FORM NRC-313 I (6-78) 10 CFR 30

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE
INDUSTRIAL

See attached instructions for details.

Completed applications are filed in duplicate with the Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety, and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 or applications may be filed in person at the Commission's office at 1717 H Street, NW, Washington, D. C. or 7915 Eastern Avenue, Silver Spring, Maryland.

APPLICATION FOR: *(Check and/or complete as appropriate)*

- [ ] a. NEW LICENSE
- [ ] b. AMENDMENT TO: LICENSE NUMBER
- [XXX] c. RENEWAL OF: LICENSE NUMBER 37-01753-01

2. APPLICANT'S NAME *(Institution, firm, person, etc.)*
Saint Joseph's University (College)

TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
215-879-7406

3. NAME OF PERSON TO BE CONTACTED REGARDING THIS APPLICATION
Dr. John P. Waldron 2/28/79

TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
215-879-7406

4. APPLICANT'S MAILING ADDRESS *(Include Zip Code)*
City Avenue at 54th Street
Philadelphia, PA 19131

5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED *(Include Zip Code)*
City Avenue at 54th Street
Philadelphia, PA 19131

(IF MORE SPACE IS NEEDED FOR ANY ITEM, USE ADDITIONAL PROPERLY KEYED PAGES.)

6. INDIVIDUAL(S) WHO WILL USE OR DIRECTLY SUPERVISE THE USE OF LICENSED MATERIAL
(See Items 16 and 17 for required training and experience of each individual named below)

	FULL NAME	TITLE
a.	Dr. John P. Waldron	Professor of Physics
b.	Dr. Robert P. Koob	Professor of Chemistry
c.		

7. RADIATION PROTECTION OFFICER
Dr. John P. Waldron

Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15.

8. LICENSED MATERIAL

LINE NO.	A ELEMENT AND MASS NUMBER	B CHEMICAL AND/OR PHYSICAL FORM	C NAME OF MANUFACTURER AND MODEL NUMBER *(If Sealed Source)*	D MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTIVITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME
(1)	PLEASE REFER TO PAGE 5, WHICH IS ATTACHED.			
(2)				
(3)				
(4)				

RECEIVED BY NMB
FEB 22 1979
Date.....
Log Feb 28 Renewal
By. Pacun
Orig. To.....
Action Compl. 2/27/79

Applicant.....
Check No.....
Amount/Fee Category.....
Type of Fee.....
Date Check Rec'd.....
Received By.....

LINE NO.	E DESCRIBE USE OF LICENSED MATERIAL
(1)	(1) through (8) - Standard experiments in basic nuclear physics and in radioisotope techniques conducted by students supervised by Dr. Waldron or Dr. Koob.
(2)	(9) - Storage only.
(3)	(10) - Target for Kaman Model 710-A neutron generator (not operating).
(4)	(11) through (14) - Storage only. These items will be disposed of by way of a commercial wate disposal service.

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FEE EXEMPT 170.11(a)(4)

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9. STORAGE OF SEALED SOURCES

LINE NO.	A. CONTAINER AND/OR DEVICE IN WHICH EACH SEALED SOURCE WILL BE STORED OR USED.	B. NAME OF MANUFACTURER	C. MODEL NUMBER
(1)	(8) 890 microcuries of cobalt 60 stored in lead pig 3.5 cm thick	New England Nuclear	Not Available
(2)	(9) 150 millicuries of cobalt 60 stored in spherical lead pig	Atomic Energy of Canada, Limited	F-22
(3)	Item (10) stored in neutron generator	Kaman	710-A
(4)	Item (13) stored in lead castle made from lead bricks 5 cm thick.		

10. RADIATION DETECTION INSTRUMENTS

LINE NO.	A. TYPE OF INSTRUMENT	B. MANUFACTURER'S NAME	C. MODEL NUMBER	D. NUMBER AVAILABLE	E. RADIATION DETECTED (alpha, beta, gamma, neutron)	F. SENSITIVITY RANGE (milliroentgens/hour or counts/minute)
(1)	Survey meter	Eberline	E-120	1	beta-gamma	0 - 0.5, 0 - 5, 0 - 50 mr/hr
(2)	Survey meter	Nuclear Chicago	2612	1	beta-gamma	0 - 0.2, 0 - 2, 0 - 20 mr/hr
(3)						
(4)						

11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

☒ a. CALIBRATED BY SERVICE COMPANY

NAME, ADDRESS, AND FREQUENCY

Most recently: Bionic Instruments, Inc. Bala Cynwyd, PA 19004. When the Modern Physics or the Radiochemistry Labs are in session, the instruments are calibrated within 90 days of use.

☐ b. CALIBRATED BY APPLICANT

Attach a separate sheet describing method, frequency and standards used for calibrating instruments.

12. PERSONNEL MONITORING DEVICES

A. TYPE (Check and/or complete as appropriate.)	B. SUPPLIER (Service Company)	C. EXCHANGE FREQUENCY
☒ (1) FILM BADGE ☐ (2) THERMOLUMINESCENCE DOSIMETER (TLD) ☐ (3) OTHER (Specify): _____	R. S. Landauer, Jr. & Co. Glenwood, Illinois 60425	☒ MONTHLY ☐ QUARTERLY ☐ OTHER (Specify): _____

13. FACILITIES AND EQUIPMENT (Check were appropriate and attach annotated sketch(es) and description(s).

☑ a. LABORATORY FACILITIES, PLANT FACILITIES, FUME HOODS (Include filtration, if any), ETC.

☑ b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING (fixed and/or temporary), ETC.

☐ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.

☐ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC.

Please see pages 6 and 7.

14. WASTE DISPOSAL

a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED

Most recently: Teledyne Isotopes, 50 Van Buren Ave., Westwood, NJ 07675

b. IF COMMERCIAL WASTE DISPOSAL SERVICE IS NOT EMPLOYED, SUBMIT A DETAILED DESCRIPTION OF METHODS WHICH WILL BE USED FOR DISPOSING OF RADIOACTIVE WASTES AND ESTIMATES OF THE TYPE AND AMOUNT OF ACTIVITY INVOLVED. IF THE APPLICATION IS FOR SEALED SOURCES AND DEVICES AND THEY WILL BE RETURNED TO THE MANUFACTURER, SO STATE.

Please see page 7.

INFORMATION REQUIRED FOR ITEMS 15, 16 AND 17

Describe in detail the information required for Items 15, 16 and 17. Begin each item on a separate page and key to the application as follows:

15. RADIATION PROTECTION PROGRAM. Describe the radiation protection program as appropriate for the material to be used including the duties and responsibilities of the Radiation Protection Officer, control measures, bioassay procedures *(if needed)*, day-to-day general safety instruction to be followed, etc. If the application is for sealed source's also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.

16. FORMAL TRAINING IN RADIATION SAFETY. Attach a resume for each individual named in Items 6 and 7. Describe individual's formal training in the following areas where applicable. Include the name of person or institution providing the training, duration of training, when training was received, etc.

    a. Principles and practices of radiation protection.

    b. Radioactivity measurement standardization and monitoring techniques and instruments.

    c. Mathematics and calculations basic to the use and measurement of radioactivity.

    d. Biological effects of radiation.

17. EXPERIENCE. Attach a resume for each individual named in Items 6 and 7. Describe individual's work experience with radiation, including where experience was obtained. Work experience or on-the-job training should be commensurate with the proposed use. Include list of radioisotopes and maximum activity of each used.

18. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 30, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

WARNING.–18 U.S.C., Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

a. LICENSE FEE REQUIRED *(See Section 170.31, 10 CFR 170)* Zero	b. CERTIFYING OFFICIAL *(Signature)* John P. Waldron
	c. NAME *(Type or print)* John P. Waldron
(1) LICENSE FEE CATEGORY: Exempt 10 CFR, 170.11 (a)(4)	d. TITLE Radiation Protection Officer
(2) LICENSE FEE ENCLOSED: $	e. DATE 12 February, 1979

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8. LICENSED MATERIAL

	A	B	C	D
(1)	Carbon 14	Various forms		3 millicuries
(2)	Cobalt 60	Various forms		1 millicurie
(3)	Phosphorus 32	Various forms		10 millicuries
(4)	Iodine 131	Various forms		20 millicuries
(5)	Sodium 22	Solid	*Epoxy resin sealed in an acrylic rod. New England Nuclear, NES-141	11 microcuries
(6)	Sodium 22	Solid	*Deposited on aluminized mylar film on brass ring Atomic Laboratories 79653	10 microcuries
(7)	Cobalt 57	Solid	*Deposited on steel disk (possible future purchase)	1 millicurie
(8)	Cobalt 60	Solid	New England Nuclear Lot Number: H-64	890 microcuries
(9)	Cobalt 60	Solid	AECL Catalog No. C-200 or C-300	150 millicuries
(10)	Hydrogen 3		Sealed tubes Kaman Nuclear Model A-3043	2 tubes of 10 curies each
(11)	Barium 140 Lanthanum 140	Various forms		10 millicuries
(12)	Strontium 90 Yttrium 90	Various forms		5 millicuries
(13)	Strontium 90		Sealed sources (U.S. Radium Model LAB-277	3 sources of 100 microcuries each
(14)	Mixed Fission Products	Various forms		2 millicuries

* = Leak testing not appropriate.

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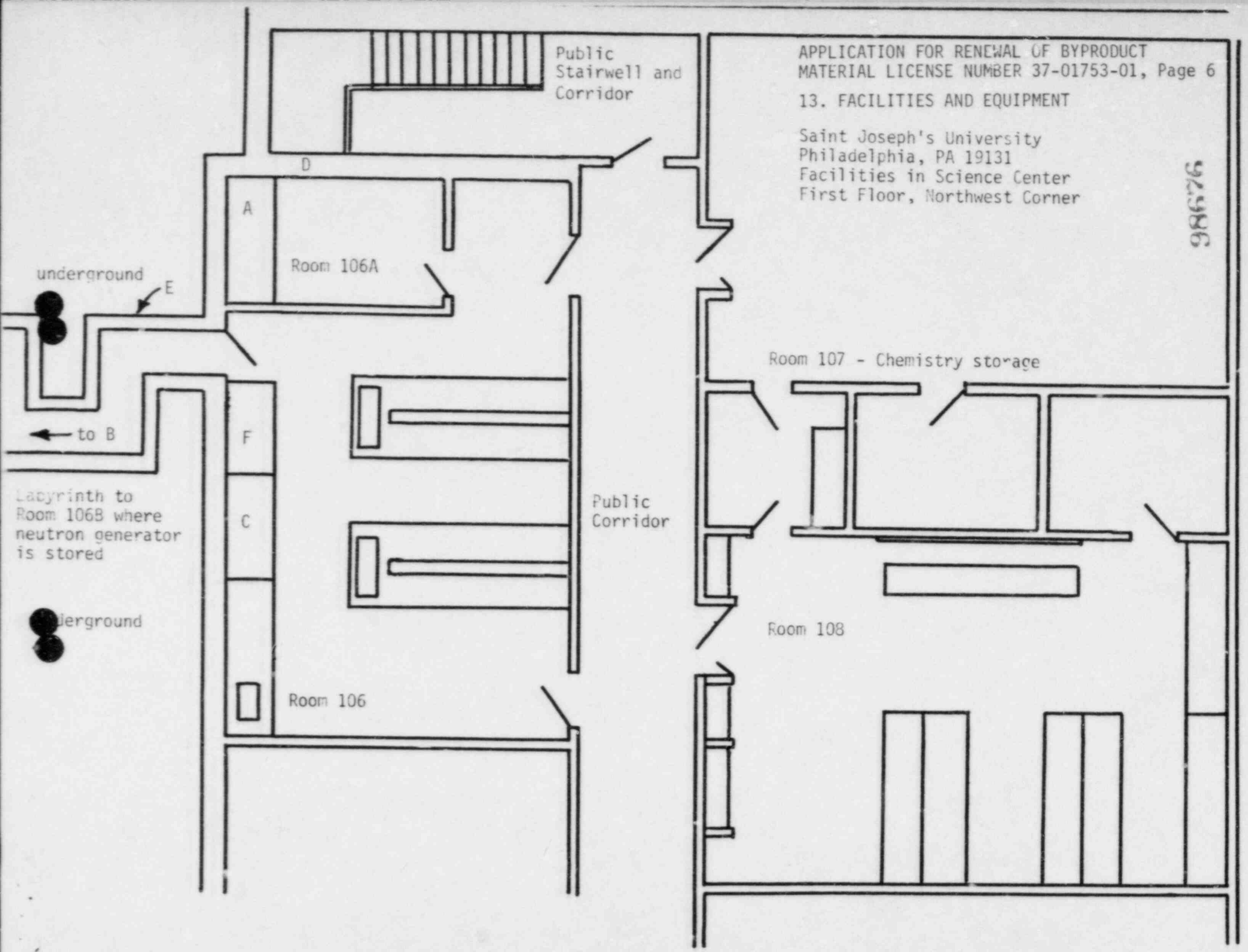
13. FACILITIES AND EQUIPMENT

Saint Joseph's University
Philadelphia, PA 19131
Facilities in Science Center
First Floor, Northwest Corner

92986



13. FACILITIES AND EQUIPMENT (Continued)

Please refer to the plans of the northwest corner of the first floor of the Science Center diagrammed on page 6. With the exception of hydrogen 3, all isotopes are stored in a lead castle located at "A" in Room 106A. Hydrogen 3 is stored in the Kaman Model 710-A neutron generator located by "B" in Room 106B. Access to Room 106 does not grant access to either Room 106A or Room 106B since all three rooms are keyed individually. Access to Rooms 106A and 106B is restricted to Dr. Waldron and Dr. Koob and to those under their direct supervision.

"C" represents a fume hood. "D" represents a 20-inch thick cement-block wall, "E" represents a 12-inch thick cement wall, while all other walls are constructed from 6-inch cement block. The roof of Room 106B containing the neutron generator is constructed of concrete of thickness one foot and is covered with a minimum of three feet, eight inches of earth.

"F" represents the location of the control console for the neutron generator. Unauthorized use of the unit is avoided by the need to possess three different keys: one to Room 106, a second to Room 106B, and a third to the control console.

Experiments using isotopes are performed in Room 106. Ordinarily, only microcurie quantities or less are used in Room 108.

14. WASTE DISPOSAL

(b) Sealed hydrogen-3 sources will be returned to Kaman for replacement as required. When necessary, other sealed sources will either be returned to their manufacturer or be transferred to a commercial waste disposal service.

The principal isotopes used are phosphorus 32 and iodine 131, about 10 millicuries each every other year.

Solid waste contaminated with these isotopes will be placed in a special waste container, lined with a disposable polyethyline bag and stored in Room 106A for at least 150 days. After at least 150 days the contents shall be monitored and if no detectable radioactivity remains, the radioactive caution label will be removed and the bag will be disposed of by normal methods.

Residual phosphorus 32 and iodine 131 in liquid form will be stored in Room 106A for at least 150 days and then disposed of by sanitary sewer in amounts of several microcuries per year.

15. RADIATION PROTECTION PROGRAM

The principal responsibilities of the Radiation Protection Officer are to ensure that our program presents the least possible exposure of individuals to radiation and to ensure that our activities are in compliance with Title 10, CFR, and the conditions of our license. He must attempt to increase awareness among faculty and students alike of proper and safe procedures in handling radioactive materials. He is directly responsible to the Vice President for Academic Affairs.

The Radiation Protection Officer specifies which isotopes may be used and by whom. Isotopes (11) through (14) are in storage only and will be disposed of by way of a commercial waste disposal service since they are not being used in our present program. At this time, no one is authorized to operate the neutron generator. A request, outlining the qualifications of our personnel, will be made in writing to the Commission seeking its approval before any attempt is made to operate the neutron generator.

The Radiation Protection Officer is responsible for maintaining records of personnel monitoring, area surveys, leak tests, and receipt and disposal of radioactive materials. In Room 106 area surveys are required at both the beginning and the end of each laboratory session. In Room 108 area surveys are required at the beginning of each laboratory session. In general, students do not work in either Room 106A or Room 106B. All personnel engaged in experiments are required to wear film badges.

Smoking is not permitted in the laboratories; food and drink cannot be brought in. At the end of an experiment, everyone is encouraged to wash and to monitor himself/herself with a survey meter.

Leak testing will be performed by either Dr. Waldron or Dr. Koob. Leak tests are performed by use of filter paper smears. Smears of sealed gamma sources are measured for activity using a NaI(Tl) detector in conjunction with a single channel analyzer. A standard NEN cobalt-60 source or other appropriate source will be used as a reference. For cobalt 60, the counting efficiency of the system ranges from 1.3×10^{-4} microcurie per cpm to 3.4×10^{-5} microcurie per cpm. Beta source smears will be measured by liquid scintillation counting.

The Radiation Protection Officer is personally responsible for the disposal of radioactive materials.

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16. FORMAL TRAINING IN RADIATION SAFETY

Dr. John P. Waldron, 6.a and 7

	WHERE TRAINED	DURATION OF TRAINING
(a)	19 Sessions of a Health Physics Training/Refresher Course sponsored by the Delaware Valley Society for Radiation Safety, Philadelphia, PA	Winter-Spring, 1975
(b)	Same as part (a)	
(c)	Same as part (a) with the addition: University of Notre Dame, South Bend, Indiana	Spring, 1955
(d)	Same as part (a)	

Dr. Robert P. Koob, 6.b

	WHERE TRAINED	DURATION OF TRAINING
(a)	University of Oklahoma, Norman, Oklahoma	ca. one week, Summer, 1964
(b)	Same as part (a)	
(c)	Same as part (a)	
(d)	Same as part (a)	

17. EXPERIENCE

Dr. John P. Waldron, 6.a and 7

ISOTOPE	MAXIMUM AMOUNT	WHERE	DURATION	TYPE OF USE
Pu-Be	5 Ci	St. Joseph's	17.5 yrs.	Student Training
^{60}Co	1000 Ci	St. Joseph's	4 yrs.	Leak Testing
^{32}P	5 milliCi	St. Joseph's	4 yrs.	Student Training
^{131}I	5 milliCi	St. Joseph's	4 yrs.	Student Training
^{137}Cs	sub microCi	St. Joseph's	17.5 yrs.	Student Training
^{241}Am	sub microCi	St. Joseph's	17.5 yrs.	Student Training

Dr. Robert P. Koob, 6.b

^{60}Co	1000 Ci	St. Joseph's	6 yrs.	Student Training
^{32}P	5 milliCi	St. Joseph's	10 yrs.	Student Training
^{131}I	5 milliCi	St. Joseph's	10 yrs.	Student Training
^{137}Cs	1 microCi	St. Joseph's	10 yrs.	Student Training
^{234}Pa	sub microCi	St. Joseph's	10 yrs.	Student Training
^{14}C	sub microCi	St. Joseph's	10 yrs.	Student Training
^{210}Bi	sub microCi	St. Joseph's	10 yrs.	Standardization Experiments
^{204}Tl	sub microCi	St. Joseph's	10 yrs.	Standardization Experiments
^{90}Sr	sub microCi	St. Joseph's	10 yrs.	Standardization Experiments

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