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design criteria for an independent spent fuel storage installation (dry type)

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Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)

Secretariat
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Foreword

(This Foreword is not part of American National Standard Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type), ANSI/ANS-57.9-1992.)

This standard provides design criteria for an independent spent fuel storage installation (ISFSI) for light water reactor spent fuel that incorporates one or more of the dry storage concepts. The dry storage concepts covered include three major types: cask (silo), drywell (caisson), and vault (canyon). The standard sets down performance and design requirements along with general guidelines that will assist in the design and licensing efforts. Also presented are interface requirements where the installation is located at an existing nuclear facility. The standard is intended to be consistent with and provide guidance in meeting the requirements of the regulations in Title 10, "Energy," Code of Federal Regulations, Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste."

An ISFSI provides for the custody of spent fuel in a stable and quiescent state pending its future disposition. This does not preclude mechanical handling activities related to fuel storage, such as rod consolidation and the canning of assemblies or consolidated fuel rods. Such activities do not involve the exposure of the fuel itself to an uncontrolled environment.

Although the spent fuel is in passive storage, decay heat and the small volume of pressurized gas within the fuel rods are mechanisms that have the potential for causing off-site release of the radionuclides contained in the spent fuel. To lessen the effect of these mechanisms, the spent fuel is kept in storage at the nuclear power plant for at least 1 yr after reactor discharge before being transferred to an ISFSI. The radiological protection requirements for personnel occupancy of the storage area set forth in the standard are based on the principle of maintaining occupational exposure consistent with the as low as reasonably achievable (ALARA) principle.

In general, the safe storage of spent fuel assemblies is achieved by maintaining a minimum of two independent barriers between the fuel and the environs. The fuel cladding is considered the primary barrier for undamaged fuel. Fuel cladding is designed to withstand a far more severe environment in the reactor than in the low-temperature conditions of static storage at an ISFSI. The confinement integrity of the cladding is to be maintained during handling and storage in the ISFSI. In addition, the complete confinement system for the stored fuel is conservatively designed to withstand damaging events, including earthquake or other extreme natural phenomena, so that there is an effective secondary barrier(s) to the release of radioactive materials under all credible conditions.

A section is provided that identifies interface considerations for shared systems and facilities in those cases where the ISFSI is located at or near an existing nuclear facility. An ISFSI that cannot be demonstrated to be independent of a nuclear facility in respect to all support services that are important to confinement cannot be licensed under 10 CFR 72. In such cases, the criteria and performance requirements set forth herein might not be applicable. Appendices that are not part of the mandatory criteria of the standard are provided for information and clarification.

American National Standard Criteria for Nuclear Criticality Safety Controls in Operations with Shielding and Confinement, ANSI/ANS-8.10-1983(R1988), provides general guidelines for nuclear criticality safety in shielded facilities. It permits a single failure to result in criticality in facilities where personnel are adequately protected by radiation shielding. The ISFSI standard requires that the more conservative criterion be utilized in the nuclear power industry so that no single failure can result in nuclear criticality.

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