

ATOMIC ENERGY COMMISSION  
APPLICATION FOR BYPRODUCT MATERIAL LICENSEForm approved.  
Budget Bureau No. 38-R027.3.

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 the 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.)National Research Corporation  
70 Memorial Drive  
Cambridge 42, Massachusetts(b) ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED  
(If different from shipping address)

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Physics Department

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

G. Frederick Vanderschmidt

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

J. C. Simons, Jr.

5. PREVIOUS LICENSE OR AUTHORIZATION NUMBER (If this is an application for renewal of a license for byproduct material obtained under a prior license or authorization for radioisotope procurement)

none

## BYPRODUCT MATERIAL OR IRRADIATION SERVICE DESIRED

6. BYPRODUCT MATERIAL (Element and mass number)

 $H^3$ 

7. CHEMICAL AND/OR PHYSICAL FORM (Or catalog number)

Zr or Ti hydride plaques  
from U.S. Radium Corp.  
(See enclosed dwgs.)

8. MAXIMUM AMOUNT OF RADIOACTIVITY IN MILLI-CURIES THAT YOU WILL POSSESS AT ANY ONE TIME

20,000 mc

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.)

The material will be used as a source of ionization in experimental investigations of vacuum gauges, gas analyzers, and other instruments involving the production of excited or ionized gas molecules as a principle of operation.

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

Material obtained from U.S. Radium Corp. bound to stainless steel plaques. (See enc. dwgs. LAB 507 & 508) Plaques are similar to Oak Ridge cyclotron targets HZR-2. Plaques stored in locked, steel container. Plaques handled using rubber gloves and tweezers. Disposal of scrap by U. S. Radium Corp.

## 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 \_\_\_\_\_

County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_

day of \_\_\_\_\_

Notary Public \_\_\_\_\_

National Research Corporation

Applicant named in Item 1

By David A. Nickerson  
Assistant Secretary  
Title of Certifying OfficialDate July 16, 1957

## 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.

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	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
1. Principles and practices of radiological health safety. . . . .	M. I. T.	1953-1957	<input checked="" type="radio"/> Yes    No	Yes    No
2. Radioactivity measurement standardization and monitoring techniques and instruments . . . . .	"	"	<input checked="" type="radio"/> Yes    No	<input checked="" type="radio"/> Yes    No
3. Mathematics and calculations basic to the use and measurement of radioactivity. . . . .	"	"	<input checked="" type="radio"/> Yes    No	<input checked="" type="radio"/> Yes    No
4. Biological effects of radiation. . .	"	"	<input checked="" type="radio"/> Yes    No	<input checked="" type="radio"/> Yes    No
5. Actual use of radioisotopes in the types and quantities for which application is being made, or equivalent experience . . . . .	N. R. C.	March-June 1957	<input checked="" type="radio"/> Yes    No	Yes    No

**13. ISOTOPE HANDLING EXPERIENCE**

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
Radium	100 $\mu$ c	M. I. T.	1953-1957	Ionizing Source
Co <sup>60</sup>	100 $\mu$ c	"	"	
Tritium	1 c	N. R. C.	1957	

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) ☒ Yes    No

**PHYSICAL FACILITIES, EQUIPMENT, AND RADIATION INSTRUMENTATION**

**15. (Cont.)**

Special ion chamber permitting mounting of source inside chamber. H<sup>3</sup> activity corresponding to 10  $\mu$ c detectable. May be used for surveying swabs.

Geiger Counter

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

Film badges worn by laboratory personnel. Urine tritium assay available from New England Nuclear Corp. in case of suspected tritium spill.

**17. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE (For film badges specify method of calibration and processing, or name supplier)**

Tritium ion chamber calibrated by checking response of plaques against determinations by U.S. Radium Corp. Other instruments returned to maker for check when response to standard radium plaque falls off. Film badges supplied by Landauer, Park Forest, Illinois.

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

Steel storage container with lock provides shielding and storage for sources.

(b) SKETCHES OF SUCH FACILITIES ARE ATTACHED (Circle answer)

Yes    ☒ No

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

Tritium plaques are continuously checked for activity lost as part of our testing program. Scrap foils are returned to U.S. Radium Corp. for disposal.

APPLICATIC FOR BYPRODUCT MATERIAL LICENSE  
SUPPLEMENT B-SEALED SOURCES

If application is for byproduct material to be used in or manufactured as a "sealed source" complete this supplement and attach to the application for byproduct material license. Applicant for use of sealed source should complete Section I. An applicant desiring to manufacture a sealed source should complete Section II. If information has been submitted previously and there are no changes in the sealed source and/or device design or other changes in information submitted previously, details requested below may be omitted provided reference is made on line below to the application or other document on which this information appears:

## SECTION I—USE (See instructions)

## 1. IF SEALED SOURCE OR DEVICE CONTAINING SEALED SOURCE IS MANUFACTURED COMMERCIALY, GIVE FOLLOWING INFORMATION:

- A. Manufacturer or supplier of sealed source and/or device U. S. Radium Corp.  
B. Make and model number of sealed source and/or device LAB 507 and LAB 508  
C. Person who will hold legal title to sealed source G. Frederick Vanderschmidt

2. (a) NAME OF PERSON WHO WILL PERFORM NECESSARY PERIODIC LEAKAGE TESTS (6-month intervals for beta-gamma; 3-month period for alpha emitters. See instructions)  
G. Frederick Vanderschmidt

- (b) IF ABOVE PERSON IS NOT THE SUPPLIER, MANUFACTURER, NOR A COMMERCIAL LABORATORY ROUTINELY OFFERING SUCH SERVICES, GIVE BRIEF STATEMENT OF EXPERIENCE OR TRAINING OF SUCH PERSON IN TECHNIQUES TO BE EMPLOYED, A STATEMENT OF LEAK TESTING PROCEDURES INCLUDING EVIDENCE OF ITS EFFICACY AND INSTRUMENTATION TO BE USED:

The sources are to be used as ionizing elements in various experimental measuring devices requiring the production of excited or ionized gas molecules as a principle of operation. Any loss of sensitivity in these instruments is immediately followed by a check of the source activity. Sources are checked by being placed in a demountable ionization chamber; loss of the order of 2% is detectable. Such checks will be made of all plaques at least every six months. For training and experience of checker, see Form 313.

## 3. ARRANGEMENTS WHICH WILL PREVAIL FOR PERFORMING INITIAL RADIATION SURVEY (If appropriate), SERVICING MAINTENANCE, REPAIR, CONTROL, AND DISPOSAL, ETC., OF THE SOURCE:

Initial radiation survey will be made by U. S. Radium Corp. along with service, maintenance, repair, control, and disposal of source.

## SECTION II—MANUFACTURE

## 4. IF SEALED SOURCE TO BE MANUFACTURED OR FABRICATED BY THE APPLICANT IS DESIGNED TO TRANSMIT ONLY GAMMA RAYS AND CONTAINS IN ELEMENTAL FORM (but not powders) COBALT 60, IRIIDIUM 192, GOLD 198, TANTALUM 182, OR THULIUM 170, GIVE FOLLOWING INFORMATION AND DISREGARD QUESTIONS 5 THROUGH 12 ON THIS SUPPLEMENT:

- (a) Quantity of byproduct material per source and model number  
(b) Leak testing procedure to be employed:  
(c) Attach annotated engineering drawing of source container and holder, if any:  
(d) Describe label to be affixed to source container and/or source holder (or attach copy. See instructions):

APPLICATION FOR BYPRODUCT MATERIAL LICENSE  
SUPPLEMENT B-SEALED SOURCES

## ALL SEALED SOURCES OTHER THAN THOSE DEFINED IN ITEM 4

## 5. QUANTITY OF BYPRODUCT MATERIAL PER SOURCE AND MODEL OR DRAWING NUMBER

1 curie per source. Dwg. Nos. LAB 507 and LAB 508

## 6. MEANS BY WHICH BYPRODUCT MATERIAL WILL BE DEPOSITED IN SOURCE CONTAINER:

The  $H^3$  is chemically bound to a thin layer of zirconium or titanium. The layer of zirconium or titanium is rolled or evaporated on a stainless steel foil.

## 7. ATTACH ANNOTATED ENGINEERING DRAWING OF SOURCE CONTAINER AND HOLDER, IF ANY:

LAB 507 and LAB 508 attached.

## 8. TYPE OF SEAL TO BE USED TO PRECLUDE LEAKAGE OF RADIOACTIVITY TO EXTERIOR OF SOURCE:

The  $H^3$  is chemically bound to the zirconium or titanium layer as in cyclotron target HZR-2. No outer seal is possible because of the low energy of the beta emission.

## 9. IF SOURCE HOLDER IS TO BE USED WILL CONTAINER BE PERMANENTLY OR SEMIPERMANENTLY MOUNTED THEREIN?

The plaques will be semi-permanently mounted in various experimental devices.

## 10. DESCRIBE LABEL TO BE AFFIXED TO CONTAINER AND/OR SOURCE HOLDER (Or attach copy. See instructions):

A 3x5" label stating the amount and type of radioactivity is affixed to all experimental setups using radioactive plaques.

## 11. EVIDENCE OF STABILITY OF SOURCE CONTAINER MATERIAL TO IRRADIATION FROM BYPRODUCT MATERIAL THEREIN (Omit if such stability is obvious):

Experience with cyclotron targets has shown this method of source preparation to be stable.

## 12. LEAK TESTING PROCEDURE TO BE EMPLOYED INCLUDING EVIDENCE OF ITS EFFICACY AND INSTRUMENTATION TO BE USED:

(See 2b.)

## DEVICES CONTAINING SEALED SOURCE

(Give following information if sealed source is to be mounted in a device)

## 13. ATTACH ANNOTATED ENGINEERING DRAWING OF DEVICE INCLUDING MODEL NUMBER AND DETAILS OF MOUNTING OF CONTAINER OR SOURCE HOLDER IN THE DEVICE:

## 14. DESCRIBE CONSTRUCTION AND OPERATION OF THE POSITIONING MECHANISM FOR BRINGING SOURCE INTO "ON" AND "OFF" POSITIONS:

## 15. DESCRIBE CONSTRUCTION AND OPERATION OF READILY VISIBLE INDICATOR OF DEVICE INDICATING "ON" AND "OFF" POSITIONS OF SOURCE:

## 16. DESCRIBE DESIGN FEATURES WHICH SERVE TO MINIMIZE RADIATION HAZARD FROM THE DIRECT BEAM AND SECONDARY RADIATION (Including type and amount of shielding as well as limited accessibility inherent in installations where use is contemplated)

## 17. DESCRIBE LABEL TO BE AFFIXED TO DEVICE (Or attach copy. See instructions):

## 18. RADIATION PROFILE OF A PROTOTYPE DEVICE IS ATTACHED. (Circle your answer):

YES

NO

20-1465-2

Supplement to  
APPLICATION FOR BYPRODUCT MATERIAL LICENSE  
(National Research Corp., Cambridge, Mass.)

TRAINING AND EXPERIENCE WITH RADIOACTIVITY OF RADIOLOGICAL SAFETY OFFICER

12.	Type of Training	Where	When	On the Job	Formal Course
1.		Westinghouse-Bettis Field	1949-1952	Yes	
2.		"	"	Yes	
3.		MIT	1947-1948		Yes
4.		NRC	1956-1957	Yes	
5.		NRC	1956-1957	Yes	

13. Isotope Handling Experience

Isotope	Max. Amt.	Where	When	Type of Use
Radium	100 $\mu$ c	NRC	1956-1957	Ionizing Source
Kr <sup>85</sup>	1 c	"	"	" "
Tritium	1 c	"	"	" "