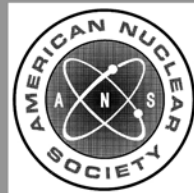


# American Nuclear Society

**safety categorization and design criteria  
for nonreactor nuclear facilities**

**an American National Standard**



published by the  
American Nuclear Society  
555 North Kensington Avenue  
La Grange Park, Illinois 60526 USA

**ANSI/ANS-58.16-2014**

**American National Standard  
Safety Categorization and Design Criteria  
for Nonreactor Nuclear Facilities**

Secretariat  
**American Nuclear Society**

Prepared by the  
**American Nuclear Society  
Standards Committee  
Working Group ANS-58.16**

Published by the  
**American Nuclear Society  
555 North Kensington Avenue  
La Grange Park, Illinois 60525 USA**

Approved September 9, 2014  
by the  
**American National Standards Institute, Inc.**

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**Foreword** (This foreword is not a part of American National Standard “Safety Categorization and Design Criteria for Nonreactor Nuclear Facilities,” ANSI/ANS-58.16-2014.)

Nonreactor nuclear facilities are designed, constructed, and operated using regulations, standards, and practices to assure that the workers in the facilities and members of the public outside the facilities are safe during the normal operations of the facilities and also in case of abnormal events or accidents. This is achieved through judicious categorization of structures, systems, and components (SSCs) and specific administrative controls (SACs) to prevent or mitigate such events. The categorization determines the types and levels of controls needed, based on the hazards at the facilities. This standard provides a roadmap to identifying existing industry codes and standards for reliable design, construction, and operation of various categories of controls, and also some new requirements that are not addressed in existing standards.

This standard provides criteria for the categorization of SSCs and SACs specifically for nonreactor nuclear facilities. Standards for design of categories of hazard controls are also identified. It has an overall objective similar to American National Standards Institute (ANSI)/American Nuclear Society (ANS) American National Standard ANSI/ANS-58.14-2011, “Safety and Pressure Integrity Classification Criteria for Light Water Reactors,” in that both provide safety categorization criteria and design codes and standards for design. While the objectives of these two standards are the same (i.e., specification of appropriate design codes and standards for safety features), ANSI/ANS-58.16-2014 requires the determination of design-basis events (DBEs) as a first step, which is not required as part of the procedures invoked by ANSI/ANS-58.14-2011 for reasons discussed below.

Nonreactor nuclear facilities are often unique and of a one-of-a-kind design. Operators of these facilities can work very close to the hazards themselves. The hazards associated with nonreactor nuclear facilities are highly dependent on the nature of the facility and its mission. For example, those hazards can involve exposure to radioactive and other hazardous materials as a result of fires, explosions, process upsets, spills and leaks, as well as inadvertent nuclear criticality. A hazard analysis is required to identify the hazards and the type of events that can be associated with them. These analyses are used to develop DBEs and the needed safety functions to prevent or mitigate them to protect workers and the public.

Light water reactors are less diverse, and DBEs are based on experience with licensing safety reviews over a period of decades, focused on protection of the public. Facility workers are not in immediate contact with the hazardous materials. The very high energy associated with nuclear fission and the high level of fission products contained in a reactor core and their energy of decay lead to a focus on ensuring reactor core cooling, including pressure boundary integrity. A new hazard analysis is not usually needed because DBEs have been preselected.

As a result, readers, reviewers, and users of this standard should not expect that there would be a high degree of correlation between this standard and ANSI/ANS-58.14-2011.

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 that provides guidance on the use of references.

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

The ANS-58.16 Working Group acknowledges the significant contributions made to this standard by Dr. Richard W. Englehart and Dr. John D. Stevenson who passed away before the standard was issued. Both Dr. Englehart and Dr. Stevenson played key roles in all phases of the standard, starting with the formulation, through the development process, and preparation of the final draft. The ANS-58.16 Working Group of the Standards Committee of the American Nuclear Society had the following membership at the time the standard was developed:

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<b>Contents</b>	<b>Page</b>
1 Introduction .....	1
1.1. Scope .....	1
1.2. Purpose .....	1
1.3. Applicability.....	2
2 Acronyms; shall, should, and may; and definitions .....	2
2.1. List of acronyms .....	2
2.2. Shall, should, and may.....	3
2.3. Definitions .....	3
3 General requirements .....	5
3.1. Regulatory basis .....	5
3.2. Methodology.....	5
3.3. Hazard analysis.....	6
3.4. Determination of DBEs .....	6
3.5. Unmitigated consequence analysis .....	6
3.6. Selection, categorization, and design of hazard controls .....	6
4 Safety categorization criteria.....	7
4.1. Categorization criteria .....	7
5 Design criteria .....	8
5.1. General design criteria.....	8
5.1.1 Single-failure criterion.....	8
5.1.2 Environmental qualification.....	8
5.1.3 Support systems .....	8
5.1.4 Interface design .....	9
5.1.5 Impairment of safety functions.....	9
5.1.6 Criticality hazard control.....	9
5.2. Civil-structural .....	9
5.3. Mechanical.....	9
5.3.1 Process system equipment.....	10
5.3.2 Ventilation .....	10
5.3.3 Mechanical handling equipment .....	11
5.3.4 Fire safety equipment .....	11
5.3.5 Explosion safety equipment.....	11
5.4. Electrical, instrumentation, and controls .....	12
5.5. Quality assurance.....	12
5.6. Specific administrative controls .....	12
6 References .....	14
<b>Appendices</b>	
Appendix A General Relationship Between ANSI/ANS-58.16-2014 Safety Categorization and Current NRC-DOE Safety Categorizations for Other Than Reactor Facilities.....	19
Appendix B Safety Categorization Process.....	22
Appendix C Structures, Systems, and Components Boundary Criteria .....	31
Appendix D References by Organizations and Bibliography.....	35
<b>Figures</b>	
Figure B.1 Safety categorization process flow diagram.....	24
Figure C.1 Boundary criteria for SC-2 and SC-3 process systems.....	33

Figure C.2	Boundary criteria for SC-2 or SC-3 process lines penetrating confinement .....	33
Figure C.3	Boundary criteria SC-1, SC-2, and SC-3 instrument lines .....	34

**Tables**

Table 1	General safety criteria for safety categorization of controls .....	7
Table 2	Codes and standards for SC-2 and SC-3 process equipment .....	10
Table 3	Codes and standards for SC-2 and SC-3 ventilation system components .....	11
Table 4	Codes and standards for SC-2 and SC-3 mechanical handling equipment .....	11
Table 5	Codes and standards for SC-2 and SC-3 safety categories .....	13
Table A.1	Typical correlation of ANSI/ANS-58.16-2014 safety categories with existing DOE and NRC safety categorization of SSCs .....	20
Table A.2	Guidance of safety criteria for safety categorization of controls .....	20

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American National Standard ANSI/ANS-58.16-2014

# Safety Categorization and Design Criteria for Nonreactor Nuclear Facilities

## 1 Introduction

This American National Standard Institute (ANSI)/American Nuclear Society (ANS) American National Standard ANSI/ANS-58.16-2014 provides criteria for the categorization of structures, systems, and components (SSCs) and specific administrative controls (SACs) as hazard controls, for nonreactor nuclear facilities. Standards for the design of hazard controls are identified based on a safety category (SC).

The criteria for categorization of hazard controls as safety SSCs and SACs are largely deterministic and are based on the magnitude of consequences of a set of unmitigated postulated design-basis events (DBEs). Consequences are in terms of radiological dose levels and hazardous chemical exposure levels to workers and the public.

In this standard, the categories are denoted by SC-1, SC-2, and SC-3, with SC-3 being the highest category with the most stringent design requirements.

Throughout, this standard makes reference to various standards and regulations. Those references are denoted by brackets. A list of those bracketed references is provided in Sec. 6.

### 1.1 Scope

This standard specifies criteria for categorization of SSCs and SACs that have a safety function based on radiological and/or chemical dose and exposure levels for the public and workers. The safety categorization leads to codes and standards that are needed for reliable design, construction, and operations commensurate with the safety categorization.

The safety categorization criteria specified in this standard will

- (1) establish an objective and technically based rationale for the determination of safety categorization;

- (2) ensure that all hazard controls required by the safety design basis are appropriately categorized;
- (3) establish a basis for consistency (i.e., minimize categorization differences among similar items in a facility).

### 1.2 Purpose

The purpose of this standard is the following:

- (1) Specify criteria for categorization of safety SSCs;
- (2) Select industry codes and standards for reliable design, construction, and operations commensurate with the safety categorization.

To meet these objectives, the standard specifies the requirements in the following steps:

- (1) identification of hazards;
- (2) evaluation of hazards;
- (3) selection of DBEs;
- (4) unmitigated accident analysis of DBEs;
- (5) identification of safety functions and categorizations;
- (6) selection of safety SSCs to fulfill safety function requirements;
- (7) evaluation, selection, and implementation of applicable industry codes and standards to ensure safety SSCs are designed, constructed, and maintained to fulfill the intended safety functions.

It should be noted that the methodologies for steps (1) through (4) are not in the scope of this standard. A proposed, new ANS standard, ANS-57.11-201x, "Integrated Safety Assessments for Fuel Cycle Facilities," that addresses integrated safety assessment is being developed and will specify requirements for steps (1) through (4). Steps (1) through (4) are essential for the identification of safety functions and selection of safety SSCs (stated in steps 5 and 6). The discussions of methodologies for steps (1) through (4) are briefly addressed in Appendices A, B, and C.