MAY 06 1987

DOCKET NO: 70-1374

LICENSEE: Idaho State University (ISU)
Pocatello, Idaho

SUBJECT: REVIEW OF LICENSE RENEWAL APPLICATION FOR SNM-1373

Background

Idaho State University (ISU) was first issued Special Nuclear Material License No. SNM-1373 in July 1973. The license was subsequently renewed in April 1981. The current license expired on April 30, 1986; however, on March 4, 1986, ISU submitted an application for renewal. Accordingly, the license has remained in effect in accordance with the timely renewal provisions of subsection 70.33(b) of 10 CFR 70.

Scope of Review

The safety review of ISU's renewal application included review of the application of March 4, 1986, and the compliance history of the license during the past 7 years.

The topics of review include an evaluation of the applicant's radiation safety and nuclear criticality safety programs and the organization. The renewal application was discussed with B. Spitzberg, NRC Region IV Inspector.

Discussion

ISU's renewal application demonstrates that they have adequate technical staff with the proper qualifications to administer an effective and safe radiological safety program. The following sections contain a description of the applicant's organization, safety program, and proposed license conditions developed by the Fuel Cycle Safety Branch staff.

Possession Limits: ISU has requested the following nuclear material for their activities:

Material	Form	Amount
A. Uranium enriched in the U-235 isotope	A. Clad uranium aluminum fuel plates	A. 1,510 grams U-235
B. Uranium enriched in the U-235 isotope	B. Uranium aluminum foils and fission counters	B. 1 gram U-235
C. Plutonium	C. Encapsulated Pu-Be neutron sources	C. 20 grams Pu

Activities

Authorized Use: The materials specified in A, B, and C above shall be used in accordance with the statements, representations, and conditions specified in the application dated March 4, 1986.

Authorized Place of Use: The material specified in A and B shall be used in the Lillibridge Engineering Laboratory at Idaho State University.

The material specified in C shall be used in the Lillibridge Engineering Laboratory. When the subcritical assembly is not in operation, the plutonium shall be stored in a neutron howitzer in a vault in the Physical Science Building basement.

Organization

ISU is operated by the State of Idaho with its principal office at Pocatello, Idaho. The board members and officers are all citizens of the United States.

The Dean of the School of Engineering is fully responsible for the safe storage and the use of the licensed material. No activities are performed without prior approval of the Dean. A Reactor Safety Committee has reviewed and approved all plans and procedures for the usage of the materials in the subcritical assembly. The applicant has not committed to having the Committee review any new activities or procedures for the assembly, therefore, the following condition is recommended:

> The Reactor Safety Committee shall review all new activities and procedures and any changes to the plans and procedures for the usage of licensed materials in the subcritical assembly prior to implementation.

The Reactor Safety Committee was formed to review procedures for the ISU AGN-201 reactor. Membership and duties are specified in the reactor license. There are six members of the Committee, other than the Reactor Supervisor and the Dean of the School of Engineering, who are ex officio members. The members, as a group, have education and experience in the various technical disciplines needed to evaluate the safety of the reactor and subcritical assembly operations. The Committee meets at least once each year.

The Dean, School of Engineering, Reactor Supervisor, and the Radiation Safety Officer have direct responsibility for the operation of the subcritical assembly. The application does not specify who is responsible for calibration of radiation instruments, leak testing sealed sources, reviewing radiation exposure, and conducting radiation surveys. However, the Radiation Safety Officer has been designated these responsibilities under Reactor License R-110. To ensure that these functions are performed under this license the following condition is recommended:

The Radiation Safety Officer shall be responsible for ensuring that instrument calibrations, radiation surveys, and leak tests are performed and for reviewing radiation exposure records.

Technical Qualifications

The resumes for the individuals in safety positions provided with the application show that their qualifications of education and experience are more than sufficient for the responsibilities they are assigned.

Radiation Safety Control

Control of Personnel Exposure

All personnel monitoring is in accordance with 10 CFR Part 20. Staff and students present wear gamma, beta, and neutron sensitive film badges. When in the room, visitors are required to wear pocket dosimeters. When operations involving special nuclear material in the subcritical assembly are in progress, a minimum of two persons must be present in the room. Personnel are required to actively pursue the ALARA policy.

Control of Contamination

The subcritical assembly consists of 150 aluminum-clad, aluminum-uranium fuel plates that are loaded in various lattice arrangements in a water-filled tank. Disposable plastic gloves or other hand coverings are used when handling the fuel plates. The uranium-aluminum foils are handled using disposable plastic gloves or tongs as appropriate. The Pu-Be neutron sources are handled with tongs or source holders in such a manner that the sources are a minimum of 3 feet away from any person. The Pu-Be sources are handled under the direct supervision of the Reactor Supervisor or the Radiation Safety Officer.

The licensee has committed to leak testing 10 percent of the fuel plates, using the standard smear test for alpha contamination, prior to each experiment and at normal inventories (at least twice per year). The foils are tested in conjunction with the fuel plates. A general area contamination survey is performed in conjunction with the fuel plate and foil surveys. In addition, a monthly contamination survey and general area radiation survey are performed.

The licensee has not committed to leak testing the sealed Pu-Be neutron sources in the application. Therefore, it is recommended that adherence to the standard leak test condition remain a part of the license. The proposed condition is as follows:

The licensee shall comply with the enclosed Annex A, "License Condition For Leak Testing Sealed Plutonium Sources," May 1987.

The staff recommends a condition which specifies criteria for the release of equipment and materials from the restricted areas to unrestricted areas. The condition shall read as follows:

> Release of equipment or materials for unrestricted use or from contaminated to clean areas onsite shall be in accordance with the enclosed Annex B, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Materials," May 1987.

Calibration of Instruments

The licensee has a range of radiation monitoring and measuring instruments which are listed in the renewal application. The licensee has not committed to calibrating the instruments. Therefore, the staff recommends the following condition:

> The licensee shall calibrate the radiation detection instruments listed on Page 6 of the license renewal application at 6-month intervals or, if the instrument has not been used during the 6-month period, prior to use.

Training

Since the assembly is used to teach basic concepts to undergraduate and graduate students, a portion of each student's education before performing experiments with radioactive materials will include information on radiation hazards, dose measurements, and laboratory procedures. Experiments are performed under the supervision of laboratory staff or knowledgeable students who have been approved by the Reactor Safety Committee.

Effluent Control

Because of the nature of the radioactive material being handled under this license, airborne activity should not be of concern.

Contaminated material (i.e., gloves, smear papers) is controlled and disposed of by Health Physics personnel in accordance with the procedure established under Radioactive Materials License IDA-33-1, issued to the University by the State of Idaho.

Nuclear Criticiality Safety

Experiments have been conducted with the assembly in a variety of fuel arrangements which show that it remains subcritical with normal water reflectors and moderators. However, the assembly could be made critical through the use of effective reflectors or moderators such as heavy water,

beryllium, and graphite (excluding the graphite base of the subcritical assembly). Although these materials are allowed into the laboratory only in very limited quantities, it has been considered that the assembly might accidentally be made critical. Therefore, a criticality alarm system is installed and maintained in the laboratory, and responsible experimenters are instructed in the criticality emergency procedures. The criticality alarm signal is wired to the assembly moderator tank drain valve so that activation of the alarm automatically drains the moderator. Response of the criticality alarm is tested annually. In view of the demonstrated subcriticality of the assembly and the controls on unusual moderators-reflectors, this frequency for checking the alarm response is deemed sufficient.

Environmental Protection

The licensing of the ISU activities is in accordance with 10 CFR 51.22 (c)(14)(v), and therefore, neither an Environmental Assessment nor an Environmental Impact Statement is warranted for this action.

Emergency Planning

The licensee maintains a criticality alarm above the assembly and has emergency procedures covering an accidental criticality. Emergency equipment and communication and alarm systems are tested every September. The licensee specifies that periodic review of emergency procedures are accomplished by drills, however, there is no timeframe specified. The staff recommends the following condition to correct this deficiency:

The licensee shall review emergency procedures on an annual basis.

Compliance History

The licensee's inspection and enforcement record since the last renewal was reviewed and discussed with Mr. B. Spitzberg, Region IV Inspector. There was one inspection during this time period, and no violations were reported. Mr. Spitzberg had no objection to the issuance of the renewal.

Conclusion and Recommendations

Upon completion of the safety review of the licensee's application and discussion with the Region IV Inspector regarding the licensee's compliance records, the staff has concluded that the licensee has the necessary technical staff to administer an effective radiological safety program. Conformance by the licensee to their proposed conditions, as well as to those developed by the FCSB staff, should ensure a safe operation, a quick detection of unfavorable trends or effects, and result in corrective actions being taken.

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Based on the discussion above, it is recommended that the license be renewed for a 5-year period in accordance with the application and subject to the recommended conditions.

Original Signed By:

Merri Horn
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Fuel Cycle Safety Branch
Division of Fuel Cycle, Medical,
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Enclosures: Annex A
Annex B

Approved by: Original Signed By:
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Annex A

LICENSE CONDITION FOR LEAK TESTING

SEALED PLUTONIUM SOURCES

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A. Each plutonium source shall be tested for leakage at intervals not to exceed 6 months. In the absence of a certificate from a transferor indicating that a test has been made within 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 microcurie 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 contamination, 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 accordance with the Commission's regulations. Within 5 days after determining that any source has leaked, the licensee shall file a report with the Division of Fuel Cycle, Medical, Academic, and Commercial Use Safety, U.S. Nuclear Regulatory Commission, Washington, DC 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 Administrator of the nearest NRC Regional 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 6 months prior to the date of use or transfer.

Annex B

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE, OR SPECIAL NUCLEAR MATERIAL

U.S. Nuclear Regulatory Commission
Division of Fuel Cycle, Medical, Academic,
and Commercial Use Safety
Washington, DC 20555

May 1987

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on a case-by-case.

1. The licensee shall make a reasonable effort to eliminate residual contamination.

2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering. -

3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces of premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of the limits.

4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to, special circumstances such as razing of buildings, transfer to premises to another organization continuing work with radioactive materials, or conversation of facilities to a long-term storage or standby status. Such requests must:

   a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.

   b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment, or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of the survey report shall be filed with the Division of Fuel Cycle, Medical, Academic, and Commercial Use Safety, U. S. Nuclear Regulatory Commission, Washington, DC 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:

   a. Identify the premises.

   b. Show that reasonable effort has been made to eliminate residual contamination.

   c. Describe the scope of the survey and general procedures followed.

   d. State the findings of the survey in units specified in the instruction.

   Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES[a]	AVERAGE[b c f]	MAXIMUM[b d f]	REMOVABLE[b e f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1000 dpm $\beta\gamma$/100 cm^2

[a] Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.