

American Nuclear Society

WITHDRAWN

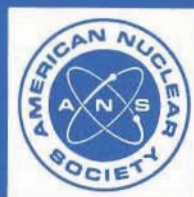
June 18, 2004

ANSI/ANS-58.14-1993

**safety and pressure integrity
classification criteria for
light water reactors**

an American National Standard

**No longer being maintained as an
American National Standard. This
standard may contain outdated
material or may have been
superseded by another standard.
Please contact the ANS
Standards Administrator for
details.**



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

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

Secretariat
American Nuclear Society

Prepared by the
**American Nuclear Society
Standards Committee
Working Group ANS-58.14**

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

Approved September 16, 1993
by the
American National Standards Institute, Inc.

American National Standard

Designation of this document as an American National Standard attests that the principles of openness and due process have been followed in the approval procedure and that a consensus of those directly and materially affected by the standard has been achieved.

This standard was developed under the procedures of the Standards Committee of the American Nuclear Society; these procedures are accredited by the American National Standards Institute, Inc., as meeting the criteria for American National Standards. The consensus committee that approved the standard was balanced to ensure that competent, concerned, and varied interests have had an opportunity to participate.

An American National Standard is intended to aid industry, consumers, governmental agencies, and general interest groups. Its use is entirely voluntary. The existence of an American National Standard, in and of itself, does not preclude anyone from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard.

By publication of this standard, the American Nuclear Society does not insure anyone utilizing the standard against liability allegedly arising from or after its use. The content of this standard reflects acceptable practice at the time of its approval and publication. Changes, if any, occurring through developments in the state of the art, may be considered at the time that the standard is subjected to periodic review. It may be reaffirmed, revised, or withdrawn at any time in accordance with established procedures. Users of this standard are cautioned to determine the validity of copies in their possession and to establish that they are of the latest issue.

The American Nuclear Society accepts no responsibility for interpretations of this standard made by any individual or by any ad hoc group of individuals. Requests for interpretation should be sent to the Standards Department at Society Headquarters. Action will be taken to provide appropriate response in accordance with established procedures that ensure consensus on the interpretation.

Comments on this standard are encouraged and should be sent to Society Headquarters.

Published by

American Nuclear Society
555 North Kensington Avenue, La Grange Park, Illinois 60525 USA

Copyright © 1995 by American Nuclear Society. All rights reserved.

Any part of this standard may be quoted. Credit lines should read "Extracted from American National Standard ANSI/ANS-58.14-1993 with permission of the publisher, the American Nuclear Society." Reproduction prohibited under copyright convention unless written permission is granted by the American Nuclear Society.

Printed in the United States of America

Foreword

(This Foreword is not a part of American National Standard Safety and Pressure Integrity Classification Criteria for Light Water Reactors, ANSI/ANS-58.14-1993.)

This standard revises and supersedes the safety and pressure integrity classification criteria provided in ANSI/ANS-51.1-1983 (R1988), American National Standard Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants, and ANSI/ANS-52.1-1983 (R1988), American National Standard Nuclear Safety Criteria for the Design of Stationary Boiling Water Reactor Plants*. 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) and ANSI/ANS-52.1-1983 (R1988) are primarily subjective; apply primarily to systems; and apply only to the new designs of PWRs and BWRs available in the USA in 1983. Appendix A of this standard provides a discussion of the evolution of safety and pressure integrity classification criteria as well as the background and history of previous efforts to develop the criteria.

This standard uses separate sets of terms for safety classification criteria (safety-related, supplemented grade, and non-safety-related) and pressure integrity classification criteria (Classes 1, 2, 3, 4, and 5). ANSI/ANS-51.1-1983 (R1988) and ANSI/ANS-52.1-1983 (R1988) address both safety and pressure integrity classification criteria using a single set of terms (Safety Classes 1, 2, and 3, and Non-Nuclear Safety). As discussed in Appendix B of this standard, the applicability of these two sets of criteria is not identical. The single set of terms used in ANSI/ANS-51.1-1983 (R1988) and ANSI/ANS-52.1-1983 (R1988) 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, due to 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 Section III criteria for pressure integrity items, and environmental qualification requirements of 10 CFR 50.49.**

* The remaining portions of ANSI/ANS-51.1-1983 (R1988) and ANSI/ANS-52.1-1983 (R1988) are not superseded by this standard. Proposed ANS-50.1, Nuclear Safety Design Criteria for Light Water Reactors, which is currently under development, is intended to supersede the remaining portions.

** For this and other portions of the Code of Federal Regulations, see Section 8, References, of this standard.

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. A safety-related procurement refers to an item that is purchased subject to the provisions of 10 CFR 21 and is intended for use in applications that are functionally safety-related. A 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. A 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 inservice inspection, inservice testing, maintenance, surveillance, and quality assurance.

The classification "supplemented grade" is applied to certain non-safety-related items during procurement, construction, and operations.

The pressure integrity classification criteria provided in Section 6 are similar to those of ANSI/ANS-51.1-1983 (R1988), ANSI/ANS-52.1-1983 (R1988), and Regulatory Guide 1.26, but have been revised to be applicable to any light water reactor design (particularly an advanced passive design).

The relationship of safety classification to pressure integrity classification, electrical classification, seismic classification, environmental qualification classification, and functional mode classification is discussed in Appendix B of this standard.

The basic design requirements for items assigned to each safety classification are summarized in Section 7.

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

Continuing efforts will be required to assess the criteria in this standard and to provide revisions or clarifications as appropriate.

Working Group ANS-58.14 of the Standards Committee of the American Nuclear Society had the following membership at the time it developed this standard:

W. H. D'Ardenne, Chairman, *General Electric Company*
J. C. Dempsey, Jr., Vice-Chairman, *Semper Technology, Inc.*
S. B. Bargerstock, *Tenera*
J. F. Garibaldi, *Ebasco Services, Inc.*
P. H. Hepner, *Combustion Engineering, Inc.*
R. Kirkwood, *U.S. Nuclear Regulatory Commission*
G. B. Locklear, *Carolina Power & Light Company*
R. C. Surman, *Westinghouse Electric Corporation*

At the time of its ballot of this standard, the LWR Criteria Management Committee, MC-1, had the following membership:

J. C. Saldarini, Chairman, <i>Ebasco Services, Inc.</i>	H. C. Shaffer, <i>Yankee Atomic Electric Company</i>
J. C. Dempsey, Jr., <i>Semper Technology, Inc.</i>	S. A. Shuman, <i>Stone & Webster Engineering Corporation</i>
L. A. Ettlinger, <i>MITRE</i>	R. C. Surman, <i>Westinghouse Electric Corporation</i>
J. C. Glynn, <i>U. S. Nuclear Regulatory Commission</i>	E. W. Swanson, <i>The Babcock & Wilcox Company</i>
P. H. Hepner, <i>Combustion Engineering, Inc.</i>	G. A. Zimmerman, <i>Portland General Electric Company</i>
R. A. Hill, <i>GE Nuclear Energy</i>	
L. A. Klosowski, <i>Niagara Mohawk Power Corporation</i>	
S. A. Nass, <i>Duquesne Light Company</i>	

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

W. H. D'Ardenne, Chairman
M. D. Weber, Secretary

R. E. Allen.....	UE&C Nuclear (for the Institute of Electrical and Electronics Engineers, Inc.)
P. L. Ballinger	Nebraska Public Power District
S. Bhattacharya	Pacific Gas & Electric Company
F. Boorboor.....	Nuclear Placement Services, Inc.
J. C. Bradford.....	Bechtel National, Inc.
T. W. T. Burnett.....	Westinghouse Electric Corporation
J. D. Cohen	Westinghouse Savannah River Company
J. B. Cotton.....	Philadelphia Electric Company
T. A. Daniels.....	Rochester Gas & Electric Corporation
W. H. D'Ardenne.....	GE Nuclear Energy (for the American Nuclear Society)
L. E. Davis	Commonwealth Edison Company
S. B. Gerges.....	NUS Corporation, Inc.
D. L. Gillispie	Institute of Nuclear Power Operations
G. L. Gyorey	GE Nuclear Energy
P. H. Hepner.....	ABB/Combustion Engineering Inc.
C. E. Johnson	U.S. Nuclear Regulatory Commission
J. T. Luke.....	Florida Power & Light Company
J. F. Mallay.....	Liberty Consulting Group
J. A. Nevshemal	Raytheon UE&C
T. T. Robin	Southern Company Services
J. C. Saldarini.....	Ebasco Services, Inc.
R. E. Scott.....	Scott Enterprises
D. J. Spellman.....	Oak Ridge National Laboratory
S. L. Stamm.....	Stone & Webster Engineering Corporation
J. D. Stevenson	Stevenson & Associates
G. P. Wagner	Commonwealth Edison Company
N. Weber.....	Sargent & Lundy
R. C. Weir	Tennessee Valley Authority

Contents	Section	Page
1.	Introduction	1
1.1	Scope	1
1.2	Purpose	1
1.3	Applicability	1
2.	Definitions	2
3.	Discussion	5
3.1	Regulatory Basis	5
3.2	Relationship of Functional, Procurement, and Application Safety Classifications	7
3.3	Relationship of "Safety-Related" with Other Terms	7
3.4	Relationship of "Safety-Related" with Other Classification Categories	7
4.	Safety Classification Process	7
4.1	General Approach	7
4.2	Methodology	7
4.3	Commercial Grade Items	9
5.	Safety Classification Criteria	9
5.1	General Criteria	10
5.2	Determination of Design Basis Events	12
5.3	Determination of Safety-Related Functions	12
5.4	Determination of Safety-Related Structures and Systems	13
5.5	Determination of Safety-Related Components and Parts	14
5.6	Items Not Classified Safety-Related	23
6.	Pressure Integrity Classification Criteria	24
6.1	Functional Criteria	25
6.2	Interface Criteria	26
7.	Basic Design Requirements	27
7.1	Pressure-Retaining Items	27
7.2	Electrical Items	27
7.3	Seismic Classification	27
7.4	Environmental Qualification	27
7.5	Quality Assurance	27
8.	References	29
9.	List of Acronyms	30
Appendices		
Appendix A	Background and History of Safety and Pressure Integrity Classification	32
Appendix B	Classification Categories	36
Appendix C	Safety Classification Examples	38
Appendix D	Typical Component Functions	61
Appendix E	Typical Component and Part Failure Modes	64

Section	Page
Appendix F Typical Examples of Pressure Integrity Class Interfaces .	66
Appendix G Bibliography	72
Tables	
Table 7-1 Basic Design Requirements	28
Table A-1 Approximate Correlation of Various Classifications Systems	34
Table A-2 Approximate Relationship of Various Safety Classification Terms	35
Figures	
Figure 3-1 Correlation of Types of Safety Classifications	6
Figure 4-1 Methodology for Safety Classification	8
Figure 5-1 Safety-Related/Non-Safety-Related Fluid System Boundary Criteria	17
Figure 5-2 Boundary Criteria for Fluid System Lines Penetrating Primary Containment	18
Figure 5-3 Boundary Criteria for Instrument Lines Penetrating Primary Containment	21
Figure 5-4 Boundary Criteria for Instrument Lines Not Penetrating Primary Containment	22
Figure C-1 Auxiliary Feedwater System (Examples 2 and 3)	41
Figure C-2 Battery Room Heat Removal System (Examples 4 and 5) ..	44
Figure C-3 Auxiliary Power System Synchronizing Circuit (Example 8)	48
Figure C-4 Hydraulic Snubber Seals (Example 21)	59
Figure F-1 Typical Fluid System Pressure Integrity Class Interfaces	69