DOCKET NO.: 70-1374

LICENSE NO.: SNM-1373

LICENSEE: Idaho State University

SUBJECT: SAFETY EVALUATION REPORT: LICENSE RENEWAL APPLICATION FOR IDAHO STATE UNIVERSITY, SPECIAL NUCLEAR MATERIAL LICENSE NO. SNM-1373

I. INTRODUCTION

By letter dated August 27, 2008, Idaho State University (ISU) submitted a license renewal application (ML082630613) to the U.S. Nuclear Regulatory Commission (NRC) requesting renewal of its Special Nuclear Material (SNM) License No. SNM-1373. The request was made pursuant to the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR), Sections 70.33 and 70.38(a). This first application met the requirements for timely submittal of their renewal request, but NRC requested ISU to resubmit their application with additional information due to deficiencies in the areas of criticality safety, radiation safety and fire safety. By letter dated February 27, 2009, ISU submitted a revised request for license renewal. NRC accepted this renewal application on June 3, 2009. ISU proposes that its facility continue to possess and use SNM for training and educational purposes, as described in the license renewal application. Based on requests for additional information by NRC staff in the areas of criticality safety, radiation safety and fire safety, ISU supplemented its application with additional submittals in each of these areas. These submittals were dated January 29, 2009, February 20, 2009, and February 14, 2011. ISU has requested a renewed license term of 10 years.

The NRC staff conducted its safety and safeguards review in accordance with 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," 10 CFR Part 73, "Physical Protection of Plants and Materials," 10 CFR Part 74, "Material Control and Accounting of Special Nuclear Material," 10 CFR Part 20, "Standards for Protection Against Radiation," and other applicable regulations.

The NRC staff used various guidance documents listed in Section VIII, REFERENCES, herein to conduct its safety review. The NRC staff's safeguards review included the review of ISU's Physical Security Plan and Emergency Plan.

ISU has an AGN-201 research reactor, which operates under NRC Reactor License No. R-110. The activities associated with this license are independent of the SNM license and are not discussed in this Safety Evaluation Report (SER). The two licenses do overlap in one area where enriched uranium contained in aluminum foils under the SNM license is used as a fission counter during reactor operations.

A notice of opportunity to request a hearing on the license renewal application was published in the *Federal Register* (FR) on November 13, 2009 (74 FR 58656). One request for hearing and petition to intervene was filed. On January 12, 2010, Kevan C. Crawford, Ph,D.(Petitioner) filed a request for hearing and petition for leave to intervene with regard to the pending application of the Idaho State University (Applicant) for a renewal of its SNM License, SNM-1373. On February 18, 2010, Petitioner filed a motion to withdraw his petition.

On February 24, 2010, the ASLB granted Petitioner's motion to withdraw and terminated its' proceeding in the matter.

II. DISCUSSION

a) General Information

ISU, with its principal office at Pocatello, Idaho, is operated by the State of Idaho. The Idaho State Board of Education provides oversight and direction of the higher education institutions in Idaho and is located in Boise, Idaho.

ISU uses SNM to supplement its education, research and training programs in the field of nuclear engineering for undergraduate and graduate students. The licensed materials are to be used in experiments at the facilities located in the Lillibridge Engineering Laboratory (LEL) building located on the main campus of ISU.

ISU is requesting authorization to possess and use SNM as follows: (a) the uranium-aluminum fuel plates would be used for subcritical assembly studies, (b) the uranium-aluminum foils are to be used as neutron monitors in experiments performed with the AGN-201 nuclear reactor, and (c) enriched U-235 is used as a fission counter. The license renewal application described the characteristics and composition of the SNM to be used in these applications. It also included acceptable drawings illustrating the facility layout where the proposed activities would take place.

The primary location authorized for use and storage is in the basement of the LEL in [redacted]. [redacted] is a controlled access area (CAA). Only safeguards-approved ISU personnel in the College of Engineering have authorized access to CAAs in the Nuclear Engineering Complex.

ISU is requesting that limited amounts of the SNM be used in two alternate locations. The two alternate locations authorized for use include the AGN-201 nuclear reactor [redacted] in the LEL and the Particle Beam Laboratory in the adjacent Physical Science Building. Personnel cleared for safeguards information access and control are to be responsible for the SNM during its use in these alternate locations. Use of the SNM in the alternate location is allowed on a temporary day-by-day use basis. The SNM cannot be stored in either alternate location overnight and shall be returned to the LEL for storage in [redacted] following its use each day. The SNM moved to either alternate location shall be under the continuous custody of the Nuclear Engineering Department personnel including the Reactor Administrator, Reactor Supervisor, Nuclear Engineering Department Chair, or a Reactor Operator

In a revision to their renewal application dated October 6, 2009, ISU removed the Idaho Accelerator Center (IAC) from the application as they no longer intended to use SNM at the IAC. The IAC is not included in the list of locations where SNM is authorized for use. Also license conditions 13 and 14 which were included in SNM-1373 Amendment 2 were not included in the renewed license as they are no longer required. These two license conditions pertained to the use of SNM at the IAC.

License condition 12 of SNM-1374, Amendment 2 was also removed from the renewed license as it had been deleted previously. This license condition pertained to emergency planning at the IAC.

The NRC staff reviewed the license renewal application to determine whether ISU was required to provide Integrated Safety Analysis (ISA) Summary information, pursuant to the provisions in 10 CFR Part 70 Subpart H, "Additional Requirements for Certain Licensees Authorized to Possess a Critical Mass of Special Nuclear Material." The NRC staff notes that the proposed activities for which the license would be renewed do not meet the criteria in 10 CFR 70.60 (i.e., that the licensee be engaged in enriched uranium processing, fabrication of uranium fuel or fuel assemblies, uranium enrichment, enriched uranium hexafluoride conversion, plutonium processing, fabrication of mixed-oxide fuel or fuel assemblies, scrap recovery of special nuclear material or any other activity). The staff determined that the activity is not one of the listed activities and could not significantly affect public health and safety. Therefore, 10 CFR Part 70, Subpart H is not applicable to the license renewal application. As a result, the NRC staff concludes that ISU is not required to submit an ISA Summary in support of its license renewal application.

ISU is requesting approval to possess and use SNM for its educational programs, as described in the table below:

MATERIAL	FORM	QUANTITY	AUTHORIZED USE(S)
Uranium Enriched to less than 20 % in the isotope U-235	[redacted] clad uranium aluminum fuel plates	[redacted] grams U-235	Instruction and Educational Programs at ISU
Uranium Enriched to 93 % in the isotope U-235	Fission counter	[redacted] grams.	Instruction and Educational Programs at ISU
Uranium Enriched to 93 % in the isotope U-235	Uranium-aluminum foils	[redacted] foils containing [redacted] grams. U-235 ([redacted] grams. per foil)	Instruction and Educational Programs at ISU

The NRC staff reviewed the license renewal application and concludes that ISU adequately described its facility and the proposed uses of the SNM for which the license is sought. Therefore, the NRC staff concludes that the information provided by ISU meets the applicable requirements in 10 CFR 70.22 and 10 CFR 70.33 and is, therefore, acceptable.

b) Organization and Administrative Structure

The current President of the University has designated the Vice President for Research as the university official who has overall responsibility for this license. A roster of current university officers with complete contact information is provided in ISU's application. All of the officers are citizens of the United States. There is no control or ownership exercised over the applicant by any alien, foreign corporation, or foreign government.

Responsibility for the supervision and operation of licensed activities will reside with the Reactor Administrator, the Reactor Supervisor, and the ISU Radiation Safety Officer. Biographical data listing qualifications for those members of the ISU faculty who have responsibility for the supervision and operation of the SCA are included in ISU's application.

The NRC staff reviewed the license renewal application and concludes that ISU has an acceptable organization, administrative policies, and sufficient competent resources that provide reasonable assurance of adequate safety for the proposed activities. Therefore, the NRC staff concludes that the information provided by ISU meets the applicable requirements in 10 CFR 70.22 and 10 CFR 70.33 and is, therefore, acceptable.

III. RADIATION SAFETY REVIEW

a. Organization and Qualifications

The Vice-President of Research (VPR) is the Senior Management representative for radiation protection matters at ISU. The Radiation Safety Committee (RSC) and Radiation Safety Officer (RSO) report directly to the VPR for matters concerning the use of radiation sources at ISU.

Responsibility for the supervision and operation of licensed activities will reside with the Reactor Administrator, the Reactor Supervisor, and the RSO. The Reactor Administrator is responsible for the safe storage and use of the special nuclear material. The Reactor Administrator is Dr. Jay Kunze who is a Certified Health Physicist and has been employed as Dean and Professor of the College of Engineering at ISU since 1995. The Reactor Supervisor is Dr. John Bennion who is a Certified Health Physicist and has been the Reactor Supervisor at ISU since September 2001. The RSO is Dr. Richard Brey. Dr. Brey is a Certified Health Physicist and has been designated as the RSO at ISU since January 2006. He has been employed in a professorial role at ISU since July 1994.

ISU's Technical Safety Office (TSO) is the organizational entity that provides administrative and technical services in support of the radiation protection program. This organization has the specific function of evaluating and controlling radiological hazards related to ISU activities. This includes the monitoring of personnel radiation doses and routine radiological emissions. The Director of the TSO is the RSO.

The RSC consists of a group of engineers and scientists, knowledgeable in nuclear reactor operations and safety matters. Members are appointed from the major academic and research areas that use ionizing radiation at ISU. It meets as often as is necessary to conduct business but not less than once per calendar quarter. A quorum of the RSC consists of at least one-half of the voting RSC membership and must include the Committee Chairperson and the RSO.

b. Written procedures

ISU maintains a Radiation Safety (RS) Manual which conveys the official policies for the control of all sources of, and exposures to, ionizing radiation that are within the jurisdiction of the university. The RS Manual defines responsibilities of individuals and organizations for radiation control and specifies the policies that guide specific decisions on radiation control matters. The RS Manual describes the Radiation Protection Program and is reviewed annually for needed revisions by the RSC. The RS Manual includes the following subject areas:

1. ALARA,
2. Radiation Safety Training,
3. Radiation Safety Program Audits,
4. Control and Monitoring of Radiation Sources,
5. Control and Monitoring of External Radiation Exposure,

6. Control and Monitoring of Intake of Radionuclides,
7. Records,
8. Instrumentation,
9. Sealed Source Leak Tests,
10. Receipt and Shipping of Radioactive Materials,
11. Radioactive Waste Management; and,
12. Emergency Preparedness.

In addition to the RS Manual, the RSC will review and approve all plans and procedures for the use of the licensed materials in the Sub-Critical Assembly (SCA). The RSC will review and approve all new experimental plans and procedures for the use of the licensed material prior to implementation as well as approve all changes to existing experimental plans and procedures that may affect safety.

c. As Low as Reasonably Achievable (ALARA) Program

ISU has committed to enacting an ALARA policy as documented in the facility's RS Manual. ISU's ALARA Program includes an annual review of radiation exposures by the RSO for adherence to the ALARA concept. The RSO reports his findings to the RSC.

d. Personnel Radiation Safety Training

Prior to working with or handling licensed nuclear material, personnel will receive training or be under the supervision of persons who have received training in radiation protection from the TSO. Per the RS Manual, each individual working with or in the presence of radioactive materials or other radiation sources is required to receive documented 10 CFR Part 19.12 radiation safety training. The extent of the training is to be commensurate with the potential risk of radiation exposure to the individual. ISU general training for radiation users contains the following subject areas:

1. Characteristics of ionizing radiation,
2. Units of radiation dose and quantities,
3. Biological effects of exposures to ionizing radiation,
4. Safe handling of radioactive materials,
5. External exposure limitation (time/distance/shielding),
6. Internal exposure limitation (contamination control/bioassays),
7. Classification of facilities and postings,
8. Individual dose limits including special limits for declared pregnant workers,
9. Mathematics pertaining to the use and measurement of radioactivity,
10. The ALARA principle; and,
11. Emergency procedures.

e. Control of Personnel Exposure

ISU issues personal dosimeters sensitive to beta, gamma, and neutron radiation to all students and staff working with SNM. These are supplied by an outside vendor that holds current National Voluntary Laboratory Accreditation Program (NVLAP) accreditation. Dosimeters are evaluated quarterly.

Visitors are issued self-reading pocket dosimeters while in the room containing the SCA. Exposures are expected to be minimal as there has been no breach of the plates or foils

resulting in dispersible materials and there is minor radiation emitted while the SCA is in operation (the dose rate is less than 0.1 millisievert per hour [mSv/h] or 10 millirem per hour [mrem/h] at the surface of the assembly). The assembly will typically be limited to 2 experiments per year and personnel will be excluded from areas where the exposure rate exceeds 1.29E-6 coulomb per killigram per hour [C/kg-h] or 5 milliroentgen per hour [mR/h] unless a specific analysis has been completed and appropriate administrative approval is obtained. There have been no indications of radiation levels above background after the fuel is placed into its storage container. The NRC determined that the licensee's program to ensure that personnel radiation exposures are minimized is considered adequate.

f. Control of Contamination

The SNM at ISU is either encapsulated or incorporated into a non-dispersible form in fuel plates, U-Al foils, and a fission counter. Personnel use disposable gloves or other hand coverings while handling the plates or foils. Leak tests on 10 percent of the fuel plates will be conducted at the conclusions of experiments and twice a year at normal inventories. The box containing the U-Al foils will be swiped on the exterior each time a plate sampling set is removed. Water used to conduct experiments is analyzed for gross activity after each experiment. Action levels for the experiment water are twice the minimum detectable activity. Contamination surveys of the area will be conducted along with the leak testing at the conclusion of experiments. At least bi-annually, general contamination and radiation surveys will be conducted in the room containing the SCA. Contamination greater than 7 dpm/100 cm^2 alpha or 70 dpm/100 cm^2 beta/gamma will be investigated and cleaned in a manner consistent with the RS Manual. Because the licensed material is in a non-dispersible form, the NRC determined that the licensee's program to monitor for and control contamination is considered adequate.

Staff notes that clearance of contaminated equipment and materials is generally unaddressed in the application but may be applicable should a release of radioactive material occur. For this reason, staff recommends the following license condition:

> Contamination guidelines shall be established for unrestricted release of contaminated material and equipment that are no greater than the limits identified in Branch Technical Position, “Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material,” April 1993.

g. Calibration of Instruments

Portable survey instruments are calibrated annually using sources that are traceable to National Institute of Standards and Technology. The licensee's program for instrumentation utilized for Radiation Protection is documented in the RS Manual and is sufficient to ensure reliable operation of survey instruments.

h. Effluent Control

There is very little SNM contaminated waste generated under this license. Because the material is in non-dispersible form, there is no ventilation monitoring. Contaminated waste (including experiment water, if necessary) will be controlled and disposed of by the TSO in accordance with written procedures. The NRC staff has determined that this commitment to the control of contaminated liquids and solid waste and the lack of routine gaseous and liquid effluents is adequate to assure effluents are maintained within regulatory limits.

i. Conclusion in Regard to the Applicants Radiation Safety Program

Based on NRC staff's review of the information provided in the license renewal application and the adequacy of ISU's radiation safety program, the NRC concludes that the program provides reasonable assurance of protecting the public health and safety consistent with the requirements of 10 CFR Part 19, 20, and 70.

IV. FIRE SAFETY

The Nuclear Engineering Laboratories where the fuel plates are located are in the basement of the LEL building. The building code to which the engineering building was designed and constructed to is unknown to the applicant. However, exterior wall construction is all brick and all floors are reinforced concrete. The staff considers this equivalent to NFPA 220 Type II noncombustible construction as required by NFPA 801 for facilities containing radioactive materials. NFPA 220 contains tables which equates the fire rating of various building components to construction type. There are no standpipes in the building but there are three nearby fire hydrants for use by the Pocatello City Fire Department outside of the building.

The SNM will be used primarily in [redacted] which has below grade reinforced concrete walls on three sides. The forth side is sheet rock on 2.5 inch steel studs and contains a fireproof entry door of steel construction. [redacted] contains a nuclear grade graphite pile with removable slabs of graphite in which irradiation foils can be inserted. The nuclear grade graphite will burn only when an external heat source is applied. It will self extinguish under normal atmospheric conditions. The only combustibles permanently in the room are the wooden surfaces of one instrument table and the platform around the subcritical tank (the platform structure is steel). Written procedures, which are posted on the door of [redacted] do not permit other combustibles to be brought into the facility except temporarily, for less than 24 hours, without the written approval of the reactor supervisor or the reactor administrator. There is a 10 lb dry-chemical fire extinguisher located next to the door of [redacted]. Two other 10 lb extinguishers are located nearby in the nuclear engineering complex. Reactor operators and security personnel are trained in the use of fire extinguishers. A heat sensor is located in the ceiling in [redacted] above the assembly tank. Activation of the sensor will alert campus security who will investigate and sound the building fire alarm which will also notify the Pocatello Fire Department which is about 0.6 miles away.

The licensee performed a calculation assuming that all of the wood dividers in the steel storage container for the fuel plates would burn and the resulting heat of combustion be absorbed by the aluminum plates. The licensee determined that there was not enough heat to melt the aluminum and the uranium was not in a dispersible form. Also, the storage container will not allow enough air inside to react with the wood for complete combustion to develop and will protect the fuel plates from radiant energy transfer from a nearby fire within room. Based on the licensee's calculations a fully developed compartment fire is not considered likely by the NRC staff based on the descriptions of the insitu combustibles and the quick response time for manual suppression. The NRC staff concludes that a release of radioactivity by fire is highly unlikely and therefore in accordance with section 7.4.3.2 of NUREG-1520, a formal fire hazards analysis need not be performed.

The NRC staff has reviewed ISU fire protection features pertaining to the fuel plates in the LEL building and determined that ISU maintains an adequate level of fire protection at the facility to

protect public health and safety. The NRC staff concludes that the applicant's equipment, facilities, and procedures provide a reasonable assurance that adequate fire protection will be provided consistent with the requirements of 10 CFR Part 70.

V. NUCLEAR CRITICALITY SAFETY

a. Background Information

ISU uses SNM under NRC Material License Number SNM-1373 for research and educational purposes to strengthen undergraduate and graduate programs in the areas of nuclear science and engineering. Currently, ISU is authorized to possess [redacted] grams of U-235 contained in 150 uranium-aluminum (U-Al) fuel plates, and [redacted] gram U-235 contained in one fission counter and [redacted] U-Al foils. ISU primarily uses the fuel plates in [redacted] of the LEL building where they are loaded in various lattice arrangements in a water-filled tank to produce a SCA. The U-Al foils are used as neutron monitors in experiments performed with the SCA or at ISU's nuclear reactor. Under the current license, ISU is authorized to transport up to ten fuel plates to alternate nuclear facilities for temporary one-day use. Experiments or activity involving the use of SNM are not performed without the prior approval of the Reactor Administrator or Reactor Supervisor.

b. Standards Commitments

The licensee commits to the requirements of ANSI/ANS 8.1-1998, "Nuclear Criticality Safety in Operations with Fissionable Material Outside Reactors" and ANSI/ANS 8.23-2007, "Nuclear Criticality Accident Emergency Planning and Response." A fixed criticality alarm system is installed in [redacted] in accordance with 10 CFR 70.24 (a)(2) and ANSI/ANS-8.3-1997, "Criticality Accident Alarm System (CAAS)" as modified by NRC Regulatory Guide 3.71. Based on the form and quantity of material (approximately [redacted] grams of U-235), NRC staff determined that a criticality monitor is not required at alternate nuclear facilities where experiments may be conducted using up to a maximum of ten fuel plates.

c. Criticality Determination

The SCA was designed to be subcritical under all conditions using water as a moderator and radial and top reflector. The licensee performed calculations for the SCA using the 19 energy group deterministic code DISNEL (Diffusion Iterative Solution using Nineteen Energy Levels). The most reactive configuration (two plates together for a total thickness of 0.16 inches) has a calculated k-effective of 0.86. The k-effective with a graphite reflector was calculated to be 0.95. Calculations were also performed on various geometric arrangements with water and graphite reflectors and the licensee determined that a criticality is not possible with these materials in any configuration with the [redacted] fuel plates. The licensee also conducted experiments with the SCA and neutron sources in a 1973 thesis (Jotikasthira, Prina, The Evaluation of the Idaho State University Subcritical Assembly, ISU Thesis, 1973).

The thesis found that the highest measured k-effective was 0.88 and also determined that criticality cannot be achieved using the SCA materials. NRC staff performed confirmatory calculations using the criticality safety code KENO and determined that an inadvertent criticality is not possible using the materials in the SCA room.

However, the licensee determined that an inadvertent criticality might be possible by the deliberate and unauthorized use of superior moderator (heavy water) or reflector materials (beryllium reflector) with the licensed SNM arranged in an optimal geometric configuration. The licensee has not identified a mechanism that would create the optimal geometric configuration and neither heavy water nor beryllium is permitted in the facility. The prevention of an inadvertent criticality is accomplished through the licensee's commitment to restricting or prohibiting the use of superior moderator or reflector materials in the SCA-Room by the Reactor Administrator, controlling access to the shipping container and tank where the SNM is stored, and posting the following administrative control notice at the entrance to the SCA-Room:

"NOTICE: The following materials are not to be taken into or stored within the subcritical assembly [redacted]: beryllium, beryllium oxide, heavy water, or fissile nuclides (i.e., U-235 and/or Pu-239) exceeding [redacted] gm of any one isotope or combination of isotopes except for the Pu-Be sources necessary for facility operation. Graphite may be taken into the subcritical assembly room only with the approval of the Reactor Administrator."

d. Conclusion with Regard to Nuclear Criticality Safety

Based on the information in the license renewal application, NRC staff determined that there is a lack of an identified mechanism that could create an optimum geometric configuration with the SNM that ISU is authorized to possess. The staff further determined that the administrative controls used by ISU (i.e., the restriction on limiting superior moderating or reflector materials) provide reasonable assurance that an inadvertent criticality will not occur.

NRC staff further concludes that there is reasonable assurance that ISU's Nuclear Criticality Safety program is adequate to assure the safety of the requested SNM handling and storage activities and that the regulatory requirements are met.

VI. PHYSICAL SECURITY PLAN

a. Physical Security Plan Review

The Physical Security Plan (PSP) was reviewed to ensure the applicant has an acceptable understanding of the security requirements as outlined in 10 CFR Part 73 and commits to implementing the general performance objectives of 10 CFR 73.67(a), the specific fixed site and security requirements of 10 CFR 73.67(c), (f), and other applicable requirements set forth in parts 73.

The PSP was also reviewed to ensure the applicant's commitment to store SNM only in a CAA, monitor the protection on SNM by an intrusion detection system or other approved procedures, maintain both a guard force and offsite response force available to respond to unauthorized penetrations or activities, establish and maintain response procedures for dealing with threats of theft or theft of SNM, and implementing the proper reporting and investigations in the event of lost or unaccounted for material.

Revision 6 of the PSP included additional information added as paragraph 4 of Section 5.2 concerning an additional storage location of SNM in quantities less than [redacted] grams. The new location is within an established CAA. This change did not reduce the safeguards effectiveness of the PSP.

b. Conclusion in Regard to ISU's Physical Security Plan

The NRC staff's review of the ISU's PSP for the protection of SNM of Low Strategic Significance (LSS) contains information that has been marked as "Safeguards Information" by the applicant, pursuant to 10 CFR 73.22. The methods and procedures as outlined in the PSP satisfy the performance objectives, systems capabilities, and reporting requirements specified in 10 CFR 73.67 and 73.71.

The PSP for the facility is acceptable and provides reasonable assurance that the requirements for the physical protection of SNM-LSS will be met. The staff concludes that Revision 6, dated July 2010, of the PSP provides reasonable assurance that the safeguards effectiveness of the PSP has not been decreased.

VII. PRINCIPAL CONTRIBUTORS

Linda Allen	James Downs
Mary Adams	Craig Hrabal
James Anderson	Richard Thompson
Greg Chapman	Barry Wray

VIII. REFERENCES

(NRC, 1983) U.S. Nuclear Regulatory Commission, Regulatory Guide 5.59, "Standard Format and Content for a Licensee Physical Security Plan for the Protection of Special Nuclear Material of Moderate or Low Strategic Significance," February 1983.

(ANSI/ANS, 1997) ANSI/ANS 8.3, "Criticality Accident Alarm System (CAAS)," 1997 (Reaffirmed in 2003).

(NRC, 2010) U.S. Nuclear Regulatory Commission, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," May 2010.

(NFPA, 2003) NFPA 801, "Standard for Fire Protection for Facilities Handling Radioactive Material," 2003.

NFPA 101, "Life Safety Code"

(NFPA) 70, "National Electrical Code."

(ANSI/ANS, 2007) ANSI/ANS 8.23, "Nuclear Criticality Accident Emergency Planning and Response," 2007.