American Nuclear Society

REAFFIRMED

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safety and pressure integrity classification criteria for light water reactors

an American National Standard

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American National Standard Safety and Pressure Integrity Classification Criteria for Light Water Reactors

Secretariat
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American National Standard

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Foreword

(This Foreword is not a part of American National Standard "Safety and Pressure Integrity Classification Criteria for Light Water Reactors," ANSI/ANS-58.14-2011.)

This standard revises and supersedes the safety and pressure integrity classification criteria provided in ANSI/ANS-51.1-1983 (R1988) (withdrawn), "Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants," and ANSI/ANS-52.1-1983 (R1988) (withdrawn), "Nuclear Safety Criteria for the Design of Stationary Boiling Water Reactor Plants."[1)] The criteria in this standard are primarily objective; are applicable to all nuclear power plant functions, structures, systems, components, and parts (including consumables); and are applicable to any light water reactor (LWR) nuclear power plant design. The criteria in ANSI/ANS-51.1-1983 (R1988) (withdrawn) and ANSI/ANS-52.1-1983 (R1988) (withdrawn) are primarily subjective, apply primarily to systems, and apply only to the new designs of pressurized water reactors and boiling water reactors (BWRs) available in the United States in 1983.

This standard uses separate sets of terms for safety classification criteria[2)] and pressure integrity classification criteria.[3)] ANSI/ANS-51.1-1983 (R1988) (withdrawn) and ANSI/ANS-52.1-1983 (R1988) (withdrawn) address both safety and pressure integrity classification criteria using a single set of terms (Safety Classes 1, 2, and 3, and Non-Nuclear Safety). The applicability of these two sets of criteria is not identical. The single set of terms used in ANSI/ANS-51.1-1983 (R1998) (withdrawn) and ANSI/ANS-52.1-1983 (R1988) (withdrawn) creates inconsistencies and a potential for misinterpretations. These limitations are avoided in this standard.

The safety classification criteria in this standard are based on NEDC-31509, "Safety Classification Methodology and Criteria for Structures, Systems, Components and Parts in BWR Nuclear Power Plants," developed by the Parts Safety Classification Committee of the BWR Owners Group and GE Nuclear Energy, and on EPRI NP-6895, "Guidelines for the Safety Classification of Systems, Components and Parts Used in Nuclear Power Plant Applications (NCIG-17)," developed by the Nuclear Construction Issues Group, a utility group sponsored by the Electric Power Research Institute.

The application of many requirements to nuclear power plant structures, systems, components, and parts is based upon their safety classification. The safety classification of an item is typically used to determine which design, procurement, manufacturing, construction, and operating requirements or controls apply.

The term "safety-related" is used to identify items that, because of their functional safety importance, must meet stringent design requirements such as Seismic Category I criteria; IEEE Class 1E criteria for electrical items; *ASME Boiler and Pressure Vessel Code*, Sec. III, criteria for pressure integrity items; and environmental qualification requirements of *Code of Federal Regulations*, Title 10, "Energy," Part 50, "Domestic Licensing of Production and Utilization Facilities," Sec. 49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants."

The safety classification of an item might be also used to help establish the procurement requirements for the item. Typically, there are three types of procurement classifications: safety-related, commercial grade, and non-safety-related.

[1)] The remaining portions of ANSI/ANS-51.1-1983 (R1988) (withdrawn) and ANSI/ANS-52.1-1983 (R1988) (withdrawn) are not superseded by this standard.

[2)] Safety-related (Q), non-safety-related with augmented quality assurance [or augmented (A)], and non-safety-related (N).

[3)] Classes 1, 2, 3, 4, and 5.

A safety-related procurement refers to an item that is purchased subject to the provisions of *Code of Federal Regulations*, Title 10, "Energy," Part 21, "Reporting of Defects and Noncompliance" (10 CFR 21), and is intended for use in applications that are functionally safety-related. Commercial-grade procurement refers to an item that is purchased without the provisions of 10 CFR 21 but is intended to be dedicated after receipt for use in applications that are functionally safety-related. Once a commercial-grade item is dedicated, it becomes a safety-related item. Non-safety-related procurement refers to an item that is purchased without the provisions of 10 CFR 21 and is intended for use in applications that are functionally non-safety-related.

During construction, safety-related items are subject to specific material selection, design, fabrication, examination, testing, inspection, certification, installation, and quality assurance requirements.

Operationally, safety-related items typically are subject to specified requirements for in-service inspection, in-service testing, maintenance, surveillance, and quality assurance.

The classification "non-safety-related with augmented requirements" is applied to certain non-safety-related items during procurement, construction, and operations when the item is not safety-related but is relied upon during a special event or where licensing requirements exist.

The focus of safety classification in this standard is on the accomplishment of safety-related functions that may be considered to provide design-basis-event prevention, mitigation, or both, without emphasizing one over the other. Multiple redundant levels of defense provide a balance of defense-in-depth strategies such that no single element (e.g., accident prevention) or barrier (e.g., containment) is emphasized to the exclusion of others. An adequate balance of prevention and mitigation as well as consideration of defense in depth is provided in the classification process through the consideration of the three basic safety-related functions identified in *Code of Federal Regulations*, Title 10, "Energy," Part 50, "Domestic Licensing of Production and Utilization Facilities," Sec. 2, "Definitions."

The pressure integrity classification criteria provided in Sec. 5 are similar to those of ANSI/ANS-51.1-1983 (R1988) (withdrawn), ANSI/ANS-52.1-1983 (R1988) (withdrawn), and Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," but have been revised to be applicable to any LWR design (particularly an advanced passive design).

The basic design requirements for items assigned to each safety classification are summarized in Sec. 6.

This standard has been written for prospective use, but the criteria are based on current practices and requirements applicable to licensed LWR designs.

This standard might reference documents and other standards that have been superseded or withdrawn at the time the standard is applied. A statement has been included in the references section (Sec. 7) that provides guidance on the use of references.

This standard does not incorporate the concepts of generating risk-informed insights, performance-based requirements, or a graded approach to quality assurance. The user is advised that one or more of these techniques could enhance the application of this standard.

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