13-108-2

Form AEC-313 (6-56)

ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved. Budget Bureau No. 38-R027.3.

DUPLICATED

INSTRUCTIONS: Complete Items 1 through 19 if this is a new application. If renewal is requested, complete only Items 1 through 11 provided that with respect to the other items there has been no change in information previously submitted. Mail two copies to: U. S. Atomic Energy Commission, P. O. Box E, Oak Ridge, Tennessee, Attention: Isotopes Extension, Division of Civilian Application. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. General requirements for issuance of an AEC Byproduct Material License are contained in Title 10, Code of Federal Regulations, Part 30.

1. (a) NAME AND SHIPPING ADDRESS OF APPLICANT (Institution, firm, hospital, person, etc.)

Indiana University
Bloomington, Indiana

(b) ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED (If different from shipping address)

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Chemistry Department

3. INDIVIDUAL USER (Name and title of individual(s) who will use or directly supervise use of byproduct material)

L. L. Merritt, Professor of Chemistry, and H. R. Mahler, Professor of Chemistry

4. RADIOLOGICAL SAFETY OFFICER (Name of person qualified in radiological safety, if other than individual user)

R. L. Seifert

5. PREVIOUS LICENSE OR AUTHORIZATION NUMBER (If this is an application for renewal of a license for byproduct material, enter number of current license or authorization for radioisotope procurement)

13-108-1 for amendent to this license (-1 should be -2 amended)

BYPRODUCT MATERIAL OR IRRADIATION SERVICE DESIRED

6. BYPRODUCT MATERIAL (Element and mass number)	7. CHEMICAL AND/OR PHYSICAL FORM (Or catalog number)	8. MAXIMUM AMOUNT OF RADIOACTIVITY IN MILLICURIES THAT YOU WILL POSSESS AT ANY ONE TIME
a. 1. Cadmium 115	a. Any	a. 50 millicuries

(continued on page 2)

9. IF IRRADIATION SERVICE IS DESIRED, STATE PERTINENT DETAILS SUCH AS: CHEMICAL COMPOSITION AND WEIGHT IN GRAMS OF TARGET MATERIAL, RADIOACTIVITY, IRRADIATION TIME IN DAYS, AND NEUTRON FLUX

STATEMENT OF USE

10. (a) DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. (If material is for "human use" complete Supplement A in lieu of this item. If material is to be used in or manufactured as a "sealed source" complete Supplement B in addition to this item.)

Same as on original application.

(b) DESCRIBE PROCEDURES WHICH WILL BE OBSERVED TO MINIMIZE HAZARD FROM HANDLING, STORAGE, AND DISPOSAL OF THE BYPRODUCT MATERIAL

CERTIFICATE

11. The applicant and any official executing this certificate on behalf of the applicant named in Item 1, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 30, and do solemnly swear (or affirm) that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

State of Indiana
County of Monroe
Subscribed and sworn to before me this 15 day of November, 1956

Vesta Burks
Notary Public My Commission Expires Nov. 9, 1959

Indiana University
Applicant named in Item 1

By J. A. Franklin
Title of Certifying Official VP & Treasurer

November 15, 1956
Date

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.

(Continued on reverse side)

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16—67204-6

Amendment 6 by (WEB)

A/30

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ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

INSTRUCTIONS: Complete Items 12 through 19 if this is a new application. This information may be omitted from subsequent applications provided there is no change in the information previously submitted, and reference is made in Item 5 to the application on which this information appears.

TRAINING AND EXPERIENCE WITH RADIOACTIVITY OF INDIVIDUAL USER NAMED IN ITEM 3

12. TYPE OF TRAINING shown on separate page.	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
1. Principles and practices of radiological health safety.			Yes No	Yes No
2. Radioactivity measurement standardization and monitoring techniques and instruments			Yes No	Yes No
3. Mathematics and calculations basic to the use and measurement of radioactivity.			Yes No	Yes No
4. Biological effects of radiation. . .			Yes No	Yes No
5. Actual use of radioisotopes in the types and quantities for which application is being made, or equivalent experience			Yes No	Yes No

13. ISOTOPE HANDLING EXPERIENCE shown on attached page.

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

14. If Radiological Safety Officer named in Item 4 is different from individual user named in Item 3, use supplementary sheet to provide equivalent information on "Training and Experience With Radioactivity of Radiological Safety Officer." Supplementary sheet is attached (Circle answer) same as original application. Yes No

PHYSICAL FACILITIES, EQUIPMENT, AND RADIATION INSTRUMENTATION

15. RADIATION DETECTION INSTRUMENTS (Use separate sheet if necessary) same as original application.

TYPE OF INSTRUMENTS (Include make and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE (mr/hr)	WINDOW THICKNESS (mg/cm²)	USE (Monitoring, surveying, measuring)

16. FILM BADGES, DOSIMETERS, AND OTHER PERSONNEL MONITORING DEVICES INCLUDING BIO-ASSAY PROCEDURES

Same as original application.

17. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE (For X-ray, isotope equip. method of calibration and processing, or name supplier)

Same as original application.

18. (a) DESCRIBE BRIEFLY REMOTE HANDLING EQUIPMENT, STORAGE CONTAINERS, SHIELDING, AND LABORATORY FACILITIES (Working areas, fume hoods, etc.)

Same as original application.

(b) SKETCHES OF SUCH FACILITIES ARE ATTACHED (Circle answer) Yes No

19. DESCRIBE BRIEFLY RADIATION SURVEYING PROCEDURES AND METHODS OF DISPOSING OF RADIOACTIVE WASTES

Same as original application.

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6 (a) Byproduct Material	7 (a) Chemical and/or physical Form.	8 (a) Maximum Amount of Radioactivity in Millicuries that you will possess at any one time.
2. Chlorine 36	Any	1 millicurie
3. Cobalt 60	Any	100 millicuries
4. Mixed Fission Products	Any	100 millicuries
5. Hafnium 181	Any	100 millicuries
6. Hydrogen 3	Any	1 curies
7. Nickel 63	Any	25 millicuries
8. Niobium 95	Any	50 millicuries
9. Selenium	Any	25 millicuries
10. Silver	Any	25 millicuries
11. Tantalum 182	Any	50 millicuries
12. Tin 113	Any	50 millicuries
13. Zirconium 95	Any	50 millicuries

10. (a and b). Same statement as on original application

12.

Type of Training	Where Trained	Duration of Training	On the Job	Formal Course
L.L. Merritt				
2.	Indiana University	Since 1947	Yes	No
3.	U. Of Michigan	1 Semester	No.	yes
5.	Indiana University	Since 1947	Yes	No
H.R. Mahler				
1.	U. of California	5 months	Yes	Yes
2.	U. of California	5 months; also, 2 years lab experience	Yes	Yes
3.	U. of California	Same as above	Yes	Yes
4.	U. of California	Same as above	Yes	Yes
5.	U. of California	Same as above	Yes	Yes

13. Isotope Handling Experience

Isotope	Maximum Amount	Where Experience was gained.	Duration of Experience	Type of Use.
H.R. Mahler				
C 14	5 mC	U. of California	2 years	Laboratory and biosynthesis, biological and organochemical tracer studies.
P 32	10 mC	Texas Research Foundation	1 year	
I 131	10 mC	U. of Wisconsin	5 years	
L.L. Merritt				
Carbon 14	4 mc	Indiana University	1950 to date	Analytical research and instruction in radio-chemistry
Cadmium 115	50 mc	Same		
Cobalt 60	100 mc	Same		
Iodine	50 mc.	Same		
Phosphorus 32	10 mc.	Same		
Zinc 65	40 mc.	Same		
Chlorine 36	.020 mc.	Same		

and many cyclotron-produced isotopes.

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Amendment to 54 (Gen)

14. Training and Experience with Radioactivity of Radiological Safety Officer

Our Radiological Safety Officer, Dr. Ralph L. Seifert, received on the job training while employed as chemist at the Metallurgical laboratory, Chicago, from January, 1944 to June, 1946. He worked with Dr. O. C. Simpson's group in Dr. G. T. Seaborg's section. He utilized plutonium (in milligram quantities) and Be^7 in the measurement of the vapor pressures of the plutonium halides and BeO. He has twice taught our Radiochemistry course, using texts by Friedlander and Kennedy and by Schweitzer and Whitney. Uranium and its decay products and P^{32} were used in the laboratory portion of this course.

PHYSICAL FACILITIES, EQUIPMENT, AND RADIATION INSTRUMENTATION

I. For radiochemical work in the biochemistry laboratories

15. Type of instrument | No Available | Radiation Detected | Sensitivity Range | Window Thickness | Use

Berkeley Scaler, No. 100	1	β,γ	Windowless Flow Counters and G.M. thin window		Measuring
Nuclear Scaler, No. 161A	1				
Nuclear Scaler, No. 165	1				

Monitoring and surveying instruments are available on loan from the radiochemical laboratory building on the campus.

16. Two electroscope pocket chambers for I^{131} work. None for C^{14} and S^{35} (Activities are always of low order.)

17. None in this area but equipment in the radiochemical laboratory building is used when needed.

18. Long handled tongs are available in this laboratory. Containers obtained from Oak Ridge are used for storage. Remote pipette control and lead and iron bricks are available in the Radiochemical laboratory Building.

19. Radioactive waste is accumulated in a covered steel container for a period of one or two months and is then burried in a special dumping ground provided by the University.

II. For radiochemical work in the radiochemical laboratory building

15. Type of instrument | No Available | Radiation Detected | Sensitity Range | Window Thickness

Beckman No. MX3A	1	α,β,γ	0-2000 MR/HR	0 to 1/8 in. bakelite
Beckman No. MX-5	3	β,γ	0-20 MR/HR 0-100,000 c/m	45 mg/sq. cm.
Victoreen No. 356	1	α,β,γ	α: 0-4000 c/m 0-40,000 γ: 0-4, 0-40 MR/HR	0.2 mil nylon
Nuclear Classmaster	1	β,γ	Indicates indiv. counts	
Nuclear Scaler No. 162	1	β,γ	Register indiv. counts	Various counting tubes used
Nuclear Scaler No. 163	1	β,γ	Ditto	
Nuclear Scaler No. 172	1	β,γ	Ditto	
NNC α-β-γ Proportional Counter No. 101	1	α,β,γ	Ditto	C

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16. Nuclear Pocke Chambers, No. 3340 10
Beckman Electroscope Pocket chambers 4

17. Survey meters are calibrated against radium standards each time the entire laboratory is surveyed. The Nuclear Classmaster is used to survey areas where radioactive material has been used after completing each operation which may have caused some contamination. This instrument registers individual counts and is checked each time it is used with any convenient source to insure that it is operating.

18. The containers in which radioactive substances are received are stored in a pit with 12 inch thick concrete walls. Iron and lead bricks are used to construct shields for transfer operations. Remote pipetting devices and long handle tongs are available. Three fume hoods in the laboratory were provided by AEC. The laboratory is equipped with stainless steel desk tops.

19. Each person using the laboratory monitors his area after each operation that may have caused contamination of laboratory surfaces. Periodically the Radiological Safety Officer surveys the entire laboratory. The radioactive waste, all of which has a low level of activity, is accumulated in a covered steel container for a period of one or two months and is then buried in a special dumping ground provided by the university.