

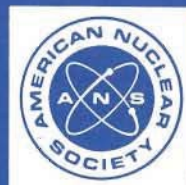
# American National Standard

**WITHDRAWN**

March 31, 1989  
ANSI/ANS-58.3-1977

**physical protection for systems  
and components important to safety**

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**American National Standard  
Physical Protection for Systems  
and Components Important to Safety**

**Secretariat  
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**Prepared by the  
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Standards Committee  
Working Group ANS-58.3**

**Published by the  
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**Abstract** This Standard presents information to a designer on how to physically protect systems and components in a nuclear power plant against hazards. Systems requiring protection and characteristics of hazards are described. Criteria are given to indicate when protection is not required. A probability of  $10^{-7}$  per site per year is used as the upper probability guideline limit for Condition of Design IV events. Physical protection methods for each hazard are discussed.

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## Foreword

(This Foreword is not part of American National Standard Physical Protection for Systems and Components Important to Safety, ANSI/ANS-58.3-1977)

In March, 1973 Working Group ANS-31.1 was initiated to write a standard on "Physical Separation Requirements for Safety Systems (other than Electrical)."

The charter of ANS-31.1 was to identify systems and components which could be exposed to internal or external plant missiles, fire, explosion, electrical interaction, or other occurrences which might require spatial separation or special protection in the form of barrier walls or isolation in individual enclosures to prevent common-mode failure or damage. The scope also included providing guides to the type of protection required and considering the likelihood of failure if unprotected. This charter has been generally followed.

The Working Group met on five occasions and in March, 1974 a draft was sent to ANS for review comment by an industry review group. A revised draft which took into consideration the industry comments was written by the Working Group in August, 1974. In September, 1974 this draft was balloted by the Working Group and along with some editorial changes was given unanimous approval to forward to Subcommittee ANS-50.

A November, 1974 draft entitled: "Separation Requirements for Protection of Systems and Components Important to Safety" was presented to Subcommittee ANS-50 in January, 1975. The comments of the ANS-50 members fell into three main categories:

(1) Some members felt the original scope called for specific guidance, and it was suggested that the Working Group investigate a change in scope, and whether other standards were necessary to provide specific guidance

(2) Some members felt the draft should state specific probability acceptance limits

(3) Some members thought the word "separation" was confusing as defined in the draft.

In March, 1975, the Working Group met to revise the draft to reflect the comments of Subcommittee ANS-50. The Working Group addressed these comments as follows:

(1) ANS-58.3 believes that this Standard should give general protection criteria and general guidance on how to implement protection methods. Specific minimum distances between hazards and components, thickness of barriers, layout of enclosures, specific design requirements for protection methods, etc., are left to the designer and ANS-58.3 believes it should not attempt in this Standard to quantify these for all the combinations of hazards and components needing protection in a nuclear power generating station. Although the March, 1975 draft was revised to provide more guidance to the designer, detailed guidance on designing for protection is more appropriately covered by other standards. Existing standards which by scope provide the desired guidance are referred to herein. Where no standard exists, ANS-58.3 has prepared and submitted scopes for recommended standards to Subcommittee ANS-50 members. For hazards not covered in other standards, the treatment in this Standard attempts to provide information useful to the designer.

(2) The March, 1975 draft was revised to provide a probability acceptance limit as it has been formulated and exists in draft form.<sup>1</sup> The basic parameter accepted from this source was the Upper Probability Limit for Damage with a threshold value for design conditions exceeding Condition IV. The other acceptance limits for lower conditions of design are under review by an industry group, but methodology and details had not been determined at the time of promulgation of this Standard.

(3) The March, 1975 draft was re-titled, "Protection Criteria for Systems and Components Important to Safety." The word "separation," which was previously used to mean protection by means of distance, barriers, enclosures, or restraints, has been changed to "protection."

A revision incorporating these comments was sent to ANS-50 in July, 1975. In September, 1975 Subcommittee ANS-50 balloted on the July, 1975 draft and agreed with the approach taken in this Standard which provides general guidance to a designer

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<sup>1</sup>See Appendix B, Reference 1.

rather than providing specific protection criteria. The criteria in this Standard which denote requirements are given in: Section 4, Protection Criteria; and 6.6.1, Criteria for When Protection is Not Required. The other major portion of the standard provides information which is believed to be useful to a designer faced with providing protection of equipment against hazards.

The Working Group feels that the hazards interaction between mechanical (including instrumentation and control components) and electrical components should be identified in one document. This interface has been stated in this Standard.

In February, 1974 the former ANS-20 and ANS-30 Subcommittees merged to form the newly constituted ANS-50 Subcommittee. The numerical designation of Working Group ANS-31.1 was changed to ANS-55.3. In January, 1975, Subcommittee ANS-50 was reorganized and the numerical designation of Working Group ANS-55.3 was changed to Working Group ANS-58.3.

Working Group ANS-58.3 of the American Nuclear Society Standards Committee Consists of the following members:

S. J. Milioti, Chairman, <i>American Electric Power Service Corporation</i>	J. W. Minarick, <i>Babcock and Wilcox Company</i>
D. Fischer, <i>U. S. Nuclear Regulatory Commission</i>	B. D. Redd, <i>United Engineers and Constructors, Inc.</i>
R. M. Hunt, <i>General Atomic Company</i>	J. W. Stacey, <i>Yankee Atomic Electric Company</i>
S. W. Kaut, <i>NUTECH</i>	R. M. Waters, <i>Combustion Engineering Incorporated</i>
E. J. Lozito, <i>Virginia Electric &amp; Power Company</i>	E. Wester, <i>General Electric Company</i>
J. C. Mesmeringer, <i>Westinghouse Electric Corporation</i>	

Contributions were also made by:

- D. A. Coudriet, *Bechtel Power Corporation*
- R. J. Brockman, *Babcock and Wilcox Company*
- T. G. Dunning, *General Atomic Company*

Working Group ANS-58.3 wishes to acknowledge Working Group ANS-2.12 for permission to abstract, as Appendix A, portions of their material on probability in proposed American National Standard N635 "Guidelines for Combining Natural and External Manmade Hazards at Power Reactor Sites."<sup>2</sup>

Protection against sabotage is not addressed in this Standard. When the American National Standards Committee N18 balloted on this Standard in May, 1976, the major comment was that the  $10^{-7}$  probability acceptance limit should be noted as a guideline. This has been done.

The membership of Subcommittee ANS-50 at the time of their approval of this Standard was:

James F. Mallay, Chairman, <i>Babcock &amp; Wilcox Company</i>	M. Kehnemuyi, <i>U.S. Nuclear Regulatory Commission</i>
R. F. Ash, <i>Baltimore Gas &amp; Electric Company</i>	Lawrence E. Newhart, Jr., <i>Catalytic, Inc.</i>
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	Frank Zapp, <i>Oak Ridge National Laboratory</i>
	C. B. Zitek, <i>Commonwealth Edison Company</i>

<sup>2</sup>See Appendix B, Reference 6.

The American National Standards Committee N18, Nuclear Design Criteria, which reviewed and approved this Standard in 1976, had the following membership:

L. J. Koch, Chairman  
 C. B. Zitek, Secretary

<i>Organization Represented</i>	<i>Name of Representatives</i>
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American Concrete Institute .....	P. E. Mast
American Nuclear Society .....	L. J. Koch
American Society of Civil Engineers .....	M. I. Goldman C. Gogolick (Alt)
American Society of Mechanical Engineers .....	J. S. Bitel R. H. Holyoak (Alt)
American Public Health Association, Inc. ....	J. R. Coleman
American Welding Society .....	J. R. McGuffey
Atomic Industrial Forum .....	I. F. Stuart
Electric Light & Power Group .....	J. E. Howard J. E. Sohngen (Alt)
Federal Power Commission .....	A. P. Donnell B. P. Chew (Alt)
Health Physics Society .....	J. M. Smith, Jr. R. L. Clark (Alt)
Institute of Electrical & Electronics Engineers .....	R. G. Benham O. W. Bilharz, Jr. (Alt)
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# Physical Protection for Systems and Components Important to Safety

## 1. Scope

The scope of this Standard is to establish the physical protection criteria for systems and components important to safety in nuclear power generating stations that are either light water moderated and cooled (LWR) or graphite moderated and gas cooled (HTGR). This Standard is also generally applicable to other reactor types. Included in the scope of this Standard is an identification of potential hazards to systems and components important to safety, and an acceptable means of insuring the protection of this equipment from the hazards.

The contents of this Standard fall into 2 categories:

(1) **Criteria.** Criteria for which systems need protection are presented in Section 4, Protection Criteria. Criteria for when protection is not needed are given in Section 6, Assessment of Need for Protection.

(2) **Guidance.** Guidance and information useful to a designer who is faced with protecting systems and components from hazards are presented in: Section 3, Design Approach for Providing Protection; Section 5, Plant Hazards; Section 7, Protection Methods; and Section 8, Implementation of Protection Methods. The tutorial nature of some of the material in these sections reflects a desire to bring some important thoughts to the attention of the designer.

The designer must implement the requirements of this Standard through the use of other, more detailed standards. For example, guidance to define one such hazard, namely missiles, and to determine the actual recommendations for protection against missiles, has been formulated and exists in draft form.<sup>1</sup> This may require further consideration of fluid jets and pipe rupture whip, guidance for which have been formulated and exist in draft form.<sup>3</sup>

An approach to design for protection is presented in Section 3, Design Approach for Providing Protection, which recognizes the fact that a designer must consider protection of the

entire system, including both mechanical, instrumentation and control, and electrical components. It is emphasized here that the designer must consider entire systems and perhaps groupings of systems in determining whether a hazard can cause unacceptable damage. The requirements of this Standard are applicable to mechanical systems and their electrical, instrumentation and control components. The electrical designer must consider possible hazards due to mechanical systems interaction such as pipe rupture and missiles; and the mechanical designer must consider the possibility of hazards in the electrical layout such as collapse of non-seismically designed cable trays during an earthquake. Electrical or mechanical components important to safety may in some cases be located in non-Category I structures. In such cases, the designer shall assure that either the structure will not fail, or failure of the structure is considered as Acceptable Damage. Guidance as to spatial separation criteria for electrical systems from other electrical systems (without mechanical system influence) has been formulated and exists in a draft standard.<sup>4</sup>

Section 4, Protection Criteria, presents protection criteria and discusses systems and components that need protection.

Section 5, Plant Hazards, identifies the possible hazards against which protection must be considered.

Section 6, Assessment of Need for Protection, presents criteria which assist the designer in his assessment of the need for protection of systems and components important to safety.

Section 7, Protection Methods, defines and discusses methods of achieving protection.

Section 8, Implementation of Protection Methods, presents, as a broad approach, guidance on implementing protection methods.

<sup>1</sup>IEEE Standard 384-1974, "IEEE Trial Use Standard Criteria for Separation of Class IE Equipment and Circuits", ANSI N41.14. The Working Group of SC-1.4 (Electrical Independence Criteria) on IEEE 384-1974 is currently updating this industry standard. The content of U.S. Nuclear Regulatory Commission Regulatory Guide 1.75 is being considered at this time by that working group. See Appendix B, Reference 3.

<sup>3</sup>See Appendix B, Reference 2.