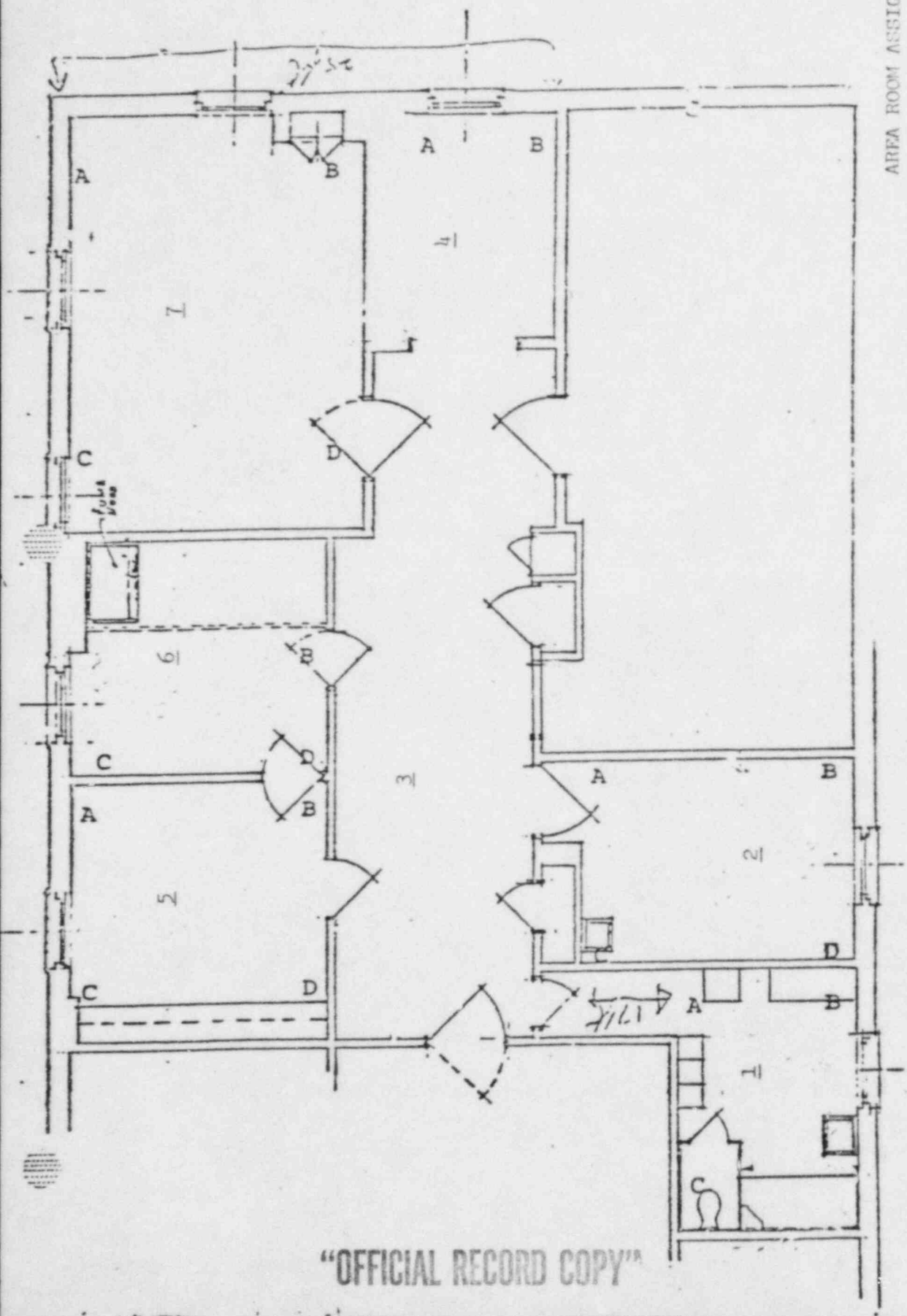
DIV. OF PLANNING

ADMINISTRATOR

DEPARTMENT HEAD

BUILDING COMM.





AREA ROOM ASSIGNMENTS

ROOM NUMBER	ASSIGNMENT
1	HOT LAB
2	PHYSICIANS OFFICE
3	SECRETARIAL AREA
4	WAITING ROOM
5	GAMMA CAMERA IMAGING
6	UPTAKE ROOM
7	WHOLE BODY SCANNER

NUCLEAR MEDICINE DEPT. 3rd Fl. North Gen.

GENERAL DIVISION

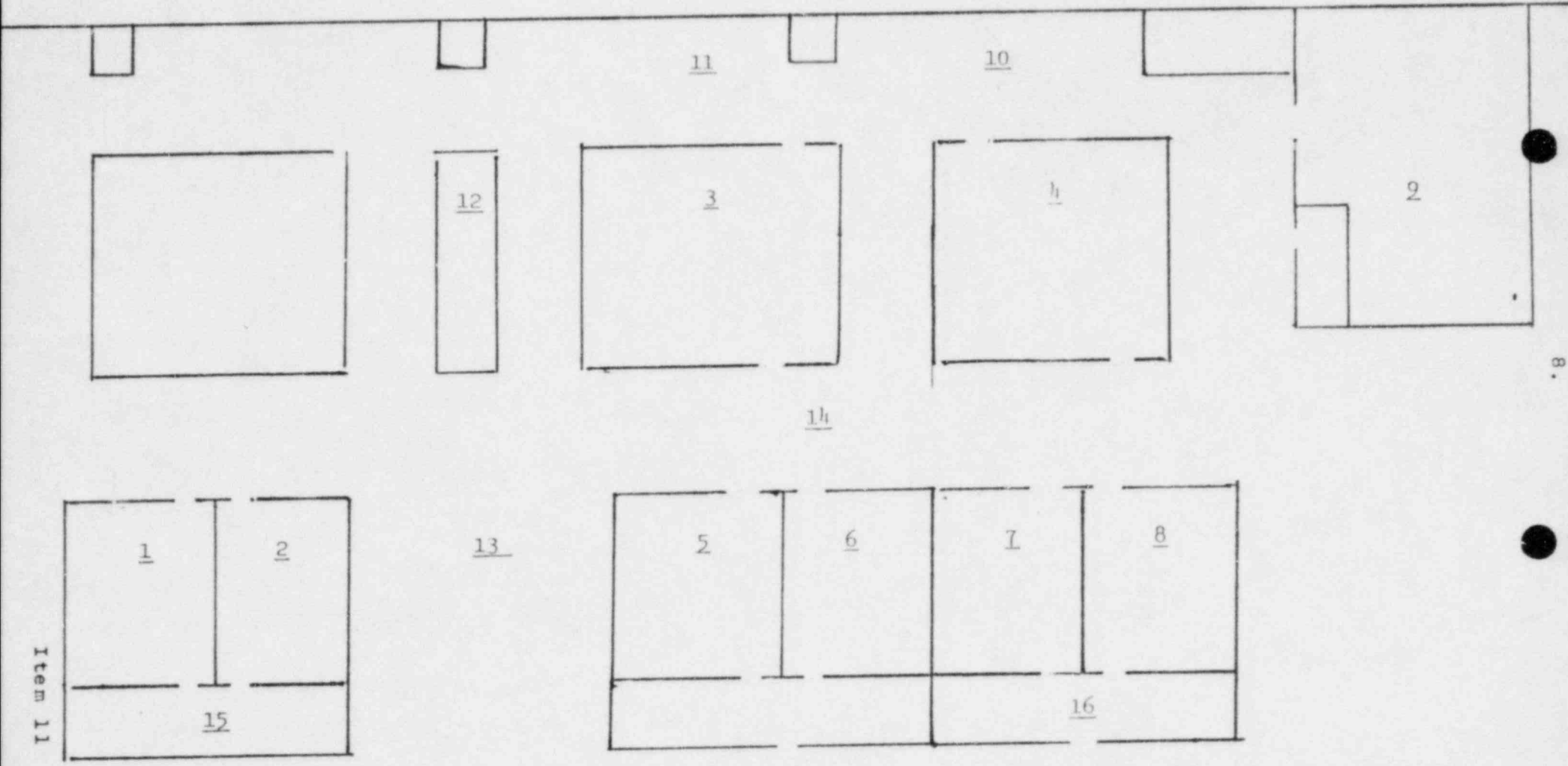
1982

WILMINGTON MEDICAL CENTER

NUCLEAR MEDICINE

DELAWARE DIVISION

Item 11



8.

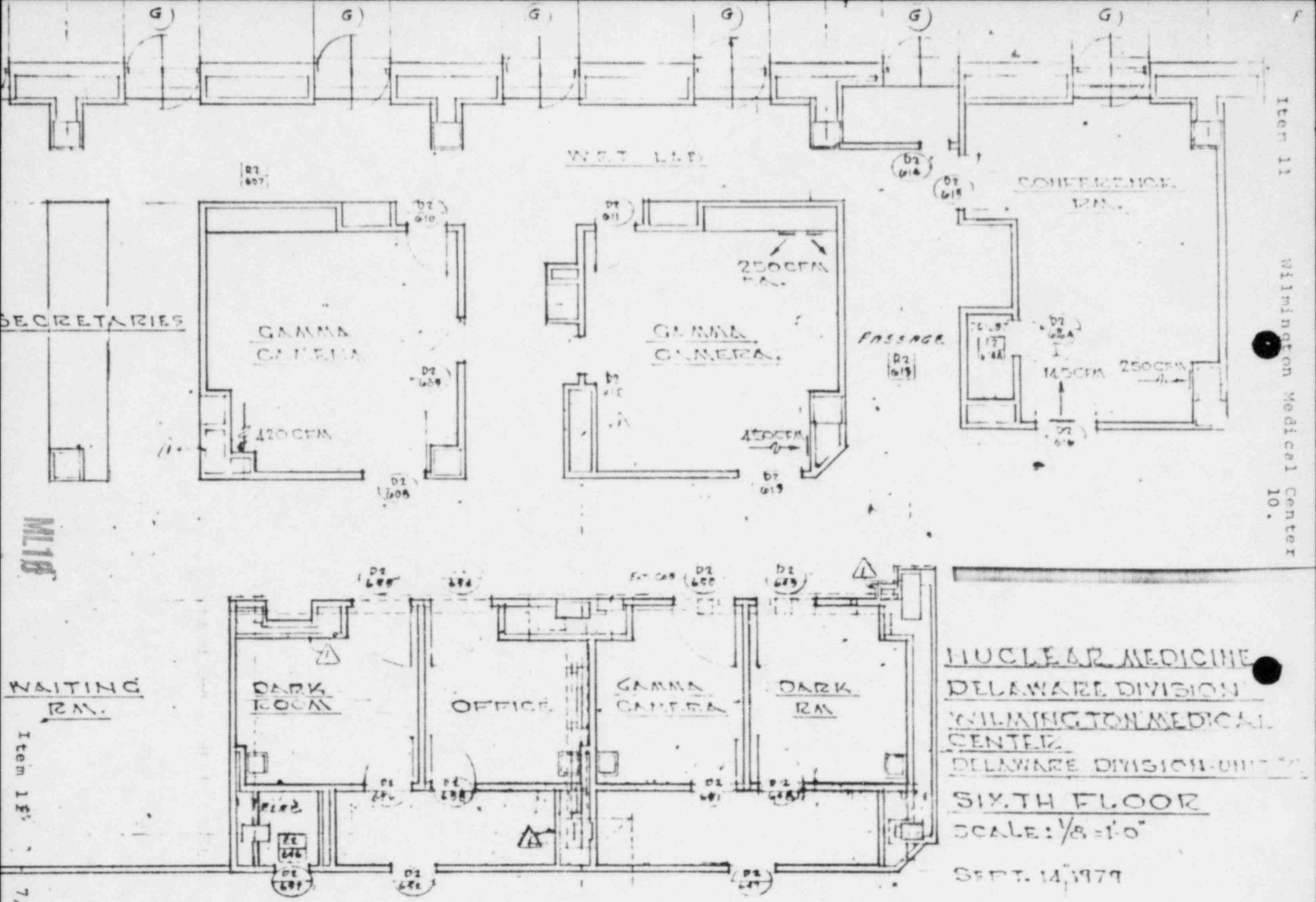
Item 11 7/28/82

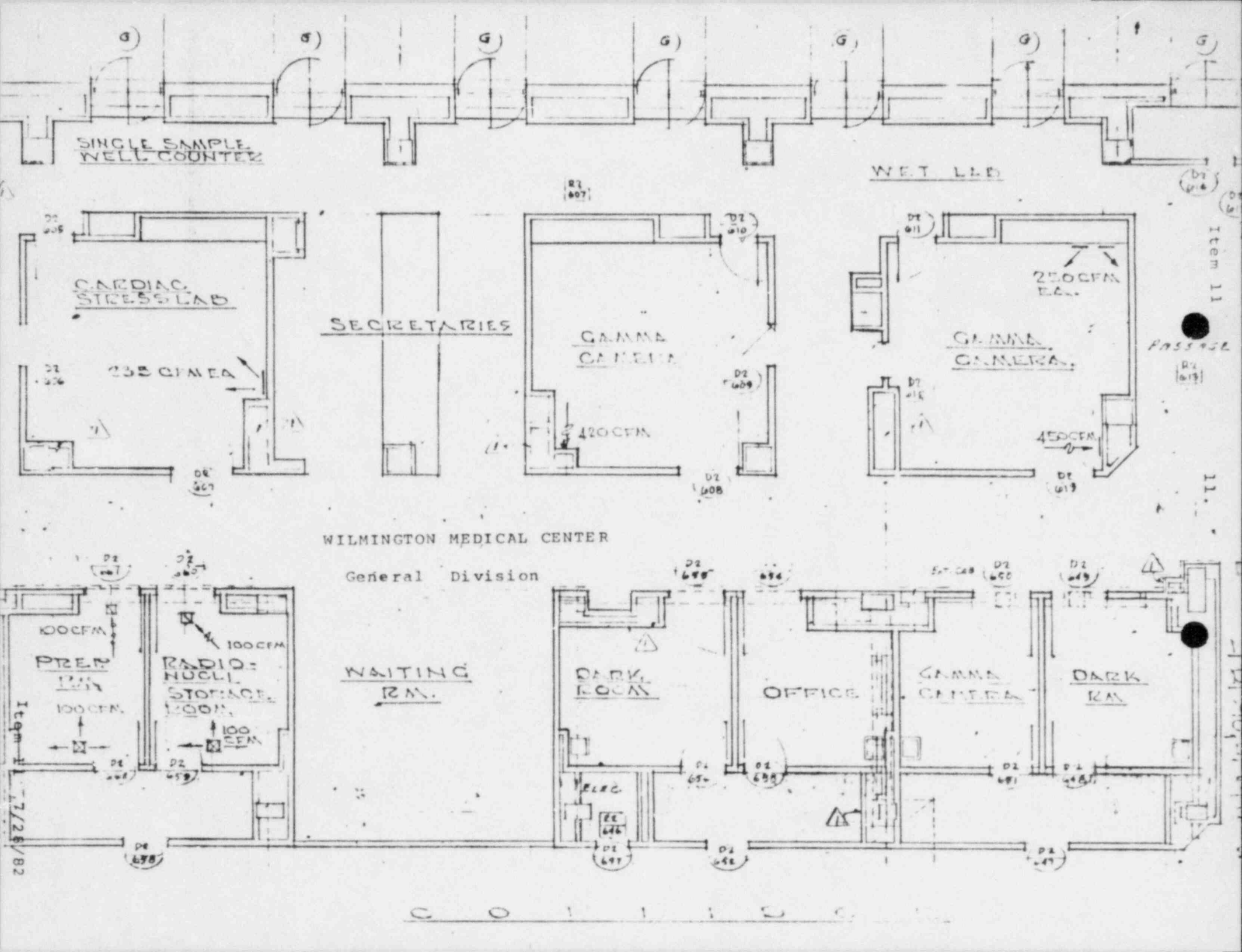
1982

NUCLEAR MEDICINE
DELAWARE DIVISION

AREA ROOM ASSIGNMENTS

ROOM NUMBER	ASSIGNMENT	
1.	DRUG PREPARATION	
2.	HOT LAB	
3.	GAMMA CAMERA	(SCINTIVIEW)
4.	GAMMA CAMERA	(TECHNICARE)
5.	FILM PROCESSOR	(DARK ROOM)
6.	CHIEF TECHNOLOGIST OFFICE	
7.	MOBILE GAMMA CAMERA	(LEM)
8.	PHYSICIANS READING ROOM	
9.	CONFERENCE ROOM	
10.	LABORATORY AREA	(WET LAB)
11.	PHLEBOTOMY STATION	
12.	SECRETARIAL STATION	
13.	PARIENT WAITING AREA	
14.	HALL	
15.	STORAGE AREA	(SUPPLIES)
16.	LOUNGE	(STAFF)


G)
WEST LAB
SECRETARIES
GAMMA CAMERA
420 CFM
250CFM EA.
GAMMA CAMERA
450CFM
CONFERENCE RM.
PASSAGE
145CFM
250CFM
WAITING RM.
DARK ROOM
OFFICE
GAMMA CAMERA
DARK RM
NUCLEAR MEDICINE
DELAWARE DIVISION
WILMINGTON MEDICAL CENTER
DELAWARE DIVISION-UNIT
SIXTH FLOOR
SCALE: 1/8"=1'-0"
SEPT. 14, 1979
Item 11
Wilmington Medical Center
10.
Item 15.
7/28/82


SINGLE SAMPLE WELL COUNTER
WET LAB
CARDIAC STRESS LAB
235 CFM EA
SECRETARIES
GAMMA CAMERA
420 CFM
250 CFM EA.
GAMMA CAMERA
PASSAGE
450 CFM
WILMINGTON MEDICAL CENTER
General Division
100 CFM
PREP
100 CFM
RADIO-NUCL. STORAGE ROOM
100 CFM
100 CFM
WAITING RM.
DARK ROOM
OFFICE
GAMMA CAMERA
DARK RM
ELEC.
Item 11
11.
7/26/82

Item 12. Personnel Training Programs:

I. Nuclear Medicine Technologist:

1. All Nuclear Medicine Technologist must have passed one of the national registry examinations in Nuclear Medicine.

2. One hour per week is scheduled for continuing education. on topics related to:

   a. Clinical nuclear medicine
   b. Equipment quality control procedures
   c. Review of applicable NRC Regulations
   d. Review of applicable conditions attached to license
   e. Review of NRC inspection reports and proposed corrective action
   f. Special topics presented by technologist or guest speaker on topics related to nuclear medicine.

3. All personnel must receive instructions on radiation safety practices by the dept. supervisor or his/her designated representative that includes:

   a. A general review of the handling, storage, and transfer of radioactive materials and waste.

   b. A review of the film badge monitoring procedure and completion of forms required by the Radiation Safety Office before issuing radiation dosimeters.

   c. A review of the laboratory safety rules, license conditions, and appropriate response to emergencies.

II. Nursing Personnel:

1. The nursing supervisor shall insure that all nursing personnel are instructed on radiation safety procedures to be followed when working with patients containing therapeutic quantities of radioactive material before beginning formal work on 2nd Center or 2nd South of the Wilmington General Division.

2. Nursing personnel who work directly with patients containing therapeutic quantities of radioactive material will be required to complete an inservice program yearly. Each person will be required to complete a self-learning packet. The employee will return his/her answer sheet to the nursing representative of the Ionizing Radiation Committee or his/her designate. New employees will complete the inservice learning packet ** within the orientation period (first four weeks of employment). Inservice records will be kept by the nursing representative or his/her designate.

** See Appendix A- A Self-Learning Package on Radiation Safety for Nursing Personnel

III. Training Program for Secretarial, Housekeeping, Security, Maintenance, and Transportation Personnel:

The Wilmington Medical Center's program for insuring that all personnel working in and around radiation areas will receive proper instructions in accordance with Section 19:12 of 10CFR, Part 19 is conducted by the Radiation Safety Technologist.

The following is a list of subjects that will be used all or in part during these inservice presentations. The exact choice of topics discussed at any one presentation will be at the discretion of the Radiation Safety Technologist in an attempt to best reach a particular audience:

1. Types of radiation
2. Interactions of radiation with matter
3. Biological effects of low-level radiation
4. Measurement of radiation
5. External vs. internal exposure
6. Exposure limits
7. Control of exposure
8. Control of contamination
9. Rules and regulations
10. Emergency procedures
11. Dosimetry

IV. Department of Radiation Therapy:

The individuals working with licensed radioactive material are:

1. Physicians
2. Physicist
3. Asst. Physicist

The above listed personnel upon joining this department are given instructions on radiation safety procedures that must be followed in order to keep the department in compliance with federal and state regulations. The following topics are covered during this initial orientation:

1. A general review of the handling, storage, and transfer of radioactive material from the Radium Storage Room to the operating room or the nursing floor and returning this material from the patient's room to the Radium Storage Room.

2. The inventory control procedure for logging radioactive material in and out of the Radium Storage Room.

3. A review of the film badge monitoring procedure and conditions attached to our license that must be complied with.

There is no annual refresher training program conducted for the above listed personnel. If regulations or conditions of license change, all concerned personnel are immediately notified and the required change in procedures are put into effect.

Ordering Radioactive Materials:

All radioactive materials, except for brachytherapy sources are ordered by the chief nuclear medicine technologist.

All sealed sources used for radiation therapy are ordered through the Dept. of Radiation Therapy by physicians listed as authorized users on this license.

Receipt of Radioactive Materials:

Delaware Division: All radioactive shipments are delivered after normal working hours to the reception desk of the Emergency Building. Security is notified, sign's for the package, and then takes these radioactive materials up to the Nuclear Medicine Hot Lab Storage Room. Packages are opened and inventoried in the morning by assigned Nuclear Medicine technician. Radioactive materials are ordered to replace used or decayed material and under these circumstances it is extremely unlikely that we would exceed our authorized activity limits.

Nuclear Medicine Section Located at the General Division: All radioactive shipments are delivered to the reception desk at the main entrance to the Wilmington General Division. Security is notified and takes these radioactive materials up to the Nuclear Medicine Hot Lab Storage Room. Packages are opened and inventoried in the morning by assigned Nuclear Medicine technician. The bills of lading enclosed with each shipment are forwarded to the Chief Nuclear Medicine Technician at the Delaware Division.

Radiation Therapy Department at the Wilmington General Division:

All sealed brachytherapy sources that are delivered to this hospital during normal working hours are promptly delivered to the Radiation Therapy Department. If the sealed sources are delivered after normal working hours, security personnel picks-up the shipment at the main reception desk and places package in Radium Storage Room located in the Department of Radiation Therapy.

Nuclear Medicine Radioactive Storage Room: All radioactive material storage rooms are located within the Nuclear Medicine sections and are under the direct observation of Nuclear Medicine personnel at all times. The door to the storage rooms are always locked after normal working hours and only authorized hospital personnel have a master key which will open these doors.

Item 13 Delaware Division

RADIOACTIVE SHIPMENTS

TO: SECURITY PERSONNEL

FROM: RADIATION SAFETY OFFICER

SUBJECT: RECEIPT OF PACKAGES CONTAINING RADIOACTIVE MATERIAL

ANY PACKAGES CONTAINING RADIOACTIVE MATERIAL THAT ARRIVE BETWEEN 4:30 P.M. AND 7:00 A.M. OR ON WEEKEND SHALL BE SIGNED FOR BY THE SECURITY GUARD ON DUTY.AND TAKEN IMMEDIATELY TO THE NUCLEAR MEDICINE DEPARTMENT. ALL PACKAGES ARE TO BE PUT IN THE RADIONUCLIDE STORAGE ROOM.

IF THE PACKAGE IS WET OR APPEARS TO BE DAMAGED, IMMEDIATELY CONTACT THE HOSPITAL RADIATION SAFETY OFFICER. ASK THE CARRIER TO REMAIN AT THE HOSPITAL UNTIL IT CAN BE DETERMINED THAT NEITHER HE NOR THE DELIVERY VEHICLE IS CONTAMINATED.

RADIATION DAFETY OFFICER: DR. EDWARD TORVIK

OFFICE PHONE: 4595

HOME PHONE: 368-7649

1/80

RADIOACTIVE SHIPMENTS

TO: SECURITY PERSONNEL

FROM: RADIATION SAFETY OFFICER

SUBJECT: RECEIPT OF PACKAGES CONTAINING RADIOACTIVE MATERIAL

ANY PACKAGES CONTAINING RADIOACTIVE MATERIAL THAT ARRIVE BETWEEN 4:30 P.M. AND 7:00 A.M. OR ON WEEKEND SHALL BE SIGNED FOR BY THE SECURITY GUARD ON DUTY . IF PACKAGE IS ADDRESSED TO THE NUCLEAR MEDICINE DEPARTMENT PLACE IN RADIONUCLIDE STORAGE ROOM. IF PACKAGE IS ADDRESSED TO DEPARTMENT OF RADIATION THERAPY PLACE IN RADIUM STORAGE ROOM.

IF THE PACKAGE IS WET OR APPEARS TO BE DAMAGED, IMMEDIATELY CONTACT THE HOSPITAL RADIATION SAFETY OFFICER. ASK THE CARRIER TO REMAIN AT THE HOSPITAL UNTIL IT CAN BE DETERMINED THAT NEITHER HE NOR THE DELIVERY VEHICLE IS CONTAMINATED.

RADIATION SAFETY OFFICER: DR. EDWARD TORVIK

OFFICE PHONE: 4595

HOME PHONE: 368-7649

1/80

all Security Personnel follow these instructions.

WR Smith 1-14-8

- 1-14-80

1-14-80

July 1982

GENERAL RULES FOR SAFE USE OF RADIOACTIVE MATERIAL

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

2. Wear disposable gloves at all times while handling radioactive materials.

3. Monitor hands and clothing for contamination after each procedure or before leaving the area.

4. Always use syringe shields for routine preparation of patient doses and administration to patients, except in circumstances such as pediatric cases when their use would compromise the patient's well-being. In these exceptional cases, use other protective methods such as remote delivery of the dose (e.g. through use of a butterfly valve).

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

   b. Do not store food, drink, or personal effects with radioactive material.

6. a. Assay each patient dose in the dose calibrator prior to administration. Do not use any diagnostic doses that differ from the prescribed dose by more than fifty (50) percent. Do not use any therapy doses that differ from prescribed dose by more than ten (10) percent.

   b. For therapeutic doses, also check the patient's name, the radionuclide, the chemical form, and the activity vs. the order written by the physician who will perform the procedure.

7. Wear personnel monitoring devices (film badge or TLD) at all times while in areas where radioactive materials are used or stored. These devices should be worn at chest or waist level. Personnel monitoring devices when not being worn to monitor occupational exposures should be stored in a designated low background area.

8. Wear TLD finger badges during elution of generator and preparation, assay, and injection of radiopharmaceuticals.

9. Dispose of radioactive waste only in specially designated and properly shielded receptacles.

10. Never pipette by mouth.

11. Survey generator, kit preparation, and areas for contamination after each procedure or at the end of the day. Decontaminate if necessary.

12. Confine radioactive solutions in covered containers plainly identified and labeled with name of compound, radionuclide, date, activity, and radiation level, if applicable.

13. Always transport radioactive material in shielded containers.

APPENDIX H

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. Also insert into the plastic bag all other contaminated materials such as disposable gloves.
4. SURVEY: With a low-range, thin-window G-M survey meter, check the area around the spill, 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: _____
OFFICE PHONE: 4595
HOME PHONE: 368-7649

ALTERNATE NAMES AND TELEPHONE NUMBERS DESIGNATED BY RSO:
Joe Solge
Office Phone 2148

Item 17. Area Survey Procedures

1. All elution, preparation areas will be surveyed daily with a low-range thin-window G.M. survey meter and decontaminated if necessary.

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

3. All other laboratory areas will be surveyed weekly.

4. The weekly and monthly survey will consist of:

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

   b. A series of wipe tests to measure contamination levels. The method for performing wipe tests will be sufficiently sensitive to detect .0005 uCi per 100 cm^2 for contaminant involved.

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

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

   b. Name of person conducting the survey.

   c. Drawing of area surveyed, identifying relevant features such as active storage areas, active waste areas, etc.

   d. Measured exposure rates, keyed to location on the drawing (point out rates that require corrective action).

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

   f. 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.

6. Area will be cleaned if the removable contamination level exceeds 0.005 uCi per 100 cm^2.

APPENDIX J

WASTE DISPOSAL

Note: In view of the recent problems with shallow-land burial sites used by commercial waste disposal firms, NRC is encouraging its licensees to reduce the volume of wastes sent to these facilities. Important steps in volume reduction are to segregate radioactive from nonradioactive waste, to hold short-lived radioactive waste for decay in storage, and to release certain materials in the sanitary sewer in accordance with § 20.303 of 10 CFR Part 20.

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

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

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

_X_ Other (specify): Held for Radioactive Decay

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

_____ Returned to the manufacturer for disposal.

_X_ Held for decay* until radiation levels, as measured in a low background area 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 will be disposed of as normal trash.**

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

_____ Other (specify): _____

3. Other solid waste will be (check as appropriate)

_X_ Held for decay* until radiation levels, as measured in a low background area with a low-level survey meter and with all shielding removed, have reached background levels. All radiation labels will be removed or obliterated, and the waste will be disposed of in normal trash.

_X_ Disposed of by commercial waste disposal service (see also Item 4 below).

_____ Other (specify): _____

4. The commercial waste disposal service used will be

Teledyne Isotopes, Westwood, N.J.
(Name) (City, State)

NRC/Agreement State License No. 29-00055-14

* Be sure that waste storage areas were described in Item 11 and that they are surveyed periodically (Item 17).

** These generators may contain long-lived radioisotopic contaminants. Therefore, the generator columns will be segregated so that they may be monitored separately to ensure decay to background levels prior to disposal.

I. NUCLEAR MEDICINE

A. General Requirements:

All therapy patients receiving more than 30 milliCuries of radioactive material will have to be scheduled with the Nuclear Medicine Laboratory at least 72 hours in advance. All such patients will be required to be admitted to a private room on 2nd Center or 2nd South in the Wilmington General Division on a reservation basis. Radioactive material for therapy purposes will be administered only during normal working hours.

The Nuclear Medicine Laboratory shall notify the Radiation Safety Office about all patients who are to receive quantities of radioactive materials greater than 30 milliCuries. The following information shall also be provided to the Radiation Safety Office.

1. Patient's Name
2. Room Number
3. Radioactive material to be administered
4. Activity to be administered to the patient

A Nuclear Medicine Technologist will be assigned to perform the following functions:

1. Pre-admission preparation of patient's room.

2. Radiation survey after administration of the radioactive material.

3. Pre-discharge survey of patient to insure that the total residual activity remaining inside the patient is less than 30 milliCuries.

4. Radiation survey of patient's room after discharge of patient in order to insure that contamination levels are below acceptable limits.

5. Remove all low level radioactive waste material to storage closet located on first floor, North Wing, of the Wilmington General Division.

A copy of the completed patient's room survey report is to be sent to the Radiation Safety Office within 48 hours after the patient's room has been returned to normal use.

B. Phosphorus-32

The physician who is to administer the Phosphorus-32 shall either obtain this material from the radioisotope storage room or have it delivered to the patient's room just prior to administration. This material shall not be delivered to a patient's room or left off at the nursing station for later administration by the physician (10CFR 20.207).

The physician shall receive the following items from the Nuclear Medicine Laboratory:

1. A copy of "Nursing Instructions" to be placed in the patient's chart.

2. Two Radioactive Material Labels:

   a. "PATIENT CONTAINS RADIOACTIVE MATERIAL" to be placed on front cover of patient's chart.

   b. "CAUTION RADIOACTIVE MATERIAL--PERMANENT IMPLANT" to be placed on inside of front cover of patient's charg.

C. Iodine-131 Cancer Therapy

All Iodine-131 for cancer therapy is administered to the patient by a Nuclear Medicine technologist. It is the responsibility of the technologist to place in the patient's chart a copy of "Nursing Instruction" and the two Radioactive Material Labels. The technologist shall perform all required radiation protection surveys of the patient's room and record data on survey form.

The technologist who administered the Iodine-131 therapy shall determine the total activity in his thyroid 24 hours post administration and submit report to the Radiation Safety Office.

D. Radioactive Waste:

The empty radioactive therapy container and all other contaminated material shall be returned to Nuclear Medicine Laboratory

NURSING INSTRUCTIONS FOR PATIENTS RECEIVING PHOSPHORUS-32 or IODINE-131 THERAPY

PATIENT _____

This patient was administered _____ mC of _____ (Isotope)

on _____ (date) at _____ a.m. p.m.

_____ (Name of Physician)

GENERAL

1. Nurses may spend whatever time is necessary near the patient for ordinary nursing care unless restrictions have been established by the Radiation Safety Office. During the first 24 hours, private duty nurses remaining in the patient's room should stay about 2 meters (6 ft.) away from the bed except during actual nursing procedures.

   No bed baths should be performed by attendants during the first 48 hrs. post administration time.

2. Patients are allowed visitors in accordance with usual hospital rules unless other instructions are given by the Radiation Safety Office. However, the first few days visitors should sit at least 1 meter (3 ft.) away from the bed.

3. Pregnant personnel SHALL NOT be assigned to work with this patient.

4. When patient is discharged, room will be surveyed for contamination before remaking room.

IODINE-131 PATIENTS

5. A separate bedpan or urinal should be kept for the patient's use until he is discharged. It should be washed thoroughly with soap and hot water, gloves being worn during the procedure. After the patient's discharge, it should be monitored by radioisotope personnel before being returned to stock. Or, if bathroom privileges allowed, then the toilet is to be flushed twice after each use.

6. Vomiting within 24 hours after oral administration, urinary incontinence, or excessive perspiration within the first 48 hours may result in serious contamination of linens or even of the floor. In any such emergency, or if urine is spilled during the collection, CALL THE ISOTOPE LABORATORY, Ext. 4776, or Dr. Frelick or Dr. Meckelnburg. Meantime, handle all contaminated material with rubber gloves.

7. The patient who has received a dose of Iodine-131 greater than 30 milliCuries may contaminate his bed linen, food dishes, water glass, and eating utensils. Therefore, his food should be served using disposable plates, cups, and eating utensils. The bed linen and disposable items should be stored in 30 gallon waste containers inside patient's room. These items shall be monitored by Nuclear Medicine technologist using a calibrated G.M. survey meter. If radiation levels are at background the linen and disposable utensils may be removed and handled in normal manner. If radiation levels are greater than background this material shall be stored in radioactive material storage room until measured radiation levels are at background.

PHOSPHORUS-32 PATIENTS

8. No special precautions are needed for dishes, utensils or instruments.

9. No special precautions are needed for vomitus, urine, stools, or sputum.

10. Surgical dressings and bandages should be changed only as directed by the doctor in charge. Surgical dressings used over the puncture wound during the first few days should not be discarded without monitoring, if they show any staining. Stained dressings should be sent to the radio-isotope lab. If there is no drainage from the puncture wound for intracavitary therapy, after the first few days dressings may be handled in the usual manner.

11. If the surgical dressing becomes damp, stained or bloody, because of drainage or leakage from the puncture wound, DO NOT TOUCH THE DRESSING. CALL THE ISOTOPE LABORATORY, Ext. 4776 or RADIATION SAFETY OFFICE, Ext. 4595.

POST MORTEM CARE OF PATIENTS

The physician in charge and the Radiation Safety Officer shall be notified upon the death of a patient containing radioactive material. Release of the body to the Department of Pathology or to the funeral director will be done only after receiveing a release from the Radiation Safety Officer or his designated representative.

EMERGENCY SURGERY

The Radiation Safety Office and the Nuclear Medicine Laboratory shall be notified immediately if patient must undergo emergency surgery. Surgeon must be informed that patient contains radioactive material.

II. NURSING CARE OF PATIENTS RECEIVING A THERAPY DOSE OF RADIOACTIVE MATERIALS

A. General Information

1. For all patients who have received a therapeutic amount of a radioactive material a "CAUTION RADIOACTIVE MATERIALS" sign is to be placed on the entrance door of the patient's room.

2. Nurses are to perform all duties in a normal and routine manner except for any special instructions given below and any special instructions given by the Radiation Safety Officer or his deputy.

3. In accordance with institutional policy no pregnant personnel will be assigned to any radioactive therapy patient, i.e., any patient with more than 30 milliCuries of any radioactive material.

B. Hazards may arise from three sources:

1. Contamination of the skin with radioactive materials.

2. Inhalation or ingestion of radioactive materials.

3. Irradiation by gamma or x-rays escaping from patient.

C. General Principles of Radiation Protection

1. Skin contamination, ingestion or inhalation is prevented in part by practicing good housekeeping, hand washing, and clean work habits.

2. External irradiation of the body may be kept below maximum permissible limits by:

   a. Taking precautions in handling contaminated equipment.

   b. Spending the minimum amount of time close to patient containing therapeutic dose of radioactive material.

For additional information see Item 20 material listed as "NURSING CARE OF PATIENTS RECEIVING THERAPEUTIC RADIOACTIVE MATERIALS" page 5 of 6, VIII. Care of Patients Having 131 Iodine.

SURVEY REPORT FOR NUCLEAR MEDICINE THERAPY PATIENT'S ROOM

All areas adjacent to the room in which a patient has received 30 milliCuries or more of radioactive material must be surveyed as well as designated locations inside the room to insure that the Wilmington Medical Center is in compliance with federal and state regulations. This means that survey should demonstrate that the measured dose rates outside the patient's room do not exceed 2.0 mrem/hour, nor will anybody receive a total dose in excess of 100 millirems during the total time that this patient occupies this room. For patients receiving radioactive material other than Iodine-131, the survey consists of two parts:

1. Radiation survey after the administration of radioactive material, and

2. Pre-discharge survey to insure that patient contains less than 30 milliCuries of radioactive material and that room is free from surface contamination and can safely be returned to routine patient use.

For the Iodine-131 cancer therapy patient the following procedure must be followed:

1. The therapy container must be opened in the fume hood and allowed to stay there with hood fan operating for five minutes before being taken to the patient's room.

2. Plastic sheeting must be placed on bedside table, around sink and toilet floor, over chair patient will sit in. Plastic bags should be placed over telephone, and inside door handle. This procedure will help minimize surface contamination.

3. After administration of the Iodine-131 a radiation safety survey must be made and measurement recorded on survey form.

4. The Nuclear Medicine Technologist administering the Iodine-131 dose to the patient must determine his/her thyroid burden 24 hours after administering the Iodine-131 to the patient. The appropriate form is located in the Nuclear Medicine Section and must be filled out completely and sent to the Radiation Safety Office.

5. A pre-discharge survey must be made to insure that patient contains less than 30 milliCuries of radioactive material.

6. A post discharge survey must be made to insure that room can safely be returned to normal patient use.

WILMINGTON GENERAL DIVISION

RADIATION SURVEY REPORT FOR NUCLEAR MEDICINE THERAPY

PATIENT'S ROOM

Name of Patient: _____ Date: _____

Room No: _____

Radionuclide Administered: _____

Date of Administration: _____

Person Performing Initial Survey: _____

Survey Instrument: _____ Calibration Date: _____

Serial Number: _____

External Radiation Intensity

Location	Measured Exposure (mR/Hr)	Calculated Total Dose (mR)
Bedside		
Visitor's Location		
Entrance to Patient's Room		
18 inches from wall in adjacent room		
Dose rate at one meter from patient		

If any of the measured dose rate values outside the therapy patient's room exceeds 2 mR/hour or will result in a dose in excess of 100 millirems per hospital admission to patient in adjacent room, corrective action must be taken.

Iodine-131 Therapy Patient

Patient Discharge Data:

Patient's Name: _____ Date: _____

Time: _____

Dose Rate at one Meter: _____

Residual Dose Remaining: _____ mCi.

Before patient can be discharged the residual body burden dose must be less than 30 mCi.

$$\text{Percent Reduction in Activity} = \frac{\text{Dose Rate at one meter at time of discharge}}{\text{Dose Rate at one meter after Adm. of Iodine-131}}$$

Residual Dose = Activity Adm. X Percent Reduction in Activity

Name of Individual performing Calculations: _____

Room Survey:

Before this room can be returned to normal patient use it must be decontaminated so that removable contamination of Iodine-131 does not exceed 0.001 uCi. per 100 square centimeters.

Date: _____ Time: _____ Surveyor: _____

Areas to be wipe tested	Activity Before Clean-up	Activity on Wipes when room returned to normal patient use
Telephone	_____	_____
Table Top	_____	_____
Water Bottle	_____	_____
Toilet Seat	_____	_____
Toilet Floor	_____	_____
Inside Door Handle	_____	_____

DETERMINATION OF IODINE-131 ACTIVITY IN THE THYROID OF

NUCLEAR MEDICINE TECHNICIANS

Date: _____

1. Use 3-inch NaI Radiation Detector.

2. Control panel settings:

   High Voltage: 1025

   Range: 1000

   Discriminator 300

3. Take a 10 minute background count.

   Total counts: _____

   Counts per minute (cpm) _____

4. Place technicians neck where thyroid is located against the NaI Radiation Detector and count for 5 minutes.

   Total Counts: _____

   Counts per minute: _____

   Less Background CPM: _____

   Net CPM* _____

5. Multiply the net CPM in technician's neck by calibration factor:

   4×10^{-5} uCi/CPM

   Activity in thyroid of technician _____ uCi.

6. Is this activity greater than 0.04 uCi?

7. If the answer to question number 6 is yes, contact your supervisor and the radiation safety office.

Name of technician being monitored: _____

* If Net Counting Rate is less than 250 CPM activity in thyroid is less than 0.01 uCi.

Item 20. Therapeutic Use of Sealed Sources.

a. Areas where sealed sources will be stored:

All sealed sources that are used in the Department of Radiation Therapy are stored in the Radium Room located in the Physics Section, basement level of the Wilmington General Division. Figure I is a sketch of the Radium Room showing location of storage containers.

Figure II is the floor plan, drawn to scale, showing area around the Radium Storage Room.

The dose to the Radium Room wall, adjacent to the secretary's office is monitored using film badge dosimeters. These dosimeters are located four (4) feet above the floor. One dosimeter is located at the mid-section of the wall, and the other two (2) dosimeters are located three and one-half (3.5) feet on each side of the mid-section of the wall. Current data from film badge dosimeters indicates that the monthly dose to mid-dection wall is less than 300 millirems and the dose to the other two film badge dosimeters is less than 400 millirems.

A monthly radiation intensity survey is performed by the Assistant Physicist and results recorded in notebook.

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

Long handled hemostats, tweezers, source holding vise are located in this room and are used by personnel preparing sealed sources for patient use. Personnel are required to stand behind the L-Block when preparing sources for patient use and when unloading applicators after they have been returned to the Radium Room.

c. Method used to determine radiation doses to the extremities of personnel handling sealed sources:

All personnel working with sealed radioactive sources are required to wear a lithium fluoride finger ring dosimeter.

d. The equipment and shielding available for transporting sources from Radium Storage Room to place of use.

There are four (4) long handled carts that are used to transport radioactive sealed sources from the Radium Storage Room to either the operating room or the nursing floor. Two of the carts have built-in radiation shielded containers. These carts are used for transporting iridium-192 moulds or vaginal applicators to and from the Radium Storage Room. The other two carts are used to transport removable lead radiation shielded containers.

Figure I

Radium Storage Room

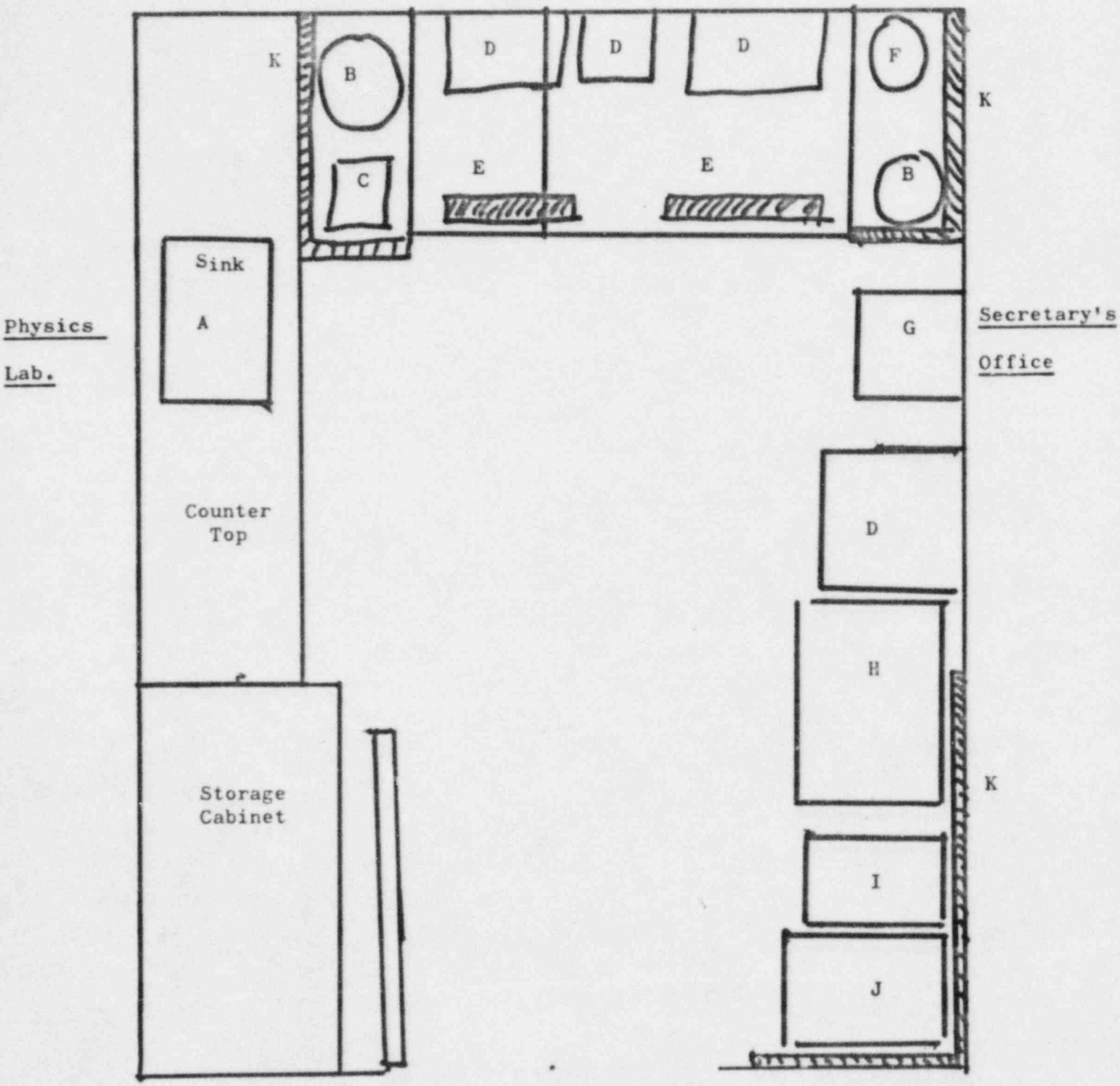


Figure I. Radium Storage Room:

A. Lead shielded box with stainless steel pan (5/8 inch thick) used for soaking returned iridium-192 moulds in hydrogen peroxide

B. Cylindrical lead containers used to store 100 milligrams equivalent Cs-137 capsules and 120 milligrams of Ra-226. The wall thickness of the cylinder is approximately two inches. The height of cylinder is approximately 18 inches. The sealed sources are stored in a transport container by one inch of lead extending up to a height of six (6) inches.

C. Storage box used to store transport container when loaded with Ra-226 applicator. The walls of this box are lined with 5/8 inch thick lead.

D. Radium storage safes

F. Cs-137 survey instrument calibration source.

E. L-Blocks with wall thickness greater than two (2) inches.

G. Cs-137 storage box lined with one (1) inch of lead. The sources are stored in a transport container surrounded by one inch of lead, extending up to a height of six (6) inches.

H. Radium applicator and needle soaker box. The walls of this box are two (2) inches thick. Applicators and radium needles are placed inside this box by physician and covered with hydrogen peroxide and allowed to soak for twenty-four (24) hours before being returned to storage containers.

I. Storage cotainer for iridium loaded applicator. The walls of this box have a lead thickness of one (1) inch. Lead bricks (two inches thick) are placed around the box and a 5/8 inch lead slab is placed on top of the cover.

J. Storage box lined with 5/8 inch lead, used to store iridium 192 before use in applicator and after withdrawal from patient use. All irridium stored in this box has been placed in iridium-192 shipping container.

K. Lead barrier 5/8 inch thick extending up to a height of approximately 15 inches.

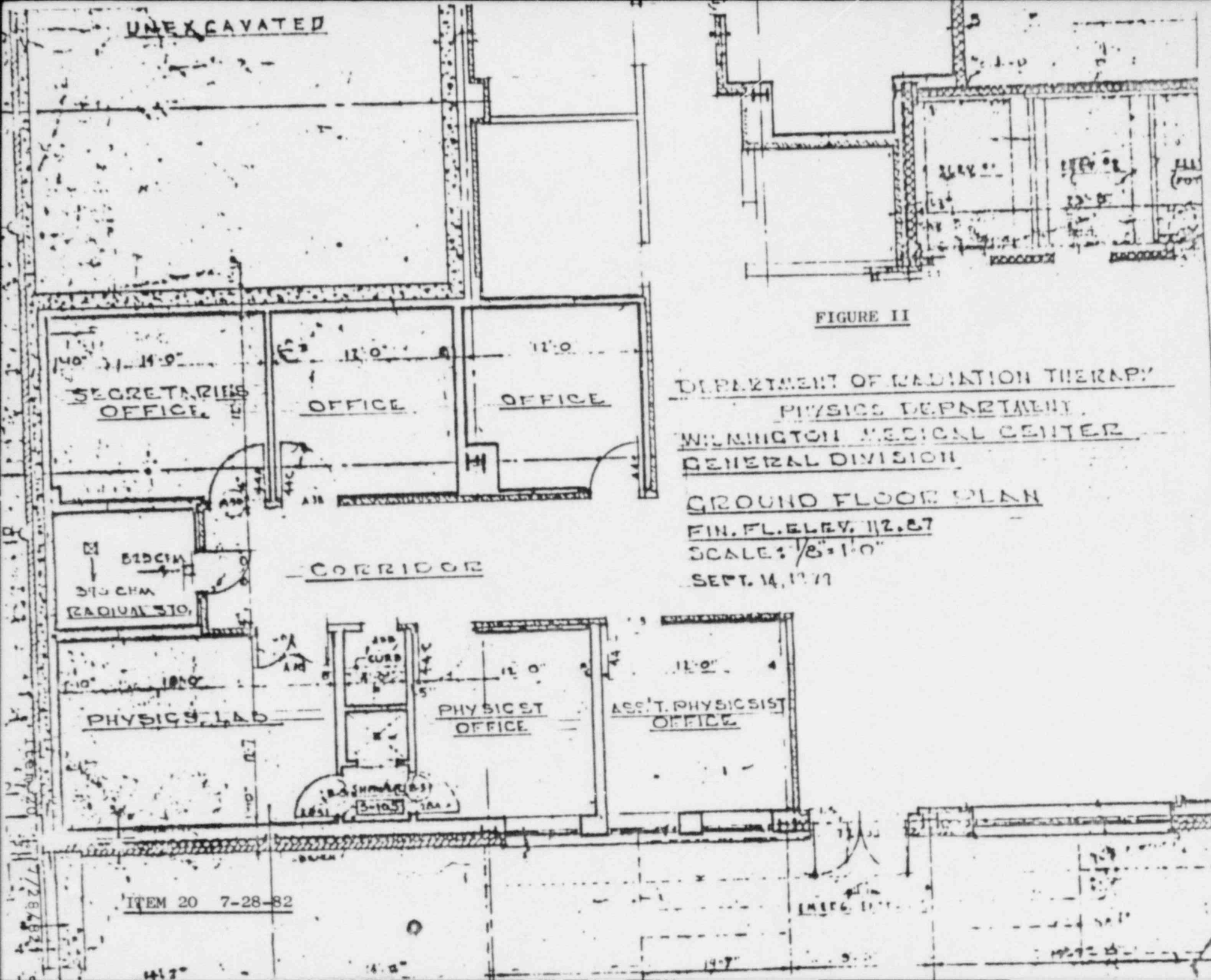


FIGURE II

ITEM 20 7-28-82

Item 20.

e. Source Accountability:

Treatment Orders: All request for brachytherapy are written up on the "Green Sheet", Form No. 15275(658)(0276). This form list the patient's name, clinical diagnosis, referring physician, proposed treatment plan, and name of physician responsible for treating patient.

Radium Curator: All "Green Sheets" requiring source preparation are sent to the Radium Curator. The Radium Curator removes sources from storage containers, prepares sources for patient use as indicated in treatment plan, completes inventory control forms, and places sources and/or applicator in shielded transport cart along with "Green Sheet" and inventory control forms. The Radium Curator also list on chalk board the date sources were removed from storage container, name of patient, kinds and type of sources, and date returned to Radium Storage Room. After sources have been returned to stoarge containers the data written on chalk board is erased, inventory control forms are completed and placed in drawer located in Radium Storage Room.

Physicist: Each shipment of iridium-192 is removed from its shipping container by the physicist and assigned an inventory control number. All iridium-192 sources are prepared for patient use by the physicist. Inventory control forms are completed by physicist.

Strontium-90: All strontium-90 eye applicator treatment orders are written up in the patient's chart. This data is not recorded on the "Green Sheet". The strontium-90 eye applicator is removed from the Radium Storage Room by the nurse working with the physician using the eye applicator. After completion of treatment the strontium-90 eye applicator is returned to the Radium Storage Room by the nurse. The date, patient's name, name of physician using eye applicator and date returned are recorded in notebook by the nurse.

Inventory: An inventory of all sealed sources is performed on a monthly basis by the Asst. Physicist.

6.

WILMINGTON MEDICAL CENTER

Department of Radiation Therapy

RADIUM THERAPY REQUISITION

Name_____

Clinical Diagnosis and Comments:

_____
Requesting Physician

Proposed plan of treatment:

15275P(658)(0276)

_____ M.D.

Item 20 7/28/82

WILMINGTON MEDICAL CENTER,
Department of Radiation Therapy

WARD RECEIPT FOR RADIUM

Name of patient _____ No. _____ Date _____

Number of needles and/or description of applicators used.

_____

Time inserted _____ 19 _____ a.m. p.m.

Time to be removed _____ 19 _____ a.m. p.m.

REMOVAL OF RADIUM

Removed by _____ _____

Time of removal _____ 19 _____ a.m. p.m.

Received in the Department of Radiation Therapy by _____

NOTE: If any radium is expelled or removed before calculated time has elapsed, please notify Department of Radiation Therapy immediately.

(This form should accompany radium returning to the Radium Room.)

15276P(658)(0276)

Item 20 7/28/82

WILMINGTON MEDICAL CENTER

Department of Radiation Therapy

OPERATING ROOM RECEIPT FOR RADIUM

Name of Patient _____ _____ Date of Treatment _____

A. RADIUM ORDER

No. and types of needles or tubes	Type of applicator and/or identification

The above radium was removed from safe by _____ on _____

Radium made up by _____ Checked by _____

Received in operating theater by _____ (Any discrepancy must be reported at once)

B. UNUSED RADIUM (To be returned without delay to Radium Room)

The above amount checked and returned to safe by _____

C. RADIUM ACTUALLY USED

To remain inserted for _____ hours, and be removed on _____ at _____ a.m. p.m.

D. RETURN OF RADIUM

Amount returned _____

Received in Department of Radiation Therapy by _____

Checked and returned to safe by _____

NOTE: Sections B & C to be completed by doctor inserting radium.

(This form is the property of th Department of Radiation Therapy and should be returned thereafter completion of Sections B & C.)

Item 20 7/28/82

RT-8

Item 20.

f. Surveys to be performed:

A representative of the Physics Section will perform the following functions:

1. Radiation survey of patient's room after brachytherapy has been started.

2. Pre-discharge survey of the patient to insure that radioactive sources have not been left in or on the patient.

3. Radiation survey of patient's room, trash containers, and linen container to insure that a sealed radioactive source has not been left in the room. If patient is discharged on a Saturday, Sunday, or holliday the discharge survey will be performed by the attending physician.

4. A Radiation Materials Area sign must be posted along side the entrance door to the patient's room.

5. Two Radioactive Material labels must be placed in the patient's chart:

   a. "Patient Contains Radioactive Material" to be placed on front cover of patient's chart.

   b. "Caution Radioactive Material-Temporary Implant" to be placed inside the patient's chart.

These labels will be removed after the sources have been removed from the patient. Radioactive sources, labels, and inventory control forms will be returned to the Radium Storage Room.

WILMINGTON MEDICAL CENTER

WILMINGTON GENERAL DIVISION

Radiation Survey Report for Iridium-192
Patient's Room

Name of Patient _____

Room No. _____

Date Mould Put on Patient _____

Activity of Ir-192 : _____

Date of Initial Survey: _____

Person Performing Initial Survey: _____

Survey Instrument: _____

Serial No. _____

Calibration Date _____

Location	Exposure mR/hr	Calculated Total Dose
Bedside		
Visitor		
Entrance		
18 inches from wall in adjacent room		
18 inches from floor of room above patient		
6 feet from floor of room below patient		

If any of the measured dose rate value will result in a dose of 100 mR in 7 days to patient in adjacent room corrective action MUST BE TAKEN.

FINAL SURVEY

Iridium-192 Patient's Room

Patient's Name:_____

Date _____

Person Performing Survey:_____

Survey Instrument:_____

Serial No. _____

Calibration Date:_____

After the Iridium-192 has been removed from the patient's room this area and also the patient must be surveyed to insure that all sources have been removed.

Patient _____mR/hr

Room _____mR/hr

Have all Inventory Control Forms been completed and returned to Radium Storage Room?_____

Item 20.

g. Nursing Care:

1. General Instructions

a. The patient's bed must be isolated from other patients.

b. Nurses and other personnel should spend only the necessary time near a patient for routine nursing care and shall be wearing a personnel radiation dosimeter.

c. Visitors must be restricted to 30 minutes per day.

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

2. Special Instructions:

a. Patients:

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

2. Unless specifically ordered by the doctor, the bath should be postponed for the duration of the radiation treatment. Patients should be encouraged to take care of their own personal hygiene.

3. Nursing Care:

a. Never handle needles, capsules or boxes containing radium or iridium with your hands. Use long forceps, preferably 12 inches.

b. While the radium or iridium is in place, hospital personnel should spend only the minimum amount of time near the patient necessary for routine nursing care.

c. All hospital personnel involved in the care of a radium or iridium patient shall wear a film badge.

d. Pregnant nurses shall not be assigned to the care of a radium or iridium patient.

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

f. Surgical dressings and bandages used to cover the area of needle insertion may be changed only by the attending physician and may not be removed from room until released by physician or Radiation Sfety Officer.

g. Special orders will be written for oral hygiene on patients having radium in the oral cavity.

WILMINGTON MEDICAL CENTER
DEPARTMENT OF NURSING

Inservice Education

M E M O R A N D U M

TO: Dr. R. L. Meckelnburg

FROM: L. J. Carpenito LJC

DATE: September 2-, 1981

SUBJECT: Procedure for Nursing Care of Patients Receiving Theraputic Radioactive Materials

Attached is a copy of the present procedure for nursing. I have sent a copy to Dr. Torvik, J. Solge and to Mrs. Thomas who will duplicate it for the next meeting. This procedure should be reviewed for content and accuracy by the committee members so it can be included in the Radiation Safety Manual.

LJC:eaw
Attachment

c.c.: Dr. Torvik
Mrs. N. Thomas
J. Solge

Permitted To Do Procedure:
R.N. - X
L.P.N. - X
N.T. -
N.A. -

NURSING CARE OF PATIENTS RECEIVING THERAPEUTIC RADIOACTIVE MATERIALS

PROCEDURE	GUIDELINES
I. Radium Patients	1. The use of the radium in and out of the patient is possibly hazardous and certain rules and precautions must be observed. a. Stay as briefly as possible with the radium patient. b. Keep as much distance as possible between you and the radium, except when performing specific duties. c. Under no circumstances should you pick up radium with your hands. d. In case of doubt as to procedure, call the Radiation Therapist. e. The "Radium Precaution" sign must be placed on the door of the room occupied by a radium patient. f. The nurse should notify the Radiation Therapist immediately if any radium needles or radium applicators are protuding or completely dislodged. Depending upon the case, the Radiation Therapist may elect to reinsert the radium himself, or give the nurse the necessary instructions for the safe storage of the dislodged radium. In the latter event, the nurse should procure a lead container from the Radium Room, using proper clamp or tongs, place the radium in the container, and return the container to the Radium Room. A note should be entered in the patient's chart as to the time the event took place and the storage of the radium and person giving instructions. g. On patients with radium insertion, a separate marked laundry hamper is place in patient's room. When the hamper is full, the Radiation Safety Officer is called to check it. Following the check and release, it is discarded in the usual manner. A separate marked trash container is placed in patient's room and trash is monitored in the same manner before discarding. h. Visitors time allowed is posted. Those under eighteen and pregnant women are not to visit.

NURSING CARE OF PATIENTS RECEIVING THERAPEUTIC RADIOACTIVE MATERIALS

PROCEDURE	GUIDELINES
	i. Pregnant personnel are not to be assigned to radium patients. j. All rooms are monitored after discharge and before cleaning.
II. Care of Patient With Implant In The Oral Cavity	1. Any patient with oral cavity implants have a feeding tube inserted through the nose in the operating room.
1. Discourage patient from talking and swallowing, especially if the implantation is in the tongue.	1. Unless contrary to written orders.
2. Patient should have mouth wash as ordered by the physician.	
3. Observe for respiratory or swallowing difficulties.	1. Place a tracheostomy set and a suction machine by the patient's bed.
4. Watch for the possible dislodgement of radium needles as often as possible, at least every 3 hours.	1. If needles are sticking out or completely dislodged, the Radiation Therapist is notified STAT.
5. Observe patient for restlessness.	1. A sedative, as ordered, should be administered.
6. If the mouth is full of secretions, suction should be applied as often as necessary to keep the patient comfortable.	
7. Observe for unusual swelling or fever.	1. Report same to the Radiation Therapist.
8. No objects should be removed from the patient's room (linen, dressings, personal belongings, etc.) until checked for possible radioactive sources of contamination by the Physicist, or released by Radiation Therapist.	
III. Care of Patients With Implants In Any Other Region of the Body	1. In general, patients with radium implants will not have dressings.
1. Efforts should be made to keep the patient from moving the site where the radioactive source is located.	1. Changing the position of the arm, neck, etc., will produce displacement of the radioactive sources.
2. The same care as checking the radium implants should be given as with the radium in the oral cavity except for the feeding precautions.	

NURSING CARE OF PATIENTS RECEIVING THERAPEUTIC RADIOACTIVE MATERIALS

PROCEDURE	GUIDELINES
3. Cleaning of the implanted region is not usually necessary.	1. The hygienic care of the rest of the body should be carried out as with any other patient, but as quickly as possible and with alternating personnel.
	2. Catheter Care (Foley) is not carried out on these patients if needles are in perineal area.
4. Objects should be checked as listed under #8 above.	
IV. Removal of the Radioactive Sources	
1. A sterile suture removal set is used. In some cases other equipment may be indicated by the Radiation Therapist.	1. Some patients should have sedation as ordered by the physician, one half hour before the removal.
2. A lead radium carrier will be brought to the bedside by the doctor.	
3. The radioactive sources removed must be checked by the doctor against the number stated in the radium form on the chart.	1. After this check has been made, the doctor in charge is required to sign the proper form indicating all radioactive sources are accounted for.
4. Encourage patient to resume normal activities.	
V. Radon Seeds or Radioactive Gold Seed	1. These are permanent implants of multiple, very small radioactive sources. 2. If in the mouth, a feeding tube for the first 24 to 48 hours might be indicated. 3. If in the skin, no special local care is necessary.
VI. Irridium Mould	
1. The nurse should frequently check the position of the mould and should notify the attending physician immediately if any change in position is apparent.	1. Same general precautions. 2. Proper position to the milimeter is of paramount importance in order to achieve the desired results. The same accuracy holds true for the time the mould should be in contact with the lesion.
2. If the mould is placed on the chest wall, as with the post-mastectomy patient, place a pillow under the arm of the affected side.	1. This abducts the arm away from the radiation source and provides support. 2. A form will be provided indicating the time the mould is placed and removed. This should be carefully recorded every day and signed by the doctor in charge of the procedure.

NURSING CARE OF PATIENTS RECEIVING THERAPEUTIC RADIOACTIVE MATERIALS

PROCEDURE	GUIDELINES
	3. When the mould is not in use, it is the responsibility of the Radiation Therapist to make certain that it is returned to the proper storage area.
3. Patient is confined to the room but may be out of bed.	
VII. Gynecologic Applications	
1. Pre-operative douche and enema are given as ordered by physician.	1. Radium application may be inserted in the operating room or in patient's room. a. When radium is inserted in OR, the patient is taken to the X-ray Department following the insertion for the necessary localization film. b. A foley catheter will have been inserted into the bladder prior to leaving the Operating Room. c. When a vaginal applicator is inserted by the physician at the patient's bedside, the nurse will insert a foley catheter before applicator is brought to the floor.
2. To hold applicator in place, a T binder is placed around the patient's waist and pinned snugly. Then: a. Tie strings that are attached to applicator to front and back of binder waistband. b. Place 8 x 12 piece of cotton padding under strings on both sides front and back. c. Apply per pad to perineal area. Bring T binder flaps between legs to hold per pad in place. Run flap under waistband and pin. Then bring flap down over waistband and pin again.	1. To prevent pressure on patient's skin.
3. Head of bed can be elevated slightly.	1. This avoids changing position of the radium. 2. Patient may have a pillow under head and knees.
4. Under no conditions shall the patient leave the bed.	
5. Secure drainage tubing from foley catheter to thigh.	1. Use method as found in Retention Catheter Procedure.

NURSING CARE OF PATIENTS RECEIVING THERAPEUTIC RADIOACTIVE MATERIALS

PROCEDURE	GUIDELINES
6. Keep catheter open and draining as bladder must be kept empty at all times.	
7. If there are two radium patients in same room with foleys, place foley drainage bags on same side of bed--not both in the center.	1. To prevent extra exposure during emptying.
8. Whenever the radium applicator is protruding from the vulva, the position shall be checked by the nurse twice a day.	1. If any change has occured, the nurse shall notify the physician.
9. Use of the bedpan is discouraged. Patient is given Lomotil to prevent defecation. E-vac-u-sac is used if patient feels urge to defecate	
10. Patient's temperature is to be taken b.i.d.	1. Notify doctor if temperature elevation is 37.7° or above.
11. Soft, low residue diet is to be given.	1. Reduced bowel activity is indicated to minimize trauma to the irradiated bowel.
12. Removal time of radium is indicated on doctor's orders or radium sheet.	1. Physician will remove radium. 2. Before disposing of vaginal packing, be sure all radium is accounted for and placed in the proper shielded container.
13. Elevate head of bed after removal of radium.	1. To get patient used to change of position.
14. Give douche and enema as ordered by physician.	
VIII. Care of Patients Having 131 Iodine	1. 131 Iodine is administered systemically by the oral route.
1. Place patient in a private room.	
2. Surface contamination can be minimized by placing plastic sheeting on the bedside table, around sink, and toilet floor, and over the chair the patient will sit in. Also, by placing small plastic bags on door handle and over telephone.	1. Notify housekeeping.

NURSING CARE OF PATIENTS RECEIVING THERAPEUTIC RADIOACTIVE MATERIALS

PROCEDURE	GUIDELINES
3. No bed bath for 48 hours.	
4. When handling excretions or contaminated material, skin-type surgical gloves are worn and hands should be washed with gloves on and then after they are removed.	1. Most of the 131 Iodine is excreted through the urine. Small amounts are eliminated in stool, perspiration, and saliva. 2. Any appropriate handwashing agent may be used.
5. If patient vomits within 24 hours, is incontinentof urine or perspires profusely within the first 48 hours, paper towels or disposable wash cloths can be used to clean up, which are then placed in a plastic bag to be monitored by the Radiation Safety Officer.	
6. Disposable dishes are used.	
7. Instruct patient to flush toilet twice after each use.	
IX. Care of Patients Having 32 Phosphorous	1. 32 Phosphorous is administered into the pleural or peritoneal cavity or injected into tumor growth.
1. Dressings at injection site should be changed only as directed by physician in charge.	1. Source of contamination would be leakage from the puncture wound made during the injection.
2. Those dressings which are stained, damp, or bloody should be monitored for contamination when they are removed.	1. Dressings may be handled as usual if no drainage from the wound after the first few days.
X. For Both 131 Iodine & 32 Phosporous	
1. Room monitored upon discharge and before scrub down.	
2. Limits on visitors, pregnant women, and children for 131 Iodine.	

NOTE: Please read Preamble to Procedures, found in front of Manual, in addition to information found in this Procedure.

NOTE: File Card for Procedure

/am

1. Quantities to be used:

   a. Patient information:

      5 studies per week at the Wilmington General Division

      15 Studies per week at the Delaware Division

      Average activity per patient = 10 millicuries

   b. Maximum possession limit = 500 millicuries

2. Use and Storage Areas:

   a. All xenon-133 gas is purchased in individual glass vials that have an activity of 10 millicuries. The maximum number of vials on hand at the Wilmington General Division would be six (6) and the maximum number of vials on hand at the Delaware Division would be 10. These vials are stored in their original shielded shipping container in the radionuclide storage rooms located in the respective division. A sketch of the storage rooms and gamma camera rooms has been included with this application. Air supply and exhaut rates have been denoted on these floor plans.

      All studies involving the use of xenon-133 at the Wilmington Division will be performed in the Gamma Camera Room, 3rd Floor, North Wing.

      Xenon-133 studies at the Delaware Division will be performed in any one of the three gamma camera rooms located on the 6th floor of this building.

   b. Ventilation systems in all areas where xenon-133 is used and stored.

      General Division: The xenon-133 patient ventilation studies are being performed in the room labeled Gamma Camera Room on floor plan submitted with this application. The ventilation is by normal diffusion of air through hallways, elevator shaft, and windows. There is no provision made for an independent air supply. This area of the hospital was originally designed to be used as an operating room area and therefore had an independent , isolated exhaust system installed. The volume of air removed from this room is calculated to be 1200 CFM. The xenon-133 exhaled by the patient is piped into the duct that is used to exhaust the air from this room. The velocity of the air passing through this tube has been measured by our Engineering Dept. and found to be 50 feet per minute.

      The exhaust is timer controled in the gamma camera room so that it is turned on at 6 .M. and turned off at 6 P.M., every day of the week.

Radionuclide Storage Room: This room has an exhaust system that is operating continuously. There is no provision for make-up air other than by normal diffusion from other areas of the hospital. The exhaust system removes air at the rate of 276 CFM. The air removed from this room is discharged through the roof venting system.

Measurement results obtained on 1-18-82 are listed in Table I for the Nuclear Medicine area as well as the Radium storage room.

Delaware Division: All the rooms at the Delaware Division have a air ventilating system that is operating continously. There is no air recirculated through the system, all air is exhausted directly to the outside of the building. Measurement results for the Delaware Division for 1-29-82 are listed in Table II.

As can be seen from the measured air supply and exhaust rates all areas where xenon-133 is used or stored are under negative pressure. The instrument used for these readings is a Bacharach Mod. 3035A. Airflow rates are determined at intervals not to exceed six (6) months.

3. Procedures for Routine Use:

a. The xenon-133 will be administered by a special breathing unit which will contain a dose with an activity up to 10 millicuries. The gamma camera will be used to record the distribution of this activity in the lungs.

b. Wilmington General Division: The xenon lung function unit sold by Nuclear Associates, Inc., is used for all studies performed in this division. The exhaust hose from this unit is connected directly into the room exhaust system. Before the dose is administered to the patient, the room venting system is turned on so that xenon-133 discharges from the lung function unit and the patient will be discharged outside the building.

Delaware Division: The xenon delivery system is sold by Atomic Products Corp., Model No. 130-133. All studies will be performed in this division with this unit.

c. Special Procedures Used to Reduce Leakage: Whenever possible nose clamps or face mask will be used to reduce leakage from patient to the room.

4. Emergency Procedures:

The maximum amount of xenon that could be released in any accident involving a single individual dose to a patient is 10 millicuries. If a single patient dose is released in the gamma cammera room or in the radionuclide storage room the negative pressure in these rooms would prevent the release of the xenon to other areas of the hospital. The personnel in the Nuclear Medicine Section have been instructed to evacuate the room (includes patient) and wait 10 minutes before re-entering. The normal ventilating system will discharge this xenon to the outside air.

5. Air Concentrations of Xe-133 in Restricted Areas:

Wilmington General Gamma Camera Room:

$C = Af/v$

$A = 5 \times 10^3$ uCi/wk

$f = 0.25$

$V = 1.2 \times 10^3$ ft.^{3}/min. or 8.15×10^{10} ml./wk.

$C = 1.5 \times 10^{-7}$ uCi/ml.

Delaware Gamma Camera Room:

Xenon studies will be performed in only one room at a particular time, therefore if the room with the lowest exhaust rate is below the MPC value than all room with a higher exhaust rate will be less than the MPC value. Room 7 has the lowest exhaust rate.

$C = Af/V$

$A = 1.5 \times 10^4$ uCi/wk.

$f = 0.23$

$V = 185$ CFM $= 1.25 \times 10^{10}$ ml/wk.

$C = 3 \times 10^{-7}$ uCi/ml.

6. Air Concentrations of Xe-133 in Unrestricted Areas:

The whole Nuclear Medicine area at the Delaware Division is vented through the one stack located on the roof. Therefore the flow rate from this stack is greater than the sum of the individual values listed in Table II.

$C = A/V$

$A = 1.5 \times 10^4$ uCi/wk x 52 Wk./year $= 7.8 \times 10^5$ uCi/year

$V = 1.7 \times 10^3$ CFM $= 2.52 \times 10^{13}$ ml./year

$C = 3.1 \times 10^{-8}$ uCi/year

General Division:

The exhaust fan in the nuclear medicine area operates from 6 A.M. to 6 P.M., seven (7) days per week, 52 weeks per year.

$C = A/V$

$A = 5 \times 10^3$ uCi/wk. X 52 wk./year $= 2.6 \times 10^5$ uCi/year

$V = 1.2 \times 10^3$ CFM $= 8.9 \times 10^{12}$ ml./year

$C = 2.9 \times 10^{-8}$

TABLE I

WILMINGTON MEDICAL CENTER
H.V.A.C. DEPARTMENT
GENERAL DIVISION

M E M O R A N D U M

TO: Dr. Torvik
Radiation Therapy Dept.

FROM: Carlo A Cofrancisco , Supvr. Dated 1/18/82

RE: Air Flow measurements in the Gamma camera room, isotope storage, fume hood, and radium storage.

The gamma camera room has no supply air system, there is one exhaust register in the room for emergency exhaust with a CFM of 1205.

The radium storage room on 3 North has no supply air system to the room. There is one exhaust vent in the room with an exhaust volume of 276 CFM.

The fume hood on 3 North is exhausted to the outside. At the working level of 1/2 opened, there is a face velocity of 225 FPM or 810 CFM. With the door fully opened there is a face velocity of 104 FPM or 749 CFM.

The radium storage room in the Physics Dept. has a supply air system with a delivery of 197 CFM. The exhaust in this room is through one grill in the ceiling which exhausts 567 CFM.

The instrument used for these readings is a Bacharach Mod.#3035A, zeroed in on 1/18/82.

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Item 21 7/28/82

TABLE II

DELAWARE DIVISION
NUCLEAR MEDICINE SUPPLY & EXHAUST READING

TO: DR. TORVIK, DEPT. OF RADIATION THERAPY 1-29-82

6th Floor Nuclear Medicine Area - Unit #2 - South - Air Readings

Room Number	Supply	Exhaust
3 (North Side) Searle Scinteview	465 CFM	620 CFM
4 (North Side) Picker	540 CFM	565 CFM
7 Searle Camera	100 CFM	185 CFM
3 (South Side) Drug Prep.	148 CFM	179 CFM
4 (South Side) Hot Lab	125 CFM	158 CFM

1st Floor Administration Area - Building - Unit #3

In-Vitro Lab	WINDOW AC's	380 CFM

Flow Meter Check - 6th Floor

Room Number	Reading	Calibration Check & Operation
3	.038	OK
4	.02	OK
7	.08	OK

Air Instrument Used: BACHARCH - FLO-RITE STYLE #1000-B Calibration Date: 1-29-82 SELF CALIBRATING

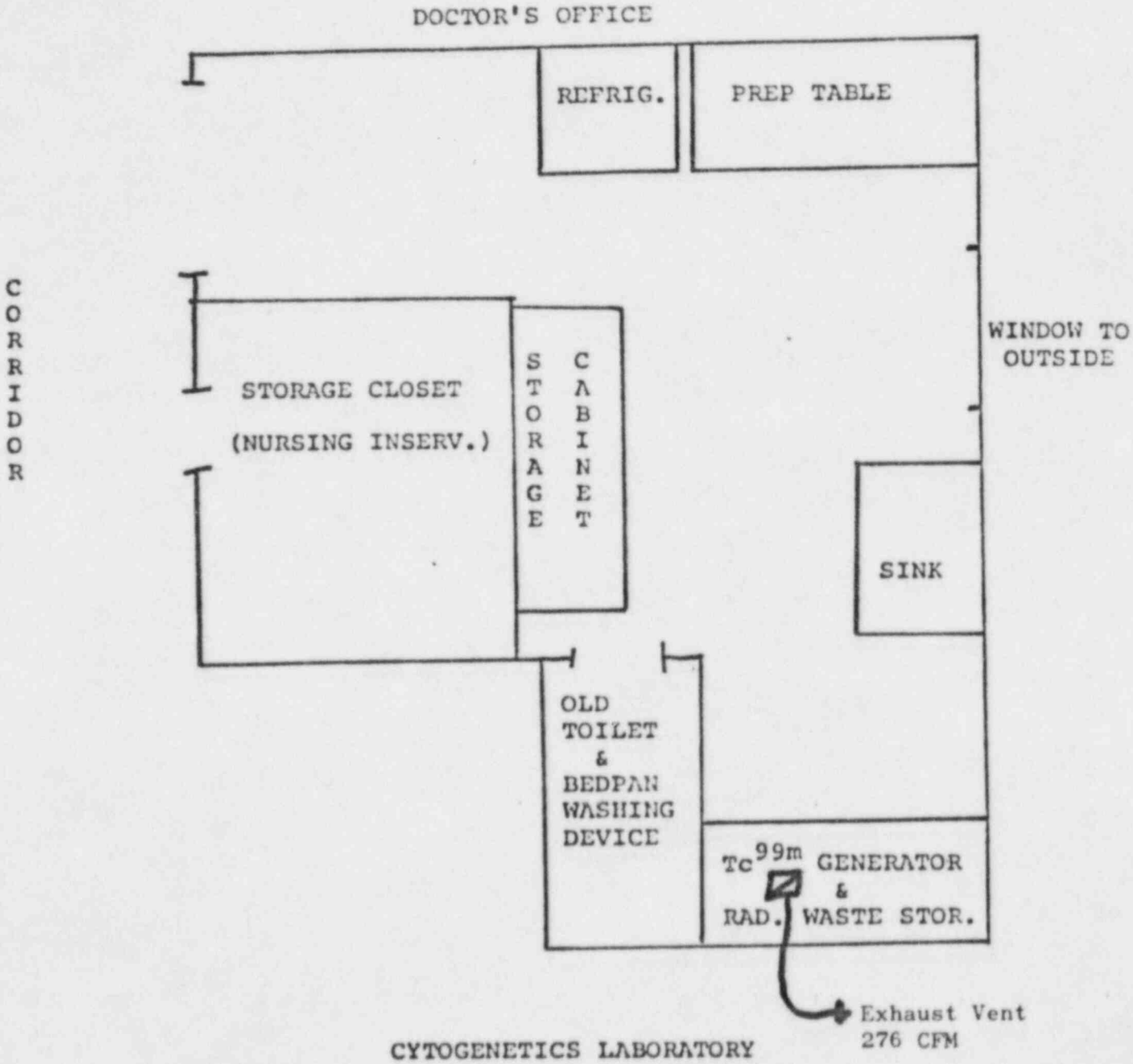
Mechanic's Initials: [illegible]

WILMINGTON MEDICAL CENTER
WILMINGTON GENERAL DIVISION

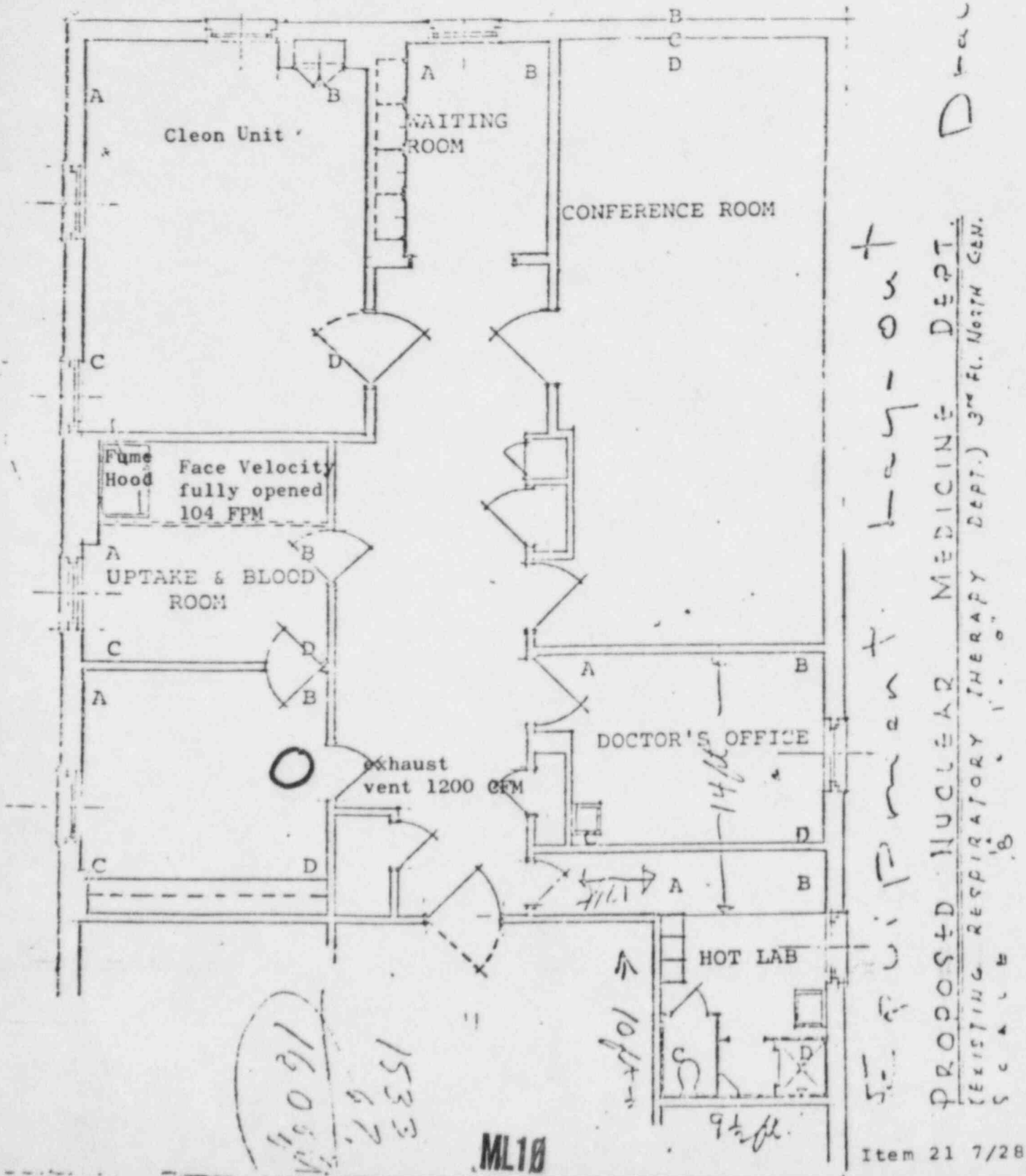
April 1982

NUCLEAR MEDICINE LABORATORY
Third floor, North wing

"Hot lab"



Wilmington Medical Center
Wilmington General Division
Nuclear Medicine
3rd Floor North Wing



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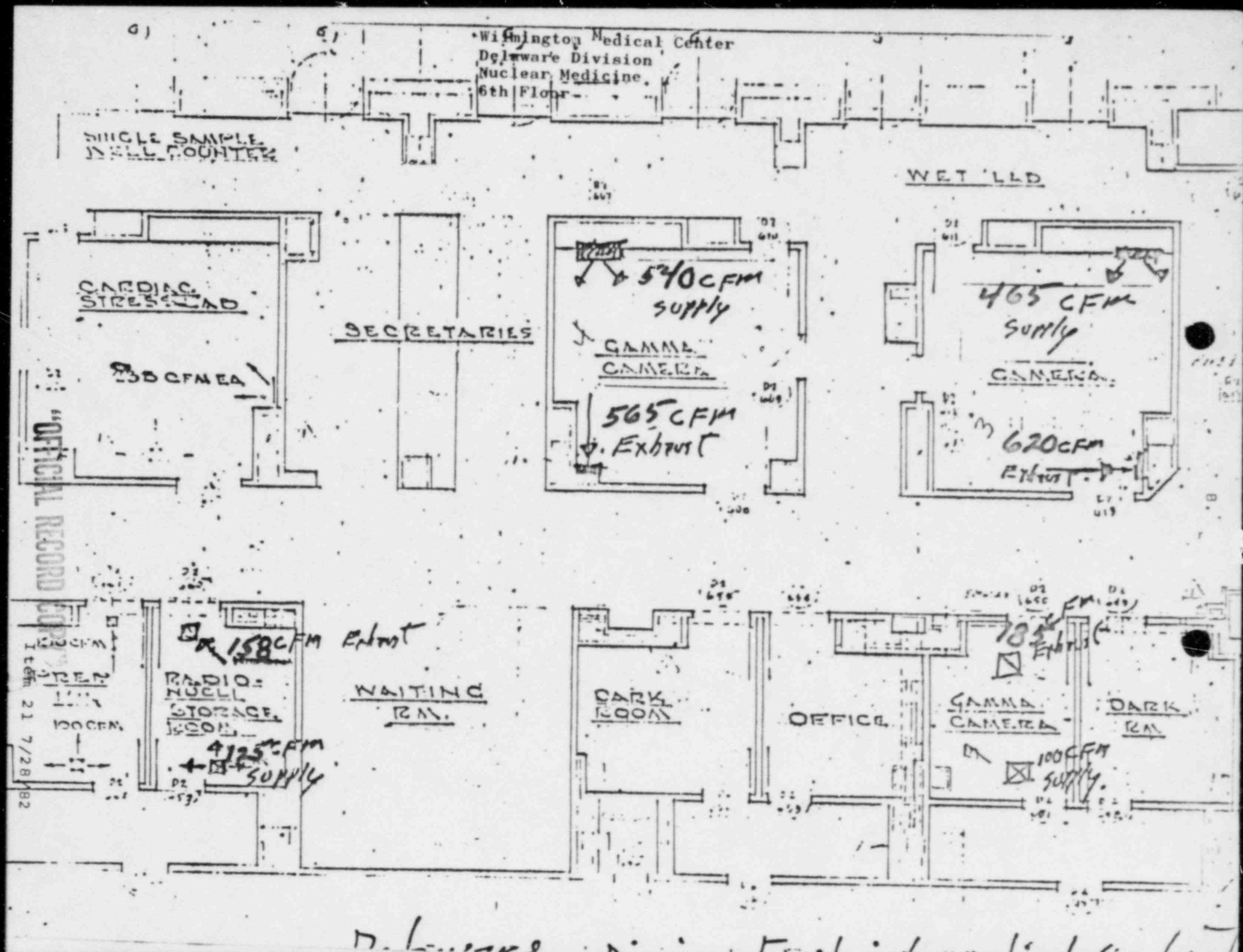
Item 21 7/28/82


Wilmington Medical Center
Delaware Division
Nuclear Medicine
6th Floor
SINGLE SAMPLE WELL COUNTER
WET LLD
CARDIAC STRESS LAB
250 CFM EA
SECRETARIES
540 CFM supply
GAMMA CAMERA
565 CFM Exhaust
465 CFM supply
GAMMA CAMERA
620 CFM Exhaust
OFFICIAL RECORD COPY
158 CFM Exhaust
RADIO-NUCL STORAGE ROOM
425 CFM supply
WAITING RM.
DARK ROOM
OFFICE
785 CFM Exhaust
GAMMA CAMERA
DARK RM.
100 CFM supply
Item 21 7/28/82