ROSARY COLLEGE
7900 WEST DIVISION STREET
RIVER FOREST, ILLINOIS 60305

June 12, 1979

U. S. Nuclear Regulatory Commission
Region III
Radioisotopes Licensing Section
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Gentlemen:

Rosary College, River Forest, Illinois (Mail Contact No. 12342), hereby makes application for a renewal of its Special Materials License, SNM - 733 (Docket No. 70-00794)

The following information is submitted (with five copies) in fulfillment of the requirements of Section 70.22 " Contents of Application" of 10CFR Part 70.

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1. Applicant

Rosary College, River Forest, Illinois, 60305 was incorporated by the State of Illinois in 1918. The principal office of Rosary College is located at 7900 W. Division St., River Forest, IL 60305.

The principal officers of the college are:

Name	Title	Address	Citizenship
Sister Candida Lund,O.P.	President	7900 W. Division River Forest, IL	U. S.
Norman Carroll	Dean of Faculties	720 Forest Ave. River Forest, IL	U. S.
John P. Brady	Vice-President of Financial Affairs	1095 Brookside Ct. Hanover Park, IL 60103	U.S.

There is no control or ownership exercised over the applicant by any alien, foreign corporation, or foreign government.

2. Activities to be Performed

The Plutonium-Beryllium neutron source will be used in the science laboratories located in the Albertus Magnus Science Hall of Rosary College. The material will be used in the education and training of undergraduate students. The following experiments are typical of those performed:

a. Simple neutron activation and radioactive decay

b. Absolute Calibration of Neutron Detection Foils
c. Preparation of Carrier-free Br^{90} from Bromobenzene
d. Separation of Mn^{56} from Potassium permanganate
e. Examination of Neutron-Induced Activities in Silver

3. Special Nuclear Material

Thirty-two (32) grams of plutonium encapsulated as one 2-curie Pu-Be neutron source have been licensed under SNM-733 since 1963 and the renewal of this license is being applied for. This Pu-Be neutron source has a weight of total contained plutonium of 32 grams (Pu-239 plus Pu-241 is 29.8 grams.) The source manufacturer and source serial numbers are NUMEC 320B38.

4. Technical Qualifications of Personnel

The proposed program of experiments will be conducted by the following members of the Rosary College science faculty:

a. Sister Mary Woods, Professor of Chemistry, obtained her Ph.D. in Chemistry at the University of Wisconsin in 1961. Her courses included work in Radiochemistry and in connection with her doctoral research she conducted experiments using Ag^{110} and scintillation well counters. Since 1970 she has been a Research Associate at Argonne National Laboratory investigating the kinetics and mechanisms of redox reactions of the actinide elements (in particular Np^{239} and Am^{243}). Her work involving millimolar quantities of these isotopes is closely monitored by Radiation Safety Personnel and she is thoroughly familiar with the practices of radiation protection.

b. Sister Mary O'Donnell, Assistant Professor of Physics, received her M.S. in Physics from Marquette University in 1962. Her Masters thesis was "Photoexcitation of 2.14 Mev level of B" . She has taught Nuclear Physics courses and has attended workshops at Argonne National Laboratory on Radioactivity Studies.

c. Dr. Margaret Jonah, Assistant Professor of Biology, received her Ph.D. in Chemical Biology from Columbia University in 1971. She has taught a course in Radiobiological Techniques and as a Research Associate at Argonne National Laboratory has become familiar with radiation safety.

5. Equipment, Facilities and Instrumentation

The Pu-Be neutron source is stored in a Visiflux Neutron Howitzer (Reactor Experiments, Inc., 140 Harbor Blvd., Belmont, CA.) in a posted and labeled closet in the Albertus Magnus Science Hall. Irradiation of samples takes place there and for the vast majority of the experiments, the source is removed neither from the Howitzer nor the closet. A 24-inch source handling tool is provided for transferring the neutron source (e.g. during leak-test procedure.) In the rare case when the source is used outside of the Visiflux, the two-foot length of rod on the source holder provides adequate distance from the source. When the source is in position in the Visiflux, the gamma radiation is negligible and both fast and slow neutron fluses are within exposure limits.

The following radiation detection instruments are available:

Number	Model Number	Radiation Detected	Sensitivity Range	Type of use
1	Precision Radiation Instruments, Inc. Model 106C	Beta-gamma	0-20,2.0,0.2 mr/hr	Monitoring Surveying
1	Baird-Atomic EWH 108 detector with 123A Scalar	Alpha-beta	0-20,000 cpm Window thickness 1.4 mg/cm^2	Measuring Monitoring
1	Baird-Atomic Microthin End Window Flow Counter Model 821C (with B/A Scalar-Timer Model 135)	Alpha-beta	Window thickness 0.7 mg/cm^2	Leak-test Measuring

Calibration of the radiation detection instruments will be accomplished upon use. A calibrated radium disc is supplied with the Precision Model 106C and the following U. S. Nuclear calibrated sources are available for the EWH 108:

Standard Number	Isotope	Activity
7065	Cl^{36}	424 Beta/sec.
P244	C^{14}	575 Beta/sec.
P479	Co^{60}	2420 gamma/sec. (1-1-64)
P407	Cs^{137}-Ba^{137}	2560 gamma/sec. (1-1-64)

Calibration of the Baird-Atomic Model 821C for leak-test purposes is accomplished by using a calibrated alpha source: U. S. Nuclear Standard No. P342, Uranium, 361 dps. This source is counted before and after each leak-test measurement. These calibration procedures are performed by Sister Mary Woods.

Following irradiation involving the Szilard-Chalmers reaction, samples are removed from the Howitzer and worked up in the Physical Chemistry laboratory adjacent to the Howitzer closet. Care is taken to cover the desk top with protective absorbent paper and the work whenever possible is conducted on protective trays. Special containers are provided for both liquid and solid radioactive wastes.

6. Procedures to Protect Health and Minimize Danger

The Pu-Be source is stored when not in use in the " storage" position of the Visiflux Neutron Howitzer. A locking rod and lock are included for locking the cover and retaining the source in its storage position when the unit is not in use. The keys will be available only to the laboratory instructors (Section 4) and the chairperson of the Chemistry Department to prevent unauthorized use or removal of the source from the Howitzer. The manipulation of the source will be accomplished only by the laboratory instructor by the use of a source handling tool.

6.1 Each laboratory instructor (Section 4) is responsible for radiation safety during the experiments she is conducting.

6.2 Personnel Monitoring

Since the neutron source is kept in the water-moderated neutron howitzer, there has been no need for personnel monitoring. It is not likely that any student or instructor would receive a dose in any calendar quarter in excess of the tolerances that have been set by the Nuclear Regulatory Commission.

6.3 Radiation Survey Program

The neutron source is kept in the water-moderated howitzer and when so positioned the gamma radiation is negligible and both fast and slow neutron fluxes are within exposure limits.

6.4 Waste Disposal

The radioactive isotopes produced by neutron activation are all short-lived. They are placed in appropriate containers for liquid or solid wastes, allowed to decay and finally dispersed in water and disposed of via the sanitary sewer system. At no time are the daily, nomthly or annual limits specified in 20.303 of 10CFR Part 20 exceeded.

6.5 Record Management

The person responsible for keeping and reviewing records is Sister Mary Woods. Records are kept on the leak-testing of the neutron source.

6.6 Material Control Provisions

Not applicable

6.7 Sealed-Source Leak-Testing Provisions

The neutron source will be leak-tested every six (6) months by Sister Mary Woods (Section h) The wipe technique will be used in the following manner:

a. Remove lid closure.
b. Remove source from the neutron howitzer maintaining the source as far from the body as possible.
c. Rotate the source against a filter pad.
d. Return the source to the neutron howitzer and place in storage position.
e. Replace lid closure.
f. Place the filter pad in the GM counter and determine the alpha activity.
g. If less than 0.005 microcurie of removable contamination is detected on the test sample, record result of leak test in log book provided.
h. If 0.005 microcurie or more of removable alpha contamination is detected on the sample, promptly evaluate personnel and area for contamination. Prevent further spread of contamination. Consider the source leaking until proven otherwise.
i. Place the source in a leak proof container, seal container, place

in shipping container and return to manufacturer for repair or replacement. Notify the Director, Division of Licensing and Regulation, U. S. Nuclear Regulatory Commission, Washington, D. C. 20555 , with a copy to the director of the nearest NRC Regional Compliance Office, describing test results and action taken.

j. Record results of all leak tests in log book.

The instrument to be used for assay of test samples is a Baird-Atomic Microthin End Window Flow Counter Model 821C with a Baird-Atomic Scalar-Timer Model 135.

6.8 General Safety Instructions

(See attached copy) These regulations are posted in the laboratory or issued to the students who will be working with radioactivity.

6.9 Emergency and Decontamination Procedures

The Safety Instruction sheet (Section 6.8) issued to students at the time they will be working with radioactivity contains decontamination procedures. Included there also are the names and telephone numbers of persons to be notified.

6.10 Procedures for Training Personnel

When the neutron source is used to activate metal foil samples or solutions to be used for the Szilard-Chalmers reaction, students are given a short lecture on the origin of the neutrons being used for activation and the need for adequate protection from radiation from the source. They are each issued a copy of the General Safety Instructions.

For the training of the faculty members involved in using the neutron source, please see Section 4.

This completes the application for the renewal of License SNM-733.

Sister Mary Woods

Sister Mary Woods
Chairperson, Natural Science Dept.
Rosary College, River Forest, IL

LABORATORY REGULATIONS FOR THOSE USING RADIOACTIVE MATERIALS

1. Maintain " good housekeeping" at all times. Keep the laboratory neat; wash glassware regularly; do not let waste or contaminated material accumulate.

2. No person should work with active materials if there are any breaks in the skin on the hand unless he/she wears rubber gloves. All such breaks should be reported to the instructor in charge before work begins.

3. Make all possible set-ups on easily cleanable trays. These should be covered with disposable, absorbent paper.

4. Make sure that all containers of radioactive materials are properly labeled at all times, showing a suitable radiation symbol and a statement of the kind and quantity of radioactive isotope and the date of measurement.

5. Keep all active solutions covered.

6. Never pipette by mouth.

7. Active liquid wastes should be poured into the labeled containers provided. They should never be poured into a standard drain.

8. Active solid wastes and contaminated materials should be placed in containers designated " Solid Active Waste".

9. Try out all new procedures with " dummy runs" not involving radioactive material.

10. Never eat, drink, smoke, or use cosmetics in a room in which radioactive materials are used or stored.

11. Monitor all work areas and hands before and after each experiment.

12. Before leaving the laboratory, the hands should be washed first, then checked with a beta-gamma survey meter. Contamination remaining after thorough washing should be reported.

13. All wounds, spills and other emergencies should be reported to the instructor immediately.

14. Before leaving the laboratory, be sure all written records have been completed.

DECONTAMINATION PROCEDURES

1. If, in the course of work, personal contamination is suspected, a survey with a suitable instrument should be made immediately. This should be followed by the required cleansing and a further survey. Routine precautionary surveys should be made at intervals.

2. In the case of spillage, the following procedure should be followed:
   a. The liquid should be blotted up. (Wear rubber gloves)
   b. All disposable materials contaminated by the spill and the cleaning process should be placed in a Solid Active Waste container.
   c. The area of the spill and the type of activity (e.g. I^{131}) should be clearly marked.

3. To decontaminate hands, brush for a long time with soap and water, using a soft brush. Hand decontamination should never be continued to the extent of damaging the skin. For firmly attached contamination, the hands may be immersed in a saturated solution of potassium permanganate, rinsed, and then dipped into 5 % sodium bisulphite to remove the stain.

4. To decontaminate the skin, treat spot contamination the same as above (3).

NOTIFICATION PROCEDURES

Be sure that at least one of the following is notified of any spillage or contamination:

Sister Mary Woods	PBX 267	Telephone: 366-2490
Sister Mary O'Donnell	PBX 270	Telephone: 366-2490
Dr. Margo Jonah	PBX 364	Telephone: 985-5497