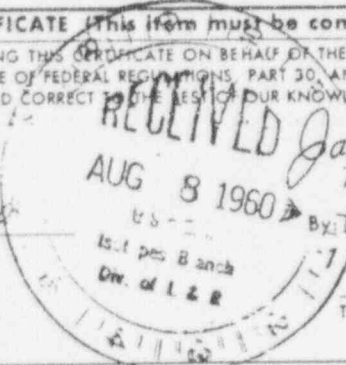


Am# 3 5-1399-4

Form AEC-313 (5-58)	ATOMIC ENERGY COMMISSION APPLICATION FOR BYPRODUCT MATERIAL LICENSE AMENDMENT	Form approved. Budget Bureau No. 38-R027.3.
<p>INSTRUCTIONS.—Complete Items 1 through 16 if this is an initial application. If application is for renewal of a license, complete only Items 1 through 7 and indicate new information or changes in the program as requested in Items 8 through 15. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail three copies to: U. S. Atomic Energy Commission, Washington 25, D. C. Attention: Isotopes Branch, Division of Licensing and Regulation. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material 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, Part 20.</p>		
1. (a) NAME AND STREET ADDRESS OF APPLICANT. (Institution, firm, hospital, person, etc.)		(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. (If different from 1 (a).)
U. S. Geological Survey Denver Federal Center Denver, Colorado		See application dated Aug. 31, 1959
2. DEPARTMENT TO USE BYPRODUCT MATERIAL		3. PREVIOUS LICENSE NUMBER(S). (If this is an application for renewal of a license, please indicate and give number.)
Water Resources Division General Hydrology Branch		5-1399-4 as amended
4. INDIVIDUAL USER(S). (Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)		5. RADIATION PROTECTION OFFICER (Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.)
O. E. Leppanen, Physicist T.E.A. van Hylckama, Research Engineer R. C. Culler, Project Hydrologist C. Sumsion, Hydraulic Engineer J. L. Sidders, Engineering Aide		
6. (a) BYPRODUCT MATERIAL. (Elements and mass number of each.)	(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLCURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. (If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)	
7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. (If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)		
<p>Ac-Be sealed source capsule is used as a fast neutron source mounted in a probe in proximity to a thermal neutron detector for use in the neutron-scattering method of soil-moisture measurement.</p> <p>Nuclear-Chicago Corp. P-19 probe with lead-paraffin storage container always used.</p> <p>9407150251 930720 PDR FOIA CARROLL93-321 PDR</p> <p>7/15/251</p>		
<p>DUPLICATED FOR DIV. OF INSP.</p> <p>28423</p>		

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TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 (Use supplemental sheets if necessary)					
8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)	
a. Principles and practices of radiation protection	See Enclosure A		Yes No	Yes No	
b. Radioactivity measurement standardization and monitoring techniques and instruments			Yes No	Yes No	
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No	
d. Biological effects of radiation			Yes No	Yes No	
9. EXPERIENCE WITH RADIATION. (Actual use of radioisotopes or equivalent experience.)					
ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE	
See Enclosure B					
10. RADIATION DETECTION INSTRUMENTS. (Use supplemental sheets if necessary.)					
TYPE OF INSTRUMENTS (Include make and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE (mr/hr)	WINDOW THICKNESS (mg/cm ²)	USE (Monitoring, surveying, measuring)
11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.					
12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. (For film badges, specify method of calibrating and processing, or name of supplier.)					
INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS					
13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. (Circle answer) Yes No					
See Enclosure C					
14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source.					
See Enclosure D					
15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved.					
CERTIFICATE (This item must be completed by applicant)					
16. 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 THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.					
Date <u>August 5, 1968</u>		<div style="text-align: center;">  </div>			
		By <u>Robert C. Liddle</u> Applicant named in item 1 <u>Oliver E. Kappanen - Physicist</u> Title of certifying official			
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.					

ENCLOSURE A

Training and experience of O. E. Leppanen is described in original application for license No. 5-1399-4 and application for renewal of license 5-1399-4 dated August 31, 1959.

Training of Mssrs. van Hylckama, Culler, Sumsion, and Sidders is listed below. Training was given under Mr. H. E. Skibitzke at the Ground Water Research Laboratory of the U. S. Geological Survey at Phoenix, Arizona. Mr. Skibitzke is trained in radioisotope handling and possesses licenses for curie quantities of materials such as Phosphorus-32.

Material given in the course includes:

- a. General principles of alpha, beta, and gamma radiation and ionization phenomena with laboratory demonstration and practice (3 hours).
- b. Radiation monitoring equipment theory and use in laboratory (3 hours).
- c. Statistics of counting with laboratory demonstration and practice (3 hours).
- d. Effects of radiation shielding by various materials upon the various emissions by experiment (3 hours).
- e. Mathematics and analysis of shielding, decay laws, and attenuation with distance (3 hours).

Other material to be given after July 18, 1960, will include Federal laws and regulations applicable to possession and safe handling of active materials. Hot laboratory procedures will be practiced for several hours. Anticipated future instruction will total about 15 hours.

O. E. Leppanen, Physicist, U. S. Geological Survey, has reviewed and discussed the theories and safety practices directly applicable to the field use of the specific materials used in the Nuclear-Chicago soil-moisture meter. This review was for 1½ hours; however, Mssrs. Culler, Sumsion, and van Hylckama have already had considerable instruction and practice in the use of the soil-moisture meter as noted in Enclosure B.

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ENCLOSURE B

Experience of O. E. Leppanen is detailed in the original applications for license No. 5-1399-4 and its renewal.

Mssrs. van Hylckama, Culler, and Sumsion have received instruction in the safe operation of the Nuclear-Chicago soil moisture meter in the field from Mr. Leppanen before amendment No. 2 was applied to license No. 5-1399-4. The instruction and actual operation of the instrument in the field amounted to several days in the case of Mr. Culler and at least one day in the case of Mssrs. van Hylckama and Sumsion.

ENCLOSURE C

The Actinium-Beryllium sealed capsule will be kept enclosed in a Nuclear-Chicago Corp. P-19 soil-moisture probe, illustrations of which are on file with the original license application. Removal of the sealed capsule from the probe will be for leakage tests only. Except when in use for soil-moisture measurement, the probe is kept enclosed in a portable shield furnished by the Nuclear-Chicago Corp., illustrations of which are also on file.

Additional shielding for transportation and storage will be provided by a steel cylinder which will house the probe in the standard shield. The cylinder was constructed as shown in figure 1, page 8.

Enclosure C, continued

The source, probe, and shield is stored for brief periods when not in actual field use at hydrologic study sites near Cibique and Buckeye, Arizona. The site near Buckeye is fenced, with locked gates. The actual storage at this site is within a locked equipment storage shelter with the probe and shields two feet from the walls. This shelter is posted.

The site near Cibique is not accessible to the public: it is part of the White River Apache reservation. The actual storage at this site is either within a locked equipment storage box prominently posted or within a locked and posted carry-all type of vehicle.

Longer period storage between field uses will be at the University of Arizona. A restricted area will be established in a basement storage room which will be posted.

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Enclosure C, continued

Transportation between field sites and the University campus is in U. S. Government vehicles such as the carry-all mentioned above. The probe and shields are positioned in the vehicles so that external radiation levels are at the "unrestricted area" levels or below.

ENCLOSURE D

Field personnel instructed in safe instrument handling.

The instrument is used by Mssrs. Culler and Sumsion at the Cibique site at most every two weeks. The instrument is operated alternately by the two users, each person operating the instrument for an eight-hour day so that exposure is limited to two eight-hour days per month.

Use of the instrument at the Buckeye site is by Mssrs. van Hylckama and Sidders. Planned use would limit exposure to each person to four 10-hour days per month at most. Average use per person would be one or two eight-hour days per month.

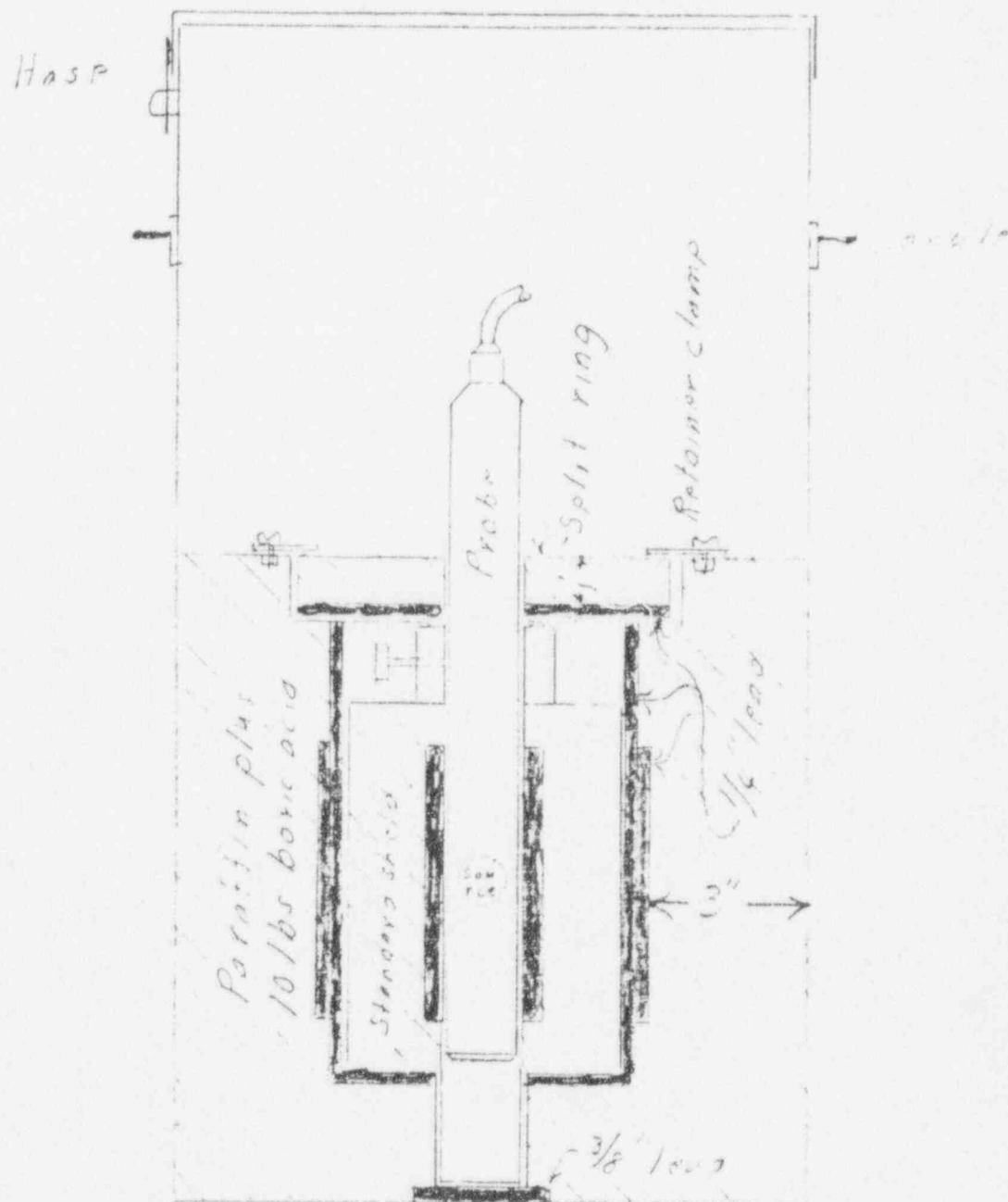
Badges and dosimeters used regularly.

Leakage testing of the sealed source will be performed at the University of Arizona nuclear engineering laboratory. The leakage test will be under the supervision of Merle H. Wittmeyer, Reactor Director, Nuclear Engineering Department, University of Arizona. Dr. Wittmeyer has been trained at the Reactor Instrumentation and Control Institute, Argonne National Laboratory (1958), and has taught nuclear engineering courses including laboratory material in radiation measurement. He has also been director and operator of the University of Arizona Trigo reactor.

A copy of a radiation survey by Dr. Wittmeyer of the soil moisture meter probe and field housing as furnished by Nuclear-Chicago Corp. is on file with the Section of Licensee Inspection at Arco, Idaho.

No servicing, maintenance, or repair of the sealed source capsule is anticipated, but would be performed by the U. S. Radium Corp., manufacturers, if necessary.

Byproduct Material License No 5-1399-4
U.S. Geological Survey



Steel cylinder for transporting
probe in standard shield.
Scale $\frac{1}{4}" = 1"$

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