

American Nuclear Society

**categorization of nuclear facility structures,
systems, and components for seismic design**

an American National Standard

REAFFIRMED

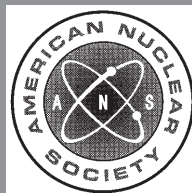
September 12, 2017

ANSI/ANS-2.26-2004 (R2017)

May 27, 2010

ANSI/ANS-2.26-2004 (R2010)

This standard has been reviewed and reaffirmed by the ANS Nuclear Facilities Standards Committee (NFSC) with the recognition that it may reference other standards and documents that may have been superceded or withdrawn. The requirements of this document will be met by using the version of the standards and documents referenced herein. It is the responsibility of the user to review each of the references and to determine whether the use of the original references or more recent versions is appropriate for the facility. Variations from the standards and documents referenced in this standard should be evaluated and documented. This standard does not necessarily reflect recent industry initiatives for risk informed decision-making or a graded approach to quality assurance. Users should consider the use of these industry initiatives in the application of this standard.



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

ANSI/ANS-2.26-2004

**American National Standard
Categorization of Nuclear Facility
Structures, Systems, and Components
for Seismic Design**

Secretariat
American Nuclear Society

Prepared by the
**American Nuclear Society
Standards Committee
Working Group ANS-2.26**

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

Approved December 2, 2004
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 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 60526 USA**

Copyright © 2004 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-2.26-2004 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 part of American National Standard Categorization of Nuclear Facility Structures, Systems, and Components for Seismic Design, ANSI/ANS-2.26-2004.)

This standard has been developed based on methods used by the U.S. Department of Energy (DOE) for performance categorizing and designing structures, systems, and components (SSCs) in nuclear facilities to withstand the effects of natural phenomena (DOE-STD-1021-93, “Natural Phenomena Hazards Performance Categorization Guidelines for Structures, Systems, and Components,” July 1993, Reaffirmed 2002; DOE-STD-1020-2002, “Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities,” January 2002; DOE-STD-1022-94, “Natural Phenomena Hazards Site Characterization Criteria,” March 1994, Reaffirmed 2002; DOE-STD-1023-95, “Natural Phenomena Hazards Assessment Criteria,” March 1995, Reaffirmed 2002).

This standard provides criteria and guidance for selecting a seismic design category (SDC) and Limit State for the SSCs with a safety function in a nuclear facility, other than commercial power reactors, whose seismic design requirements are established by other standards and regulations. The SDC and Limit State are to be used in conjunction with standards ANS-2.27, “Criteria for Investigations of Nuclear Materials Facilities Sites for Seismic Hazard Assessments”; ANS-2.29, “Probabilistic Seismic Hazard Analysis”; and ANSI/ASCE/SEI 43-05, “Seismic Design Criteria for Structures, Systems and Components in Nuclear Facilities.” These standards together establish the design response spectra and the design and construction practices to be applied to the SSCs in the facility, dependent on which SDC and Limit State are assigned to the SSC. The objective is to achieve a risk-informed design that protects the public, the environment, and workers from potential consequences of earthquakes. Application of this group of standards will produce (a) the design response spectra, (b) the SSC Limit State necessary to achieve adequate safety performance during and following earthquakes, and (c) SSC designs that achieve the desired Limit State. Referenced standards and their procedural relationship to this standard are discussed in Appendix A of this standard.

Working Group ANS-2.26 of the Standards Committee of the American Nuclear Society had the following membership at the time of approval of this standard and indeed was stable throughout the development of the standard:

N. W. Brown (Chairman), *Lawrence Livermore National Laboratory*

S. Additon, *Rocky Flats Environmental Technology Site*

H. Chander, *U.S. Department of Energy*

D. Guzy, *U.S. Department of Energy*

A. Hadjian, *Defense Nuclear Facilities Safety Board*

Q. Hossain, *Lawrence Livermore National Laboratory*

C. Morrell, *Shaw Group, Inc.*

A. Persinko, *U.S. Nuclear Regulatory Commission*

H. C. Shaffer, *Consultant*

J. D. Stevenson, *Consultant*

C. M. Vaughan, *Global Nuclear Fuel*

This standard was prepared under the guidance of Subcommittee 21, Design Criteria/Operations, of the American Nuclear Society. At the time of the ballot, Subcommittee 21 was composed of the following members:

R. M. Ruby (Chairman), *Constellation Energy*

C. H. Moseley (Vice Chairman), *BWXT Y-12*

T. Dennis (Secretary), *Individual*

N. Brown, *Lawrence Livermore National Laboratory*

C. Eldridge, *Pacific Gas & Electric Company*

S. Floyd, *Nuclear Energy Institute*

J. Glover, *Graftel, Inc.*
M. P. Horrell, *Washington Group, Inc.*
R. P. Kassawara, *Electric Power Research Institute*
L. Krieder, *Engineering Planning & Management, Inc.*
R. Morris, *Tennessee Valley Authority*
D. Ostrom, *Individual*
W. J. Rudolph, *FirstEnergy Corporation*
J. D. Stevenson, *Individual*
M. Wilson, *Millstone Nuclear Generating Station*

This standard was processed and approved for submittal to ANSI by the Nuclear Facilities Standards Committee (NSFC) of the American Nuclear Society on ANSI/ANS-2.26, "Categorization of Nuclear Facility Structures, Systems, and Components for Seismic Design." Committee approval of this standard does not necessarily imply that all members voted for approval. At the time it approved this standard, the NFSC had the following membership:

D. J. Spellman (Chairman), *Oak Ridge National Laboratory*
R. M. Ruby (Vice Chairman), *Constellation Energy*

C. K. Brown, *Southern Nuclear Operating Company*
R. H. Bryan, *Tennessee Valley Authority*
H. Chander, *U.S. Department of Energy*
M. T. Cross, *Westinghouse Electric Corporation*
T. Dennis, *Individual*
D. R. Eggett, *AES Engineering*
R. A. Hill, *GE Nuclear Energy*
R. Hall, *Exelon Nuclear*
N. P. Kadambi, *U.S. Nuclear Regulatory Commission*
M. Labar, *General Atomics*
E. Lloyd, *Exitech*
J. E. Love, *Bechtel Power Corporation*
J. F. Mallay, *Framatome ANP*
C. Mazzola, *Shaw Environmental, Inc.*
R. H. McFetridge, *Westinghouse Electric Corporation*
C. H. Moseley, *BWXT Y-12*
F. J. Pineau, *Knolls Atomic Power Laboratory*
W. B. Reuland, *Electric Power Research Institute*
J. Saldarini, *Tetra Tech FW*
R. E. Scott, *Scott Enterprises*
S. L. Stamm, *Stone & Webster*
J. D. Stevenson, *J. D. Stevenson Consultants*
C. D. Thomas, Jr., *Individual*
J. A. Wehrenberg, *Southern Company Services*
M. J. Wright, *Entergy Operations*

Contents	Section	Page
	1 Scope	1
	2 Definitions	1
	3 Applicability	1
	4 Determination of SSC Seismic Design Categories	2
	4.1 Introduction	2
	4.2 Categorization Process	2
	4.3 Rules of Application	4
	5 Determination of Limit States	4
	6 Analyses to Support Selection of SDC and Limit States	5
	6.1 General Requirements	5
	6.2 Unmitigated Consequence Analysis	5
	6.3 Data Compilation	6
	7 References	8
Table		
	Table 1 SDCs Based on the Unmitigated Consequences of SSC Failure	3
Appendices		
	Appendix A Risk-Informed Basis for Seismic Design Categorization and Associated Target Performance Goals	10
	Appendix B Examples of Application of Limit States to SSCs	15
	Appendix C Guidance on a Structured Approach to Support Making the Judgments Required in Section 6.2 of This Standard	19