University of Evansville

Post Office Box 329
Evansville, Indiana 47702

July 30, 1979

John E. Bowyer
Regional Licensing Section
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Dear Sir:

Enclosed is our renewal for license (two copies) No. 13-09810-01. The Control Number is 99342.

If there are questions, I may be reached at (812) 479-2696.

Sincerely,

Darrell Megli

Darrell Megli, R. S. O.
University of Evansville

gm

Enclosure

AUG 1 1979

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Form AEC-313 (2-73) 10 CFR 30

UNITED STATES ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved
Budget Bureau No. 38-R0027

INSTRUCTIONS.—Complete Items 1 through 16 if this is an initial application or an application for renewal of a license. Information contained in previous applications filed with the Commission with respect to Items 8 through 15 may be incorporated by reference provided references are clear and specific. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail two copies to: U.S. Atomic Energy Commission, Washington, D.C., 20545, Attention: Materials Branch, Directorate of Licensing. 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, and the license fee provisions of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 16 and the appropriate fee enclosed. (See Note in Instruction Sheet).

1. (a) NAME AND STREET ADDRESS OF APPLICANT. (Institution, firm, hospital person, etc. Include ZIP Code and telephone number.)

University of Evansville
Box 329
Evansville, Indiana 47702

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. (If different from (a). Include ZIP Code.)

Engineering-Science Building on campus at 1800 Lincoln Avenue, Evansville, Indiana 47714

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

1. Physics
2. Chemistry
3. Biology

3. PREVIOUS LICENSE NUMBER(S). (If this is an application for renewal of a license, please indicate and give number.)

13-09810-01 renewal

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.)

Dr. Darrell Megli, Associate Professor of Physics
Dr. Lowell Weller, Professor of Chemistry
Dr. James Drenneman, Associate Professor of Biology

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.)

Dr. Darrell Megli, Associate Professor of Physics

6. (a) BYPRODUCT MATERIAL. (Elements and mass number of each.)	(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES 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.)	
A. Sulfur 35	Any form	25 millicuries
B. Iodine 131	"	10 millicuries
C. Phosphorus 32	"	10 millicuries
D. Carbon 14	"	20 millicuries
E. Iodine 125	"	5 millicuries
F. Phosphorus 33	"	5 millicuries
G. Zinc 65	"	5 millicuries
H. Chromium 51	"	5 millicuries
I. *Cesium 137	"	5 millicuries
J. **Americium 241	"	0.26 microcuries

*sealed source in a capsule - General Radioisotope Processing Corporation
**two plastic disc sealed sources - General Radioisotope Processing Corporation

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.)

C. is used for radioactive tracer experiments in plants in the Biology Department by Brenneman. A,B,D,E,F,G,H are used for half-life studies, exchange reactions and tracer experiments by Weller.

I. is used as a sealed gamma source in Advanced Physics laboratory experiments by Megli. J. These are used as reference sources by Megli.

(Continued on reverse side)

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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)
SEE ATTACHED SHEETS				
a. Principles and practices of radiation protection			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 ATTACHED SHEETS			

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/cm²)	USE (Monitoring, surveying, measuring)
SEE ATTACHED SHEETS					

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.

SEE ATTACHED SHEETS

12. FILM BADGES, DOSIMETERS, AND BIO ASSAY PROCEDURES USED. (For film badges, specify method of calibrating and processing, or name of supplier.)

SEE ATTACHED SHEETS

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS IN DUPLICATE

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)

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 ATTACHED SHEETS

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. SEE ATTACHED SHEETS

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.

License Fee Category $ exempt

Fee Enclosed $ _____

Date 3/27/79

University of Evansville

Applicant named in item 1

By: Fred S. McGowan

Vice President for Administration

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.

Form AEC 313
Training and Experience

ITEMS 8 and 9. Radiation Safety Officer - Darrell Megli

The Radiation Safety Officer has received training and experience at Pennsylvania State University (1960-62) performing nuclear physics experiements at the nuclear reactor site and at Kansas State University (1965-69) also performing nuclear physics experiments some of which were in the nuclear reactor building. Additional training and experience were received at Los Alamos Scientific Laboratories (summer 1968), Omega West Reactor Site. Some of the experiences were as follows:

(a) Calculation of amount of sample material and exposure time for a given neutron flux to produce a desired activity.

(b) Preparation and sealing of sources in sample holders for exposures in nuclear reactors.

(c) Monitoring of sources after removal from reactor with portable G-M type survey meters.

(d) Preparation of beta and gamma sources for counting experiments.

(e) Calculation of activity at later times knowing initial activity and halflife.

(f) Attending Nuclear Physics Seminars at Kansas State University at which the Radiation Safety Officer covered terminology of radiation exposure and formulas for calculating dosages.

(g) Attending several sessions at Los Alamos Scientific Laboratories in summer, 1968, on Nuclear Safety which covered handling of radioactive materials.

Since 1969, the R.S.O. has on a regular basis taught a Nuclear Physics course which includes laboratory experiments. In 1975, he attended the "Second Conference On Nuclear Energy in Indiana" at which much time was spent on nuclear safety.

The experience with materials has been mainly with sources made in nuclear reactors for beta and/or gamma counting experiements. Most sources ranged from microcurie to millicurie amounts.

Dr. Darrell Megli was appointed as Radiation Safety Officer for the University of Evansville, June 14, 1974, in a letter from Charles E. P. Simmons, Vice President for Academic Affairs, to Dr. Lowell Weller, Chairman, Department of Chemistry.

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 (Use supplemental sheets if necessary)

8. TYPE OF TRAINING — Dr. James Brenneman	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection	Louisiana State University	16 wks.	Yes No	(Yes) No
b. Radioactivity measurement standardization and monitoring techniques and instruments	Louisiana State University	16 wks.	Yes No	(Yes) No
c. Mathematics and calculations basic to the use and measurement of radioactivity	Louisiana State University	16 wks.	Yes No	(Yes) No
d. Biological effects of radiation	Louisiana State University	16 wks.	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
p32 I^{131} C^{14}	1 mc	Graduate Course in Radiotracer Methodology	16 weeks	radioactive tracer experiments

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/cm²)	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 IN DUPLICATE

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

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.

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)

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License Fee Category $ _____

Fee Enclosed $ _____

Applicant named in item 1

By: Fred S. McKinney

Date _____

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.

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 5 (Use supplemental sheets if necessary)

8. TYPE OF TRAINING Dr. Lowell Weller	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection	University of Michigan	10 wks.	Yes (No)	(Yes) No
b. Radioactivity measurement, standardization and monitoring techniques and instruments	Lab. Experience University of Michigan	10 yrs. 10 wks.	(Yes) No No	(Yes) No
c. Mathematics and calculations basic to the use and measurement of radioactivity	University of Michigan	10 wks.	Yes No	(Yes) No
d. Biological effects of radiation	University of Michigan	10 wks.	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
various beta & gamma	micro to millicurrie amts. emitters	University of Michigan Use of isotopes in organic and biochem	10 weeks Intermittant use over 10 yr. period	various experiments Isotope used as tracer in various organic and biochem. expts.

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/cm²)	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 IN DUPLICATE

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

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.

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 executed by applicant)

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License Fee Category $ _____

Fee Enclosed $ _____

Applicant named in item 1

By: Frank S. McManus

Date _____

Title of certifying official

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Form AEC 313

ITEMS 10 and 11. Radiation Detection Instruments and Calibration Procedures

The following describes some of the radiation detection instrumentation available for use.

(a) Two CDV-700 Model No. 6B Victoreen Inst. Co. Geiger Counters, sensitive to moderate and high energy betas and to gamma radiation down to low energies. 0-0.5,5 and 50 MR/hr ranges. These instruments have check source attached. They are prepared in accordance with the Office of Civil Defense and the Indiana State Department of Civil Defense by the Indiana University Radiological Maintenance and Calibration Program. The instruments are calibrated every two years at Indiana University.

(b) Two Precision Radiation Inst., Inc. Model 107C portable Geiger counters.

(c) One Precision Radiation Inst. Inc. Model 111B portable scintillation counter.

(d) One Oakridge Atom Industries, Inc. Lecturer II Geiger counter.

(e) Scintillation probes for gammas, fast neutrons, slow neutrons, alphas and betas to be used with a Baird Atomic 530 A pulse-height analyzer.

The procedure used to leak test the Pu-Be neutron source (license SNM-995) for alpha emitters is as follows. It is performed by the Radiation Safety Officer.

(a) The alpha probe is connected to the Baird Atomic 530A pulse-height analyzer.

(b) A five minute count of background is made.

(c) A five minute count is then made of a clean piece of filter paper.

(d) The neutron source is removed from the water moderator tank with source-handling tools and rubbed on the paper to remove any contamination if present.

(e) The source is quickly returned to the water tank.

(f) The filter paper is then counted for five minutes to detect any alpha emitter collected on the paper.

(g) The calibration is done by counting for five minutes a standard Am-241 alpha source. The activity of the source is provided by the supplier-General Radioisotope Processing Corporation, San Ramon, California.

(h) The activity on the filter paper wipe test is then the activity of the standard source times the ratio of the counts/5 min of the wipe test to the counts/5 min from the standard source.

(i) All counting is done with the same source - to - detector distance of 1 cm.

Form AEC 313
Film badges, Dosimeters and Bio-assay procedures

ITEM 12

Due to the low level of radiation in laboratories where students and staff members work, neither film badges, nor Thermoluminescent dosimeters, nor pocket dosimeters are used.

The beta and gamma radiation levels in the nuclear physics laboratory, where most radioactive materials are used, are only slightly above background. Measurements with a G-M Survey Meter indicate the average level is at most 0.02 MR/HR above background for betas and gammas. Students spend, at most, 30 hours in the laboratory per calendar quarter. This results in a max. dose of about 0.6 mrem per quarter from betas and gammas in addition to background.

An AEC representative monitored the neutron source (11/25/68) and from his data the dose rate is approximately 1.6 mrem/hr at one meter from the source when contained inside the water moderator. The students work at an average distance of about 3 meters from the source. Their average dose is then about 5 mrem per calendar quarter from neutrons.

In all, the students receive about 6 mrem dose for one calendar quarter above background from betas, gammas and neutrons in the nuclear physics laboratory (staff members receive perhaps 10 mrem).

Dosages to persons in other laboratories on campus would be even less than that to persons who work in the nuclear physics laboratory. In the biology laboratory, radioactive materials are used only in one course which is offered every other year. Radionuclides are used only in one experiment and involve about 1 microcurie of P 32 in 20 ml of solution in plant materials. The radiation is from betas and will not involve exposures significantly above background. In freshman chemistry lab, samples of microcurie amounts are counted in halflife studies. Students may spend at most two or three hours on these experiments. In the biochemistry lab, microcurie amounts of C14 are used but again involve low radiation levels and over relative short periods of time.

Preparation time by staff members of the materials used in the biology and chemistry labs is on the order of ten to twenty minutes per year. The source materials will involve one or two millicurie activity at most (total). Lead shielding is used for protection. The amount of exposure to staff members for a year again is only a little above background.

These dosages fall below the 25% of the maximum permissible dosages specified in paragraph (a) of section 20.101 of 10 CFR Part 20.

In the event of accidental internal uptake of radioactive materials, the person would be taken to a nearby hospital which employs persons trained in bioassays and nuclear medicine.

Form AEC 313
Item 13. Facilities and equipment

All radioactive materials are used and stored in laboratories in the Engineering-Science building.

(a) PHYSICS. Alpha, beta and gamma sources are stored in a locked metal cabinet in ES 230. Sources of more than about 0.1 millicurie activity are stored in lead. The Pu-Be neutron source remains locked in the water tank except when being leak tested. Special handling tools are used to leak test the neutron source.

(b) CHEMISTRY. Sources are stored in lead under a hood in a chemistry lab (ES 314).

(c) BIOLOGY. Except during the time when the radiotracer experiment is performed, radioactive materials are not stored in the biology labs. During the experiment they are kept locked up when not under the instructor's supervision.

Form AEC 313
ITEM 14. Radiation Protection Program

a. Any person wanting to order radioactive materials is to contact the R.S.O. to make sure the possession limits are not exceeded. All materials are ordered through the purchasing department.

All orders arrive during regular business hours and at Receiving.

b. Receiving employees are to contact the R.S.O. before any shipment with radioactive materials is opened. For materials not exempt from the license the R.S.O. will make a wipe test and use gloves while opening to determine that the shipment is not damaged or leaking. Materials exempt from the license will be inspected also.

c. Students are given written and verbal instruction on radiation safety and closely supervised. Only students enrolled in these courses may use the radioactive materials.

d. Students are given common sense instructions in the use of radioactive materials, such as:

1. Don't place any radioactive source in your mouth or inhale any radioactive materials.
2. Don't place any radioactive sources in your pocket or hold them close to your body for extended periods of time.
3. Don't spend more time than necessary near the neutron howitzer.
4. Don't remove any radioactive sources from the laboratory.
5. Don't eat or smoke around radioactive materials and be sure to wash your hands before eating.
6. Report any accident to the instructor immediately.

e. Emergency instructions.

MEMORANDUM

June 19, 1974

TO: Persons concerned with safety

FROM: Darrell Megli, U of E Radiation Safety Officer

This is to make knownthe presence of radioactive materials stored on the University of Evansville campus. These materials are stored in the Engineering-Science building in two locations: (1) Room 314 (under the hood) and (2) Room 230 (in a metal cabinet, and in a tank of water called a neutron howitzer).

In case of an emergency such as a fire, explosion, tornado or earthquake, there exists the possibility of danger from these materials. In an emergency, one of the following persons should be notified (starting at the top of the list).

	HOME PHONE
Darrell Megli	477-4884
Ben Riley	476-5094
Lowell Weller	477-4974

In case of a fire, the radioactive materials should be removed from the building in their appropriate containers. In case of a tornado or explosion, all radioactive materials should be accounted for. A survey meter should be used to search for the materials and check for contamination.

f. does not apply

g. A survey meter is used to check a work area after radioactive materials are used.

Form AEC 313

ITEM 15. Waste Disposal

It is our practice to not dispose of any radioactive materials. They are stored and allowed to decay.