APPLICATION FOR RENEWAL

OF LICENSE SNM-180

SPECIAL NUCLEAR MATERIALS

Submitted to

Director, Division of Materials Licensing

U.S. Nuclear Regulatory Commission

Washington, D.C. 20545

by

Nuclear Engineering Teaching Laboratory

The University of Texas at Austin

Austin, Texas 78712

January 1986

8602180371 860116
PDR ADOCK 07000157
C PDR

REVISED SUBMITTAL FOR

SPECIAL NUCLEAR MATERIAL LICENSE

70.22(a) (1) Name of Applicant:
Nuclear Engineering Teaching Laboratory
Department of Mechanical Engineering
The University of Texas at Austin
ETC 5.160
Austin, Texas 78712

T.L. Bauer, Laboratory Assistant Director/ Supervisor, Taylor Hall, Room 133, U.S. Citizen

D.E. Klein, Laboratory Director, Taylor Hall, Room 104, U.S. Citizen

H.G. Rylander, Chairman, Mechanical Engineering, Engineering Teaching Center, Room 5.214A, U.S. Citizen

E.F. Gloyna, Dean, College of Engineering, Cockrell Hall, Room 10.310, U.S. Citizen

G.J. Fonken, Provost and Executive Vice President, Main Building, Room 201, U.S. Citizen

70.22(a) (2) Activity and location for which Special Nuclear Material License is requested:

The Nuclear Engineering Teaching Laboratory of The University of Texas at Austin uses Special Nuclear Materials to supplement the training and instruction programs in the field of nuclear engineering. The items described in this application are used for Junior, Senior and Graduate level laboratory courses in the Nuclear Engineering Program of the Mechanical Engineering Department. The licensed materials are to be used in experiments in the Nuclear Engineering Laboratory facilities lo-

cated in Taylor Hall of the University's Main Campus.

Laboratory facilities associated with the Nuclear Engineering Program include a research reactor and charged particle accelerator with appropriate Nuclear Regulatory Commission license, NRC R-92, and Texas Health Department Radioactive Materials License Authorization TDH 6-485 No. 48.

A diagram of facility location and floor plan is included in Appendix A-1, 3. Primary location for storage and operation of the assembly will be Taylor Hall Room 131.

70.22(a) (3) Requested duration of license is for 5 years.

70.22(a) (4) Description of Special Nuclear Material: The Special Nuclear Material to be covered by this license is an extension of the previously granted license, SNM-180, dated February 27, 1958, and later amendments.

I. U-235 Subcritical Reactor Assembly

A. Description

1. A homgeneous system is assembled of 2695.52 grams of UO_2 impregnated in high density polyethylene with a total weight of 18,788.1 grams. The UO_2 is enriched to 19.776% U-235, for a total U-235 composition of 469.74 grams.

2. The assembly consists of a cylindrical core with 10" diameter and 14" length assemble from 8 fuel disks into one unit. Axial and radial holes in the assembly may be filled with 36 smaller fuel disks of about 1" diameter. The cylindrical core unit contains 465.03 grams of U-235 with the fuel plugs totaling 4.71 grams of U-235. (One fuel plug is unaccounted for.)

~~460912~~

3. The fuel assembly operation is supplemented by 3 reflector assemblies, 3" polyethylene, 6" polyethylene, and 10" graphite. An additional graphite block provides an external thermal source.

4. A multiplication factor of less than 7.5 has been measured for all reflector and fuel load conditions.

5. Appendix A-4 illustrates the basic assembly components and configuration.

B. Usage

The subcritical assembly and the reflector media material are used with neutron sources to demonstrate the concepts of subcritical multiplication, thermal diffusion, fermi age, flux measurement and other basic nuclear engineering principles. Both neutron detection systems and foil activation techniques are applied in various experiments to monitor neutron flux levels and flux shape.

II. Plutonium-Beryllium Neutron Sources

A. Description

1. M-797 source contains 15.970 gms Pu sealed in a tantalum and stainless steel capsule with dimensions of 1.02" O.D. x 1.46" high. The Pu is 93.02325% enriched in (Pu-239 + Pu-241) making a total of 14.8560 gms (Pu-239 + Pu-241). The source has a total strength of 1.81×10^6 neutrons/second (12-3-61).

2. M-798 source contains 31.960 gms of Pu sealed in a tantalum and stainless steel capsule with dimensions of 1.021" O.D. x 2.182" high. The Pu is 93.02325% enriched in (Pu-239 + Pu-241). The source has a total strength of 3.83×10^6 neutrons/second (6-4-65).

3. M-799 source contains 79.940 gms Pu sealed in a tantalum and stainless steel capsule with dimensions of 1.31" O.D. x 2.72" high. The Pu is 93.02325% enriched in (Pu-239 +

Pu-241) making a total of 74.363 gms (P-239 + Pu-241). The source has a total strength of 8.82 X 10^6 neutrons/second (12-3-61).

B. Usage

The plutonium-beryllium neutron sources are used for neutron detector calibration, subcritical reactor multiplication sources and neutron dose measurement experiments. Operation of the subcritical reactor assembly is accomplished by insertion of a neutron source into the radial or axial access hole or by positioning a source near the core assembly.

70.22(a) (6) Technical Qualifications of Applicant:

I. Administrative structure.

Staff qualifications for responsible utilization of licensed special nuclear materials in the Nuclear Engineering Teaching Laboratory include the administration of special nuclear material license, a nuclear reactor operating license and a state radioactive materials license. The administrative structure consists of a Radiation Safety Committee, Radiation Safety Officer, Reactor Committee, Laboratory Director and Laboratory Assistant Director/Supervisor. Laboratory staff includes reactor operator, research associate (radiochemist), technicians, administrative secretary and research assistants.

II. Radiation Safety Committee

The Radiation Safety Committee is established through the office of the University President and contains 3 faculty and/or staff members from Science or Engineering Departments.

A. Duties of the Radiation Safety Officer

A Radiation Safety Officer acts as the delegate authority of the Radiation Safety Committee with responsibility to the University Safety Engineer. Policies and practices set forth by the Radiation Safety Committee re-

7609712

garding the safe use of radioisotopes and sources of radiation on the University campus are implemented by the Radiation Safety Officer.

Duties of the Radiation Safety Officer are numerous but consist primarily of establishing, monitoring, and curtailing programs for the safe use of radioactive materials and radiation sources with respect to state or federal license requirements. Some specific duties include periodic surveys and inspection, maintenance of radioisotope records and personnel exposures, disposal of radioactive wastes, periodic leak tests of sealed radiation sources, calibration of radiation detection instruments, help in the training of staff, aide in preparation of procedures, define proper radioactive material handling methods, and act as liaison for state and federal license responsibilities.

B. Qualifications of Radiation Safety Officer

Qualifications of the Radiation Safety Officer require a Bachelor's degree in engineering, physics or related field. Preferred qualifications require an advanced degree in health physics or radiological health or certification as a Safety Professional or Health Physicist. Experience required is three years work in radiation safety and/or radiological health plus a thorough working knowledge of Texas Regulations for Control of Radiation and supporting regulations issued by the United States Nuclear Regulatory Commission. Preferred experience includes knowledge of particle accelerators and nuclear reactors.

III. Reactor Committee

A reactor committee responsible to the Dean of the College of Engineering with at least three members knowledgeable in the fields of nuclear safety shall review, evaluate, and approve standards associated with the operation of the lab-

oratory facility. Jurisdiction shall include all nuclear operations in the facility and general safety standards. The Radiological Safety Officer is an ex officio member of the committee. Laboratory facility operation will be under the direct control of the Laboratory Director or a licensed Senior Operator designated by the Laboratory Director.

A. Duties of the Laboratory Supervisor

Daily activities of the laboratory are directed by an NRC licensed senior operator whose responsibility is to direct the operation of the nuclear reactor and other laboratory activities. The Senior Operator schedules and coordinates activities, assures the maintenance of appropriate license records and equipment calibrations, reviews experiments and procedures, supervises the use of radioactive materials and sources, supervises the activities of other laboratory personnel and supports teaching research functions of the laboratory.

B. Qualifications of the Laboratory Supervisor

Qualifications of the Reactor Supervisor require a Bachelor's degree in engineering or science with three years experience in a related field. Qualifications for a USNRC Senior Operator license is required. Preferred qualification is a Master's or Ph.D degree in a field of nuclear engineering or science with appropriate experience. Experience preferred is five years including two in a supervisor position. Knowledge of nuclear facility operation, radiation detection systems, data acquisition and analysis systems, electronic and mechanical measuring equipment and utilization of computer equipment are required skills.

IV. Laboratory Staff

A. Nuclear Technical Specialist (one or more positions)

#6097J

Duties of a nuclear technical specialist include operation and maintenance of equipment, review of procedures and regulations, instruction and assistance of students or researchers, and assist in record maintenance and report preparations. Qualifications require engineering or science degree or appropriate laboratory experience with radioactive materials and radiation detectors. Pursuit of an NRC operator or senior reactor operator license is required. Preferred experience includes advance knowledge of electronics, computer programming or other valuable laboratory discipline.

B. Research Associate (radiochemist) (half time to full time)

Duties of the radiochemist consists of planning and supervising the utilization of the nuclear reactor and other radiation sources for neutron activation analysis, production of radioisotopes, and irradiation of materials. The radiochemist instructs experimenters in radiochemical procedures, use of radiochemical equipment and facilities, and conducts research projects. Qualifications require a Ph.D. degree or equivlalent experience in fields of nuclear chemistry, with experience in various analysis techniques that utilize radiation sources and radioactive materials.

C. Other Staff

An administrative secretary aides in the preparation of reports and documents. Other staff, students or researchers, are employed as projects warrant. The minimum staff is considered to consist of a laboratory supervisor, nuclear technical specialist (technician) and half-time radiochemist. Additional technoial support also is available from faculty members of the Mechanical Engineering Department employed to teach courses in the Nuclear Engineering Program.

D. Appendix A-5 contains a block diagram of the administrative structure. Specific data on key personnel is contained in Appendix A-6,8.

70.22(a) (7) Facilities and Equipment for Handling Special Nuclear Material

I. Areas of storage and use:

A. All the special nuclear materials described in this license are stored in Taylor Hall, Room 131A, which contains a TRIGA nuclear reactor. Construction of the room consists of fireproof exterior walls, provisions for continuous radiation monitoring, and controlled access monitoring.

1. Routine assembly, operation and storage of the subcritical core is in open areas of the reactor laboratory room. Storage of the core is in a 55 gallon barrel protected from exposure to combustible materials.

2. The fuel pellets are assembled in the reactor laboratory or in adjacent controlled laboratory areas. Storage of the pellets is in a floor safe located in the reactor laboratory.

3. The plutonium-beryllium neutron sources are stored in a 10 foot deep storage well located in the reactor laboratory. Because of the value of the plutonium-beryllium neutron sources as calibration standards the sources may be transported in an appropriate shipping container to other laboratory facilities for temporary use.

B. All materials are stored such that radiation levels at the container surfaces are less than 2 mr/hr.

C. Appendix A-9 contains a diagram of the plutonium-beryllium neutron source shipping container.

7600912

II. Shields, equipment and handling devices.

A. The low specific activity of the non-operating subcritical core material allows for direct handling of materials. A polyethylene jacket protects the core assembly disk units against the small risk of radioacitve contamination from the fuel pellet disks. Tweezers and small lead shields or other shield material are available to handle radioactive foils generated by neutron exposure in the subcritical assembly. Signs and rope are available to define radiation areas during assembly operation.

B. Routine handling of the plutonium-beryllium sources is accomplished with long handle tongs and long threaded rods. Shielding material such as paraffin, borated polyethylene, lead, concrete block and shield casks are available to provide improved radiation safety in various neutron source applications.

III. Measuring and monitoring devices

A. Personnel monitoring devices are required of all persons working in the laboratory with radiation sources. Film badges for laboratory personnel (that are sensitive to gamma radiation (10 mrem), energetic beta (40 mrem), fast neutron (20 mrem), thermal neutron (10 mrem), are provided by Landauer. Pocket dosimeters (ionization chambers) are avaiable for dose measurements of gamma (0-200 mrem) or thermal neutron (0-120 mrem). A TLD measurement system with several detectors (.1 mr/hr-100,000 R/hr) are also available for dose evaluations.

B. Portable radiaton monitors include ionization chamber, two GM tube probes, two supplemental probes and one neutron detector. The ionization chamber is a Victoreen model 440 with scale ranges of 3 to 300 mrem/hr. Two thin window GM tube monitors (~1.5 mg/cm^2), one a

Victoreen Thyac III (probe 489-35) and the other a Technical Associates PU6-1AB (probe P-6A), are normally maintained. Scale ranges for both instruments are X1, X10, X100 and X1000. Full scale sensitivity on the X1 scale is 200 c/m and 500 c/m for the respective instruments with conversions of 1000 c/m and 4000 c/m for 1 mrem/hr. Two supplemental scintillation probes provide detection of alphas or neutrons. One probe (model 702-5) is a thin window alpha probe for the Victoreen Thyac unit and the other probe (model PNS-20) is a polyethylene moderated neutron probe for the Technical Associates unit. Neutron detection and dose measurement are provided by an Eberline PRS-2 with BF_3 probe (model NRD-1). The unit has a digital readout with four ranges for either measurement accuracy or count time, and a manual start/stop mode.

C. Specialized detection systems are available for analytical radiation measurements that are routinely required in a neutron activation analysis laboratory. The reactor room is continuously monitored by area radiation monitors with preset alarms (5 mr/hr) and a continuous air monitor with filter for particulate monitoring that also provides audible alarm indication. A gamma spectroscopy system (Ge(Li)) and α-β windowless proportional counter plus other miscellaneous detectors and equipment represent substantial capability to analyze radioactive materials. Both BF_3 proportional counters and U-235 fission counters with associated electronics are available to monitor and demonstrate operation of the subcritical assembly. Other detection systems, such s gaseous, scintillation or solid state detectors, allow students to count neutron activated foils.

IV. Radioactive Waste Disposal

A. Sources of radioactive waste material from the operation of the subcritical assembly are slightly contaminated from the polyethylene impregnated fuel pellets, activation products

X60972

exposed in the assembly and fission products generated by operation.

B. Provisions exist through the Radiation Safety Office for the collection and disposal of low level radioactive waste materials such as gloves, rags, and paper created by routing handling, and maintenance of the assembly. Disposal of materials to the sanitary sewer system are also monitored by the Radiation Safety Officer as allowed by state licenses. Subcritical irradiations are at fluxes of $\sim 10^8 n/cm^2/sec$ for a few minutes to hours. In general, foils or materials irradiated in the assembly are short half-life and reusable thus not representing a waste material, or may be stored until the radioactive hazard diminishes.

C. Calculations indicate that the total fission product inventory of the assembly should not normally exceed several microcuries of fission product activity. Contained as an integral part of the assembly the activity is primarily a potential hazard to handling of the assembly are not considered to waste until the assembly is decomissioned. (Calculations in Appendix A-10).

70.22(a) (8) Safety Procedures to protect health and minimize danger to life or property.

I. Procedures are applied to establish safe conduct of activities with radioactive materials and radiation sources. The procedures in effect are to satisfy various requirements of federal USNRC licenses for special nuclear materials and state TDH licenses for radioactive materials. Procedures are reviewed by staff, researchers and students. The reactor supervisor drafts procedures and approves changes. Substantive changes to procedures are reviewed by the Reactor Committee. The procedures are categorized into four basic functional groups; monitoring, calibration, operation, and emergency.

A. Monitoring Procedures

1. Access to laboratory areas is controlled by staff personnel.
2. Film badges are required in the laboratory for staff when radiation sources are in use.
3. Dosimeters are required for occasional visitors and unusual source handling conditions.
4. Status of special nuclear material is verified by periodic inventory (6 mo. cycle).
5. Status of plutonium-beryllium is monitored by leak tests of source (6 mo. cycle).

B. Operating Procedures

1. Routine operation of the subcritical assembly shall consist of insertion of one of the plutonium-beryllium sources (including fuel pellets and non-fissile foils) into the subcritical core assembly with any of the designed conditions for reflector or moderator components.

2. Routine operation of the subcritical assembly will be authorized by the reactor supervisor.

3. A survey of gamma and neutron radiation levels during operation will be made and an area radiation monitor with alarm will be continuously active or a monitor available at all times during operation.

C. Emergency Procedures

1. Basic emergency procedures in effect for radiological emergencies in the Nuclear Engineering Teaching Laboratory are contained in Appendix A-12,16.

2. Special precautions for material storage are required to minimize the potential for airborne radioactivity from exposure to fire hazards. Storage when not in use will be in a tightly closed 55 gallon bar-

rel. The barrel is stored away from flammable materials. The laboratory is constructed of firewall construction. Leakage to the environment during normal operation is controlled by weatherstripping entrances and filtered exhausts.

II. Training Program

The primary use of radiation sources and the subcritical assembly in the Nuclear Engineering Teaching Laboratory is to support and extend the education of undergraduate and graduate students in basic concepts of nuclear engineering. A portion of each student's education before performing experiments with radioactive materials will consist of material on radiation interactions, radiation hazards, dose measurements, and laboratory procedures. Experiments are performed with the supervision of laboratory staff. Staff personnel are trained to handle materials by a combinaton of formal classroom education and laboratory training by other qualified staff depending on the nature of responsibility required.

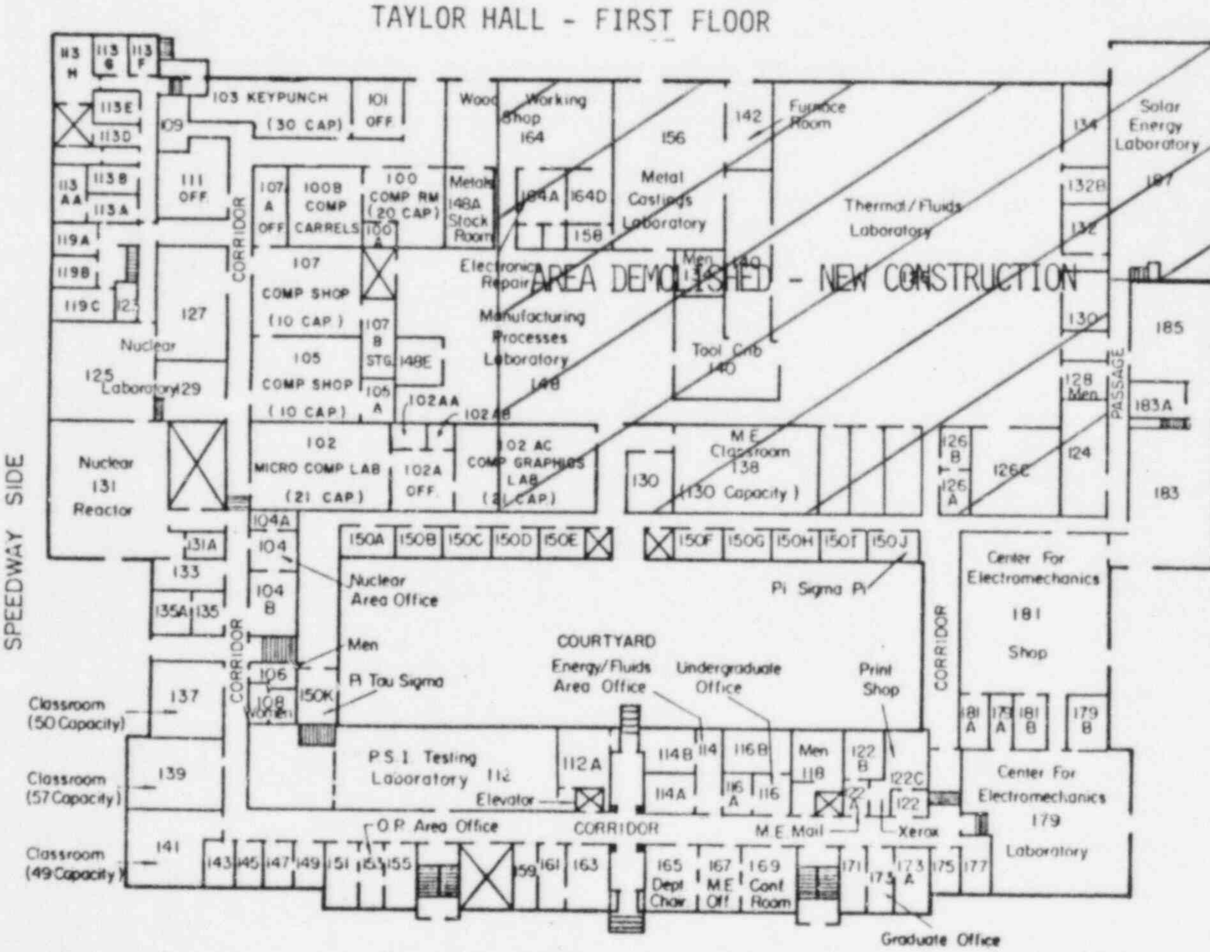
III. As Low as Reasonable Achievable

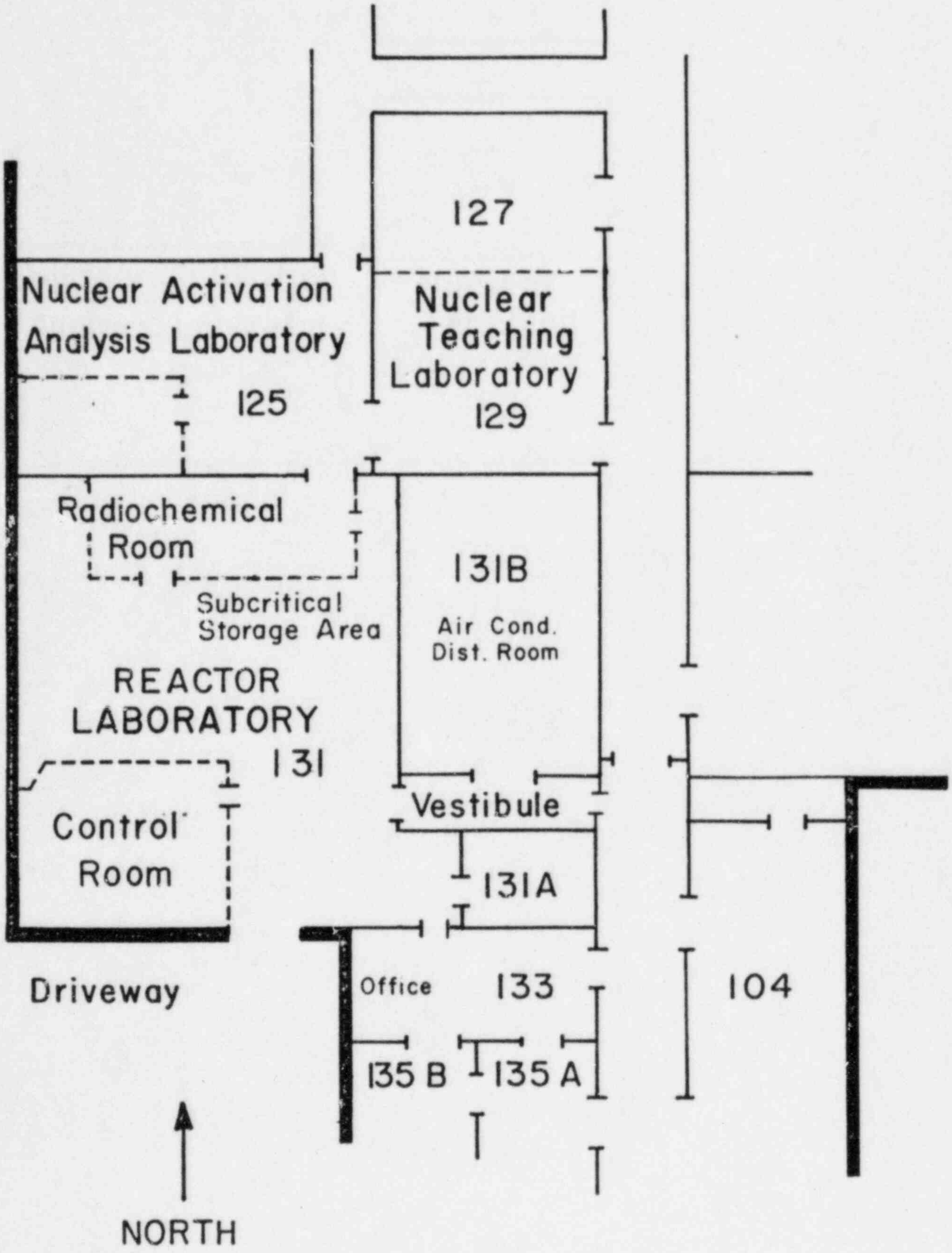
The "as low as reasonable achievable" goal of a radiation safety program is supported by the procedures of the Radiation Safety Committee, Reactor Committee and Nuclear Engineering Teaching Laboratory. Many of the type of experiments performed on a routine basis do not represent significant radiation doses. Less routine experiments may be required on occasion that represent more significant doses. Both occasional and periodic review of radiation doses of staff, students, and visitors is carried out by Laboratory Staff and the Radiation Safety Office. In general, radiation doses are in the minimal or near minimal category for many routine experiments. A review of significant deviations from expected values will be reviewed by the appropriate committee. Typical values are presented in Appendix A-17.

Location of Nuclear Engineering Teaching Laboratory
Austin, Texas

7160910

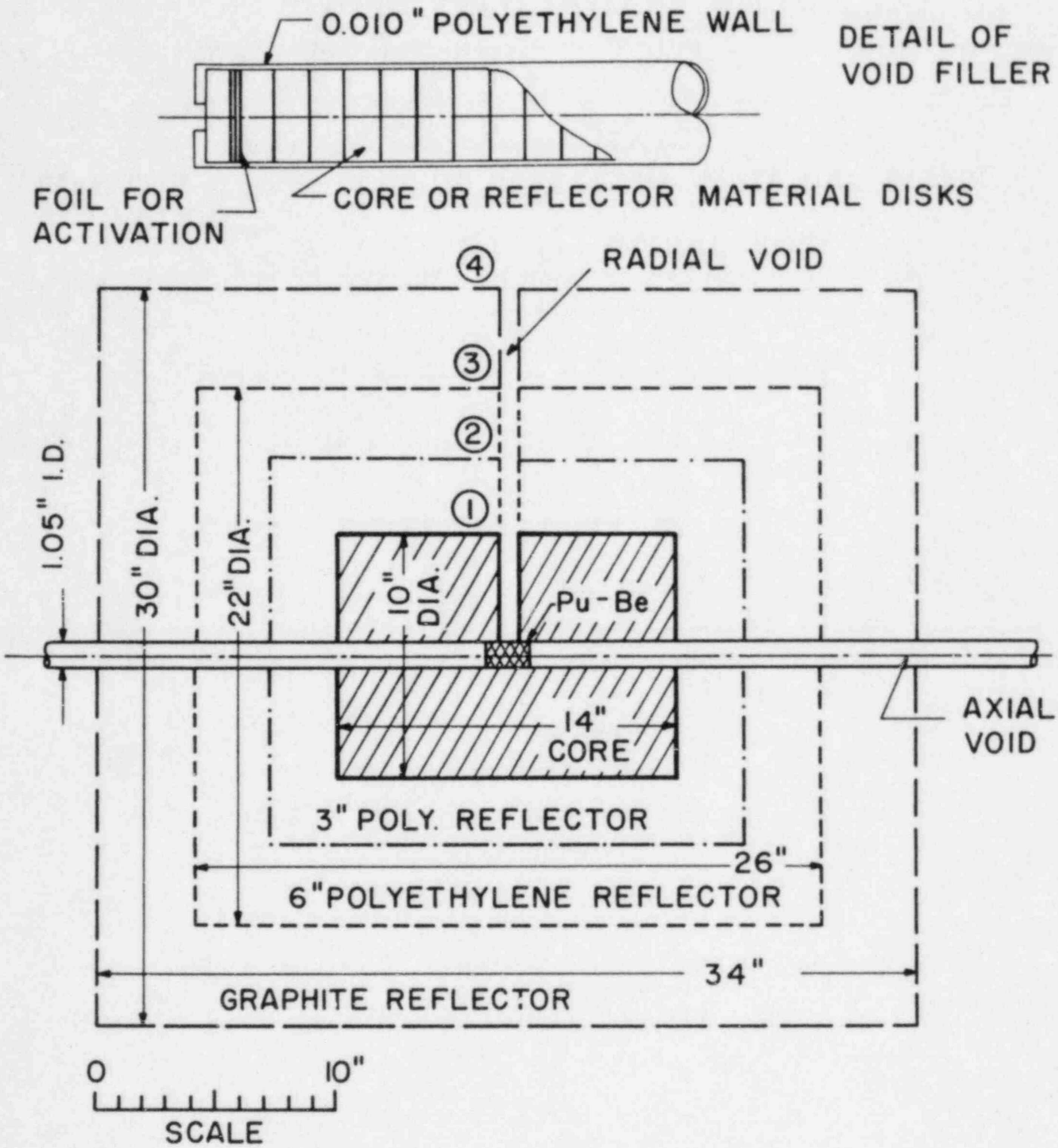
TAYLOR HALL - FIRST FLOOR





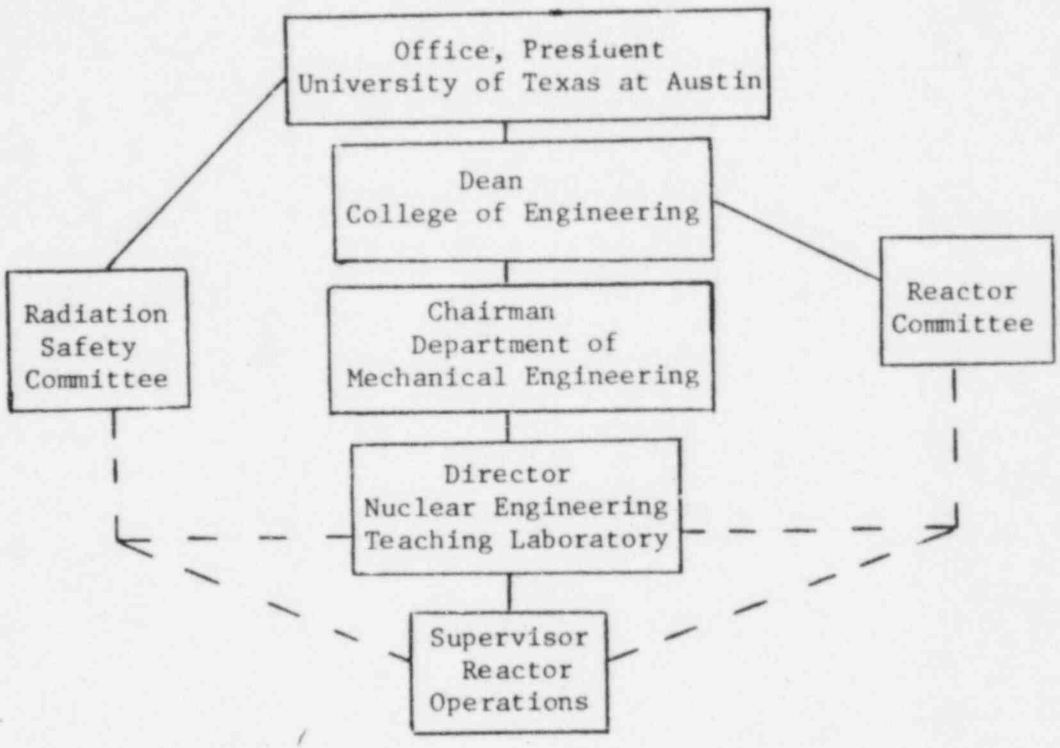
127
Nuclear Activation
Analysis Laboratory
125
Nuclear
Teaching
Laboratory
129
Radiochemical
Room
131B
Subcritical
Storage Area
Air Cond.
Dist. Room
REACTOR
LABORATORY
131
Control
Room
Vestibule
131A
Driveway
Office
133
104
135 B
135 A
NORTH

#60912



Basic Configuration of Subcritical Assembly, Reflectors and Source

4600912



The safety of operation of the Nuclear Engineering Teaching Laboratory shall be related to the University Administration as shown in the following chart.

PERSONNEL QUALIFICATIONS

I. H. W. Bryant, Radiation Safety Officer

A. Experience

U.S. Air Force, 1950-54
One year electronics and radar school;
Three years radar technician

General Dynamics, Fort Worth, Health Physics Group, 1954-1973
Aircraft decontamination programs;
Instrumentation (maintenance, calibration, procurement);
Area Monitoring (3 reactors, neutron generators, x-ray equipment; multicurie sources, radioactive waste);
Environmental monitoring;
Personnel monitoring;
Air pollution control;

The University of Texas, 1973-present
Radiation Safety Officer

B. Education

Texas Christian University, 89 semester hours
U.S. Public Health and NIOSH Schools:
Basic Radiological Safety - 1956
Occupational Radiation Safety - 1957
Gamma Spectroscopy - 1967
Reactor Safety and Hazard Evaluation - 1969
Nonionizing Radiation - 1974
Occupational Health Hazards - 1976
The University of Texas Division of Extension
Certified Safety Professionalists Safety Study Program (taught radiation safety, physics, and math sections of course) - 1975
The A&M University Extension Service
Safety in the Chemical Industry - 1976
Austin Community College
Instructor in safety courses

C. Organization Membership

Charter Member of Health Physics Society
South Texas Chapter of HPS

II. D. E. Klein, Director Nuclear Engineering Teaching Laboratory

A. Experience

Design Engineer, IBM, Summer 1969

Design Engineer, Proctor & Gamble, Summer 1970, 1971-1972

8160912

Summer Engineering Practice School, Argonne National Laboratory, 1973

Teaching Assistant, Univeristy of Missouri-Columbia, 1973-1977

Engineer, General Atomic, 1974

Assistant Professor Mechanical Engineering(Nuclear Program) University of Texas, 1977-present

Associate Director Nuclear Engineering Teaching Laboratory University of Texas, 1977-1978

Director, Nuclear Engineering Teaching Laboratory, 1978-present

B. Education

University of Missouri
- B.S., Mechanical Engineering, 1970
- M.S., Mechanical Engineering, 1971
- Ph.D., Nuclear Engineering, 1977

C. Organizations

American Nuclear Society
American Society of Mechanical Engineers
Registered Professional Engineer, State of Texas, 1979

III. T. L. Bauer, UT Nuclear Engineering Laboratory Supervisor

A. Experience

The University of Texas
- Center for Nuclear Studies, Laboratory Assistant, 1970-71;
- Nuclear Reactor Laboratory, Research Assistant/ Teaching Assistant, 1971-77;
- Mechanical Engineering Department(Nuclear Program), Assistant Professor, 1978-1980;
- Research Scientist/Nuclear Engineering Teaching Laboratory Supervisor, 1980-present
- USNRC operator license, UT TRIGA, 1979-1981
- USNRC senior operator license, UT TRIGA, 1980-present

B. Education

The University of Texas
- Bachelor of Science in Physics, 1971
- Master of Science in Engineering, 1974
- Ph.D., Nuclear Engineering, 1978

C. Organizations

American Nuclear Society

IV. M.G. Krause, Nuclear Technical Specialist

A. Experience

Resident Associate, Argonne National Laboratory, Idaho, 1979

Graduate Research Assistant, The University of Texas at Austin, Department of Mechanical Engineering, 1979-80, 1982, 1983

Teaching Assistant, The University of Texas at Austin, Department of Mechanical Engineering, 1980, 1982, 1984

Nuclear Technical Specialist, The University of Texas at Austin, Nuclear Engineering Teaching Laboratory, 1980-present

B. Education

The University of Texas at Austin
- B.S., Mechanical Engineering, 1978
- M.S., Mechanical Engineering, 1984
- Work on Ph.D. in Mechanical Engineering in progress

C. Organizations

American Nuclear Society
Pi Tau Sigma - National Mechanical Engineering Honor Society
Tau Beta Pi - National Engineering Honor Society

V. R.H. Clements, Nuclear Laboratory Research Assistant III

A. Experience

U.S. Navy
- Nuclear Power School/Training Unit, 1973
- Engineering Watch Supervisor/USS James Madison SSBN 627, [illegible]-78

Commercial
- Senior Reactor Operator/St. Lucie Nuclear Generating Station, Florida Power & Light Company, 1980-83
- Operations Consultant/MEC Inc., Washington, D.C., 1983-84

Research
- Senior Reactor Operator/Texas A&M University TRIGA, 1984-85

B. Education

Texas A&M University, Mechanical Engineering (61 hours)
The University of Texas at Austin, Mechanical Engineering (13 hours)

VI. D.H. Eppes, Nuclear/Electronics Technical Specialist III

A. Experience

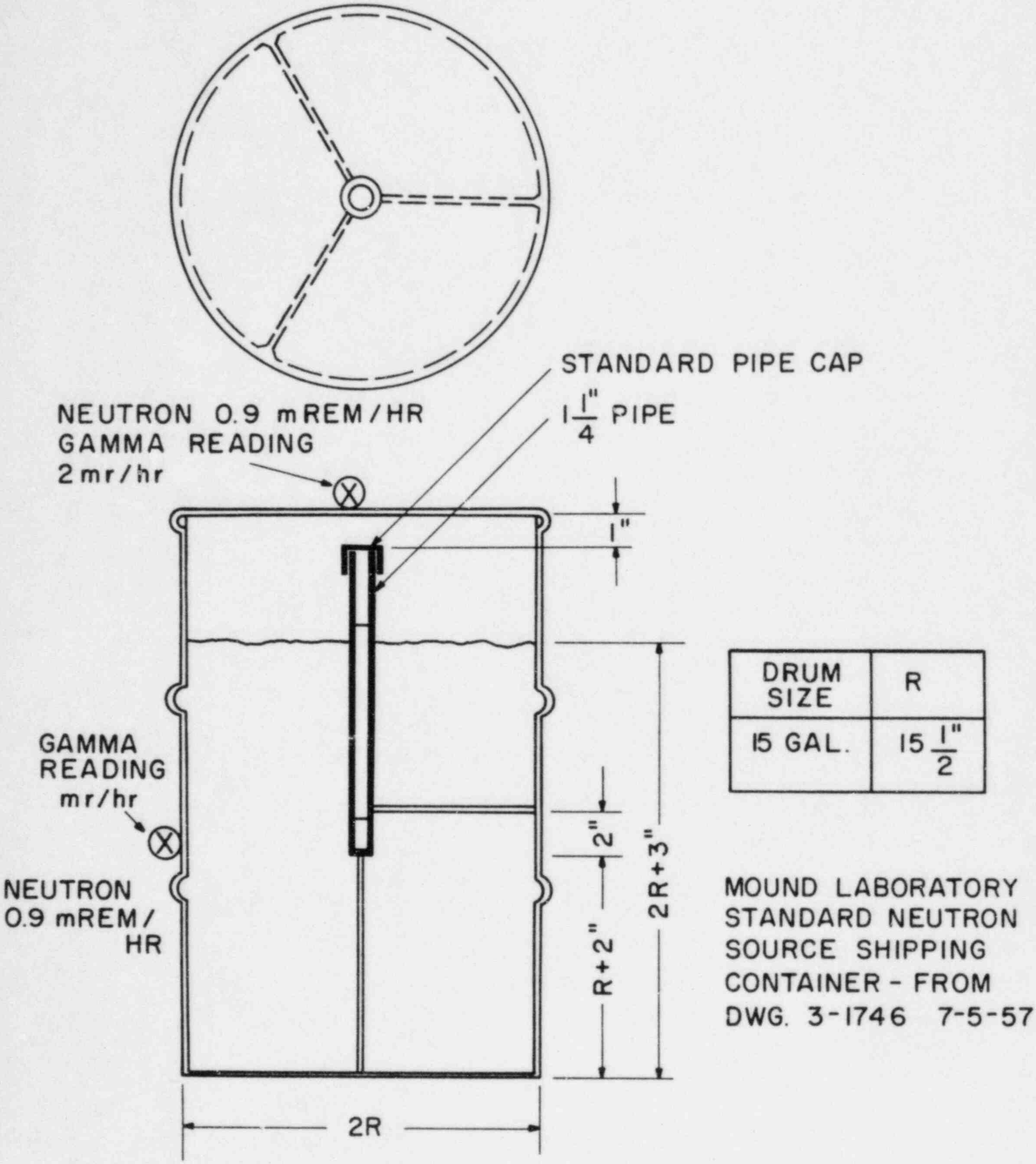
Westinghouse Electric Corporation, Naval Reactors Facility, Idaho National Engineering Laboratory, 1980-84

The University of Texas at Austin, Nuclear Engineering Teaching Laboratory, June 1984- present

B. Education

Texas A&M University, B.S. in Nuclear Engineering
The University of Texas at Austin, 30 hours towards M.S. in Electrical Engineering

~~460912~~



DRUM SIZE	R
15 GAL.	15 1/2"

Plutonium Beryllium and Shipping Container

Fission Product Buildup in
Subcritical Assembly

Experimental measurements with a neutron source of 1.6×10^6 n/sec generate a neutron density approximately but conservatively represented by n(x) = a(sin bx)/x in both axial and radial dimensions. The constants are determined to be $a = 50 \times 10^{-3}$ n/cm^2, and $b = .18$ cm^{-1}. The total fission rate in the assembly is then determined by $\int \Sigma_f \, n(\vec{r}) \, V \, d\vec{r}$ where V is the thermal neutron velocity 2.2×10^5 cm/sec. The total fissions/sec are calculated to be 9.65×10^4. With an energy release of 185 MeV/fission the power of the assembly will be (9.65×10^4 fission/sec) x (185 MeV/fission) x (1.60×10^{-13} watts/MeV) equals 2.86×10^{-6} watts. A source strength of 8.82×10^6 n/sec would generate 15.8×10^{-6} watts. The smaller source represents about 90 watts-sec of power/year of continuous operation. A more realistic estimate is 100 hours/year or about 5.71 watts-secs with the larger source. From 1960 till 1985 100 hr/yr operation with the larger neutron source results in (25 yr) x (3.15×10^7 sec/yr) x (1.15×10^{-5}) x (9.65×10^4 fissions/sec) x (8.82×10^6 n/sec) / (1.6×10^6 n/sec) is 4.80×10^{12} fissions. Assuming that after 100 days the fission products beta decay at a rate of 10^{-8} decays per fission then (4.8×10^{12} fissions) x (10^{-8} decays/fission) x (3.7×10^4 decays/μ curie) is less than 1.5 μ curies of activity.

460915

LICENSE CONDITION FOR LEAK TESTING
SEALED PLUTONIUM SOURCES

A. Each plutonium source shall be tested for leakage at intervals not to exceed six (6) months. In the absence of a certificate from a transferor indicating that a test has been made within six (6) months prior to the transfer, the sealed source shall not be put into use until tested.

B. The test shall be capable of detecting the presence of 0.005 microcuries of alpha contamination on the test sample. The test sample shall be taken from the source or from appropriate accessible surfaces of the device in which the sealed source is permanently or semipermanently mounted or stored. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Commission.

C. If the test reveals the presence of 0.005 microcurie or more of removable alpha comtamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired by a person appropriately licensed to make such repairs or to be disposed of in accordnace with the Commission regulations. Within five (5) days after determining that any source has leaked, the licensee shall file a report with the Division of Fuel Cycle and Material Safety, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, describing the source, the test results, the extent of contamination, the apparent or suspected cause of source failure, and the corrective action taken. A copy of the report shall be sent to the Director of the nearest NRC Inspection and Enforcement Office listed in Appendix D of Title 10, Code of Federal Regulations, Part 20.

D. The periodic leak test required by this condition does not apply to sealed sources that are stored and not being used. The sources excepted from this test shall be tested for leakage prior to any use or transfer to another person unless they have been leak tested within six (6) months prior to the date of use or transfer.

University of Texas
Nuclear Engineering Teaching Laboratory
Emergency Procedures

The basic philosophy in case of emergency is, first, to remove all persons to safe locations and, secondly, for qualified individuals to return cautiously for evaluation of the situation.

Possible hazards are:	(1) Isotope spill (2) Radiolytic gas release
Remote hazards are:	(1) Uncontrolled power excursion (2) Chemical reactions

The amount of emergency action taken shall be based upon the most pessimistic view of the potential hazard. The Supervisor or his designated agent shall be in complete command of all persons in the Laboratory and all actions taken in the Laboratory during an emergency. During the emergency he shall follow orders from the Laboratory Director or from the Chairman of the Radiation Safety Committee only if in his opinion such orders lead to a more conservative or more cautious approach to the correction of the overall situation.

1. Radiological Hazard.

There shall be three grades (or classifications) of emergency situations ranging from the most minor to the maximum credible. The required action in each grade shall include all pertinent provisions of all lower grades.

460913

a. Grade A:

This includes the most situations, such as a small spill of a non-volatile low-level radioactive liquid. Whoever first notices the situation is responsible for alerting all others in the Laboratory. The reactor operator shall modify his plans for operation as he may deem necessary and shall be prepared to scram the reactor until the situation is remedied. The Supervisor is responsible for the evaluation and correction of the situation and for supervising all necessary monitoring, remote handling, use of protective clothing, and other health and safety measures.

b. Grade B:
Up to 100 mr/hr
Up to 5000 cpm on CAM — Known cause.

This limiting level has been established as being near the upper limits permitted by the Nuclear Regulatory Commission and Texas Radiation Council for restricted areas if a person were to remain in the area for a period of about twelve hours per calendar quarter. This grade has been established for cautionary purposes. Occupancy of the Laboratory is restricted to employees with film badges.

c. Grade C:
Over 100 mr/hr, or
Over 5000 cpm on CAM — Unknown cause.

All persons shall immediately evacuate the Laboratory into TAY 125, picking up all readily available portable

survey equipment and closing the doors on their way out. If there is any damage to the walls or roof of the Laboratory, the air-conditioning blower in room 131B shall be turned off (switch on right upon entering 131B). If the situation warrants, the Supervisor or his designated agent shall evacuate all adjacent rooms (104, 125, 129, 131B, 133, 135, 204). One person shall warn others not to enter the hall near the Laboratory from the north. Another will similarly guard at the corridor intersection adjacent to room 135. The Supervisor or his agent will station himself, with monitoring equipment, in the driveway south of the Laboratory. If radiation levels in the corridors adjacent to the Laboratory approach the legal maxima for unrestricted areas, the evacuation of all persons shall be continued as far as necessary to ensure compliance with these regulations.

2. Fire and Other Hazards

In case of fire or other hazards not directly associated with radiation, the general procedure will be to scram the reactor, secure radioactive materials and notify the Fire Marshal(CTX 3511) or the Chief, University Police (CTX 4441). The Supervisor or his designated agent shall have the same authority and responsibility as he has in the case of a radiation hazard. He shall decide the type and extent of action to be taken based upon the location and characteristics of the hazard.

2160912

At least two carbon dioxide fire extinguishers shall be maintained in readiness in the Laboratory area. In the event of fire all ventilation equipment will be shut down.

3. The following persons shall be notified:

(1) Laboratory Supervisor:

Thomas L. Bauer CTX 5136 (345-5044)

(2) Laboratory Director

Dale E. Klein CTX 5136 (459-0075)

(3) Radiation Safety Officer:

Bill Bryant CTX 4601 and 3511 (452-6689)

(4) Chief, Traffic & Security Officer (Chief, University Police)

CTX 4441 PAX 1031

(5) Radiation Control Division of State Health Department:

(512)458-7460

(6) Laboratory Technician:

If necessary, the Chief Traffic and Security Officer may request assistance from the City of Austin Police and Fire Departments.

If Laboratory personnel are unable to obtain sufficient survey equipment and/or protective clothing during the evacuation, such items shall be requested from the Radiation Safety Officer or the Radiation Control Division. At least once each calendar quarter the emergency procedures as outlined above shall be reviewed by the employees involved.

SOURCE	RADIATION TYPE	POSITION				METER
		1	2	3	4	
		BARE	3" POLY	6" POLY	GRAPHITE	
M-797	β	0	0	0	0	SU-14TW
"	$\beta + \gamma$	11mr/hr	6mr/hr	3mr/hr	11mr/hr	SU-14TW
"	n(Thermal)	220/cm^{2}sec	UNDET.	120/cm^{2}sec	45/cm^{2}sec	FOILS
NONE	β	0	0	0	0	SU-14TW
"	$\beta + \gamma$	1.2 mr/hr	0	0	0	SU-14TW

DOCKET NO. 70-157

CONTROL NO. 26364

DATE OF DOC. 01/16/86

DATE RCVD. 01/27/86

FCUF ✓	PDR ✓
FCAF	LPDR
WM	I&E REF. ✓
WMUR	SAFEGUARDS ✓
FCTC	OTHER

DESCRIPTION:

enclosed is a request to renew and amend their license

01/29/86 INITIAL CEC