American Nuclear Society

design requirements for light water reactor spent fuel storage facilities at nuclear power plants

an American National Standard

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Design Requirements for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Plants

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Foreword

(This Foreword is not a part of American National Standard Design Requirements for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Plants, ANSI/ANS-57.2-1983.)

This standard sets necessary design requirements for the designer of spent fuel storage facilities at water cooled nuclear power plants. It gives general guidelines and specific design parameters which could assist in both the design and licensing efforts if used. However, the designer is not relieved of the responsibility for complying with specific construction codes referenced herein. U. S. Nuclear Regulatory Commission (NRC) regulatory guides exist that contain information useful in designing systems and components. This standard was developed under sponsorship of the American Nuclear Society and was approved as an American National Standard in 1976 (N210-1976). In this revision, it has been extensively changed and completely reorganized. Working group ANS-57.2 which developed and rewrote the standard had the following membership during the period in which it was prepared:

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At the time of its approval of this standard, Subcommittee ANS-55, Fuel and Waste Management, had the following membership:

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The American Nuclear Society's Nuclear Power Plant Standards Committee (NUPPSCO) had the following membership at the time of its approval of this standard.

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Design Requirements for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Plants

1. Introduction and Scope

1.1 Introduction. Spent nuclear fuel represents a potential risk to the health and safety of the general public and of personnel involved in its handling. It also represents a substantial investment on the part of the owner organization. However, protection of the general public and operating personnel must take precedence over any other consideration in design and construction of spent fuel handling and storage facilities. This requirement is consistent with protection of the owner's investment in the fuel.

1.2 Scope. This standard presents necessary design requirements for facilities at nuclear power plants for the storage and preparation for shipment of spent fuel from light-water moderated and cooled nuclear power stations. It contains requirements for the design of the following:

Fuel storage pool
Fuel storage racks
Pool makeup, instrumentation and cleanup systems
Pool structure and integrity
Radiation shielding
Residual heat removal
Ventilation, filtration and radiation monitoring systems
Shipping cask handling and decontamination
Building structure and integrity
Fire protection and communication.

1.3 Objectives. This standard defines the functions of spent fuel facilities at nuclear power plants including both equipment and systems. This standard includes basic requirements and system arrangements with consideration for design, construction, fabrication, maintenance, operation and licensing.

This standard is based on systems engineering criteria developed and presented in American National Standards Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants, ANSI/ANS-51.1-1983 [1], and Nuclear Safety Criteria for the Design of Stationary Boiling Water Reactor Plants, ANSI/ANS-52.1-1983 [2].[1]

2. Definitions

backup system. An alternate system of similar functional capability to the normally operating system. It need not be the same seismic category and safety class as the system it backs up.

cell. A unit for storage of an individual fuel assembly. It is a subassembly of a storage rack.

control components. Items that control coolant flow or reactivity and must be handled or shifted in position during fuel loading or refueling. Examples are: control rods, flow limiting orifices, burnable poison rods.

crane.

1. Auxiliary Fuel Handing Crane - a crane used for handling equipment including fuel assemblies and new fuel shipping containers.
2. Cask Crane - a crane designed for handling spent fuel shipping casks.

demineralized water. Water purified by ion exchange to a quality at least equal to Type IV in American National Standard Specification for Reagent Water, ANSI/ASTM D 1193-77 [3].

failed fuel. A fuel assembly with a perforation of or a defect in the fuel cladding, or any distortion or break causing a structural change that requires, due to the fuel condition, any of the following:

Use of abnormal handling procedures or equipment,
Premature replacement of a fuel assembly,
Replacement of its component parts or restrictions on plant operation.

fuel damage. Damage to a fuel assembly that breaches the cladding or distorts or disrupts spacer grids, fuel rods, end fittings or overall

[1]Numbers in brackets refer to corresponding numbers in Section 7, References.