University of Evansville

Post Office Box 329
Evansville, Indiana 47702

70-1045

2/11/80 - Trfd to Reg III for action. To retain Control 15305

January 24, 1980

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U.S. NUCLEAR REG. COMMISSION
MAIL SECTION

License Management Branch
Division of Fuel Cycle and Material Safety
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: University of Evansville
P. O. Box 329
Evansville, Indiana 47702

Program Code 22120
License Number SNM 995
Renewal of License

Gentlemen:

Please accept this letter of application for License Renewal.

1. University of Evansville
P. O. Box 329
Evansville, Indiana 47702

Governed by a Board of Trustees with 1979-80 officers as follows:

Officers: Board of Trustees
1979-80

Chairman: John H. Schroeder
920 Colony Road
Evansville, Indiana 47715

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1315 East Chandler Avenue
Evansville, Indiana 47714

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2. The neutron source is used for teaching purposes. The source remains in the water tank except when being leak tested and is used only in the laboratories in the Engineering-Science building. When not in use, the neutron howitzer is kept in a security cave built into an outside basement wall off of room E101.

3. Request renewal for 5 year period.

4. Pu-Be neutron source encapsulated in stainless steel. The source contains eighty (80) grams of Pu-239.

5. NA

6. The neutron source will be used by, or under the supervision of,

Darrell Megli, Radiation Safety Officer
Associate Prof. of Physics
A.B. Kansas Wesleyan Univ.
Salina, Kansas
M.S. Penn State Univ.
Ph.D. Kansas State Univ.

Masters thesis was on V^{52} and Cr^{55} Beta-Ray End-Point Energy Determination by Scintillation Spectrometer Method. Ph.D. dissertation was on Measurement of Some Nuclear Parameters in the Radioactive decay of Ce^{143}, Er^{171} and Zr^{97}. I worked during the summer of 1968 on nuclear decay schemes at Los Alamos Scientific Laboratories.

Specific experiences in radiological safety and materials handling include the following:

(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 Physic 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.

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

Other staff: Benny R. Riley
Associate Prof. of Physics
B.S. Murray State College
M.S. University of Ky.
Ph.D. Carnegie-Mellon Univ. in Elementary Particle Physics

1. Resident Research Associate at Argonne National Laboratory -- summers of 1964 and 1965.
2. Worked in the experimental area with a He bubble chamber at the zero-gradient-synchrotron at Argonne while doing Ph.D. thesis.
3. Did some experiments at Oak Ridge National Labs. with radiation sources.

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

   (a) Two CDV-700 Model No. 6B Victoreen Inst. Co. Geiger Counters, Sensitive to betas and gammas. 0-0.5, 5 and 50 MR/hr ranges - these instruments have calibration sources attached.

   (b) Three CDV-715 Model No. 1A Victoreen Inst. Co., sensitive to gammas with 0-500 R/hr range.

   (c) Eight CDV-742 Pocket Dosimeters (0-200 R range) with two CDV-750 Dosimeter chargers.

   The above radiological monitoring equipment if 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.

   Other monitoring instruments include:

   (a) One Bendix 200 mrad neutron insensitive gamma only pocket dosimeter.

   (b) One Bendix 200 mrad fast neutron plus gamma tissue equivalent pocket sodimeter.

   (c) One Bendix 120 mrem thermal neutron pocket dosimeter.

   (d) Two Precision Radiation Inst., Inc. Model 107C portable Geiger Counters.

   (e) One Precision Radiation Inst., Inc. Model 11B portable Scintillation counter.

   (f) One Oakridge Atom Industries, Inc. Lecturere II Geiger Counter.

   (g) One Landsverk Electrometer Company Model L-75D Analysis Kit.

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

   (i) One 256 channel pulse-height analyzer manufactured by the Nucleus.

The procedure used to test the Pu-Be neutron source for alpha-emitter leakage is as follows:

The neutron source is removed from the tank with source-handling tools. It is rubbed on a piece of filter paper and quickly returned to the water tank. The filter paper is then counted for alphas with an alpha probe (Baird Atomic 20-804) connected to a Baird Atomic 530A pulse-height analyzer. The calibration procedure consists of counting a standard Am-241 alpha source and checking background and counts from a clean filter paper. All counting is done with the same source-to-detector distance. The alpha activity on the test wipe can then be calculated. The leak tests are performed by the Radiation Safety Officer. The source is leak tested every six months.

8. The neutron source is moved from its security cave into the nuclear physics lab only when it is needed. This would be at most 10 hours per calendar quarter.

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 3 meters from the source. Their average dose is then about 2 mrem per calendar quarter from neutrons. The beta and gamma radiation levels in the nuclear physics laboratory 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, 20 hours in the laboratory per calendar quarter. This results in a maximum dose of about 0.4 mrem per quarter from betas and gammas in addition to background. In all, the students receive about 2.4 mrem dose for one calendar quarter above background from betas, gammas and meutrons in the nuclear physics laboratory (staff menbers may receive 5 mrem).

Dosages to persons in other laboratories on campus from the neutron source would be even less than that to persons who work in the nuclear physics laboratory. These dosages fall below the 25% of the maximum permissible dosages specified in paragraph (a) of section 20.101 of 10 CFR Part 20.

For the above reasons, neither pocket dosimeters nor film badges are worn in the nuclear physics lab on a regular basis.

Students are instructed in the safe use of radioactive materials and are closely supervised by faculty members who are acquainted with the safe use them. Students are given common sense instructions in the use of radioactive materials, such as:

a. Don't place any radioactive source in your mouth or inhale any radioactive materials.
b. Don't place any radioactive sources in your pocket or hold them close to your body for extended periods of time.
c. Don't spend more time than necessary near the neutron howitzer.
d. Don't remove any radioactive sources from the laboratory.
e. Don't eat around radioactive materials and be sure to wash your hands before eating.
f. Report any accident to the instructor immediately.

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

Radioactive sources produced in the neutron howitzer are either solid metals or solid chemicals sealed in small plastic vials to eliminate spilling of radioactive materials.

Because of the relatively small neutron flux only relatively small activities of relatively short half lives can be produced.

These sources are never disposed of. They are always kept to decay away.

The local campus safety and security officers and the local fire department have been informed of the presence and location of the neutron source and other radioactive materials. They have also been instructed in emergency procedures in the event of a disaster.

If additional information is required, please address requests to the undersigned.

Sincerely,

Darrell Megli

Darrell Megli
Radiation Safety Officer

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