American Nuclear Society

REAFFIRMED
October 28, 1998
ANSI/ANS-58.3-1992 (R1998)

physical protection for nuclear safety-related systems and components

an American National Standard

REAFFIRMED
March 18, 2008
ANSI/ANS-58.3-1992 (R2008)

This standard has been reviewed and reaffirmed with the recognition that it may reference other standards and documents that may have been superseded or withdrawn.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.

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ANSI/ANS-58.3-1992

Addendum to ANSI/ANS-58.3-1992 (R2008) Foreword

[The foreword and this addendum are not part of American National Standard "Physical Protection for Nuclear Safety-Related System and Components," ANSI/ANS-58.3-1992 (R2007)]

The scope of the ANS-58.3 standard is to identify potential natural phenomena and accident safety hazards to light water nuclear power plants and to discuss in general terms means for protecting against such hazards, except for missiles where simplified first order methods to resist missile effects are presented in Appendix B. The term "physical protection" originally was related to accidental and natural hazards. In recent years, it has come to be associated with safeguard requirements associated with acts of sabotage and land, sea, or air malevolent vehicle intrusion.

With the present-day definition of "physical protection," it would be fitting to revise the title to "Natural Phenomena and Accident Hazards for Nuclear Safety-Related Systems and Components." However, American National Standards Institute requirements do not permit any changes to a current standard through reaffirmation. As the foreword is not considered part of the standard, it is acceptable to include this addendum.

The safety hazards identified in this standard are still applicable to the design of nuclear facilities and as such should still be identified in an American Nuclear Society standard. To the extent the standard serves as a guide to the natural phenomena and accident hazards to be considered in nuclear facility design, it serves a useful purpose to the nuclear industry. For this reason the standard was reaffirmed in 2008. Currently, safeguards design requirements that have been identified by regulatory authorities are outside the scope of this standard.

Furthermore, we'd like to acknowledge a large effort by the U.S. Army Corps of Engineers (COE) and the American Society of Civil Engineers (ASCE) on the subject of this standard. It is believed that the COE and ASCE documents will in time cover most of the details in ANS-58.3. Once these documents are finalized, they will be reviewed and addressed in a revision of this standard if determined appropriate.

American National Standard for Physical Protection for Nuclear Safety-Related Systems and Components

Secretariat
American Nuclear Society

Prepared by the
American Nuclear Society
Standards Committee
Working Group ANS-58.3

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Approved August 6, 1992
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.

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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.

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Foreword

(This foreword is not part of American National Standard Physical Protection for Nuclear Safety-Related Systems and Components, ANSI/ANS-58.3-1992.)

The working group revised this standard based on the assumptions that a stationary light water reactor power plant design team would use this standard in conjunction with many other standards, codes, and regulations. The effort was to make this standard as broad as possible to cause the designers to consider every relevant area based on industry experience to date. Details in any particular area would come from standards specific to that area.

A draft standard on plant design against missiles was issued for trial use and comment in 1974 as ANSI/N177 (ANS-58.1). This work is included as a nonmandatory appendix.

Working Group ANS-58.3 consists of the following members:

H. C. Shaffer III, Chairman, *Yankee Atomic Electric Company*
G. H. Marcus, *U.S. Nuclear Regulatory Commission*
J. Conant, *Combustion Engineering, Inc.*
C. Zeamer, *Washington Public Power Supply System*
R. Harris, *Consultant*

R. C. Surman, *Westinghouse Electric Corporation*, provided assistance in the resolution of probabilistic approaches that are now discussed only in parent standards ANSI/ANS-51.1-1983 (R1988) and ANSI/ANS-52.1-1983 (R1988).

The membership of MC-1, Light Water Reactor Criteria Management, at the time it reviewed this standard was as follows:

W. H. D'Ardenne, Chairman, *GE Nuclear Energy*
R. Bone, *Stone & Webster Engineering Corporation*
E. J. Borella, *Ebasco Services, Inc.*
D. M. Crowe, *Georgia Power & Light Company*
R. Fortier, *Stone & Webster Engineering Corporation*
E. E. Fricks, *Stone & Webster Engineering Corporation*
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R. J. Mazza, *Sargent & Lundy*
W. Moody, *Southern California Edison*
H. G. O'Brien, *Tennessee Valley Authority*
P. M. Pivawer, *Power Authority of the State of New York*
H. A. Putre, *Perry Nuclear Power Plant*
H. C. Shaffer III, *Yankee Atomic Electric Company*
R. C. Surman, *Westinghouse Electric Corporation*
E. W. Swanson, *Babcock & Wilcox Company*
E. R. Wiot, *Roy F. Weston Company*

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

L. J. Cooper, Chairman
M. D. Weber, Secretary

W. M. Andrews ..... Southern Company Services, Inc.
F. Boorboor ..... United Engineers & Constructors*
C. O. Coffer ..... Pacific Gas & Electric Company
L. J. Cooper ..... Nebraska Public Power District
(for the American Nuclear Society)
J. D. Crawford ..... Combustion Engineering Corporation
W. H. D'Ardenne (Vice Chairman) ..... GE Nuclear Energy
S. N. Ehrenpreis ..... Westinghouse Electric Corporation
S. B. Gerges ..... NUS Corporation, Inc.
C. J. Gill ..... Bechtel National, Inc.
C. E. Johnson, Jr. ..... U.S. Nuclear Regulatory Commission
D. Lambert ..... Tennessee Valley Authority
R. T. Lance ..... Rockwell International Corporation
J. F. Mallay ..... Management Analysis Company*
J. K. McCall ..... Pacific Gas & Electric Company
R. E. Miller ..... Duke Power Company
J. A. Nevshemal ..... Toledo Edison Company
P. T. Reichert ..... United Engineers & Constructors
B. M. Rice ..... Duke Power Company (retired)
(for the Institute of Electrical & Electronics Engineers, Inc.)
J. C. Saldarini ..... Ebasco Services, Inc.
M. O. Sanford ..... GPU Nuclear Corporation
S. L. Stamm ..... Stone & Webster Engineering Corporation
J. D. Stevenson ..... Stevenson & Associates
T. J. Sullivan ..... Institute of Nuclear Power Operations
C. D. Thomas, Jr. ..... Yankee Atomic Electric Company
W. T. Ullrich ..... Philadelphia Electric Company
G. P. Wagner ..... Commonwealth Edison Company
G. L. Wessman ..... Consultant
G. J. Wrobel ..... Rochester Gas & Electric Corporation

* Affiliation at time of balloting

Contents

Physical Protection for Nuclear Safety-Related Systems and Components

1. Introduction and Scope

1.1 Scope. This standard sets forth physical protection criteria for nuclear safety-related systems and components in stations using light water reactors (LWRs). This standard includes an identification of potential hazards to nuclear safety-related systems and components and acceptable means of ensuring the protection of this equipment from these hazards.

1.2 Purpose. The contents of this standard fall into two categories:
(1) Criteria – Criteria for which systems need protection are presented in Section 3, "Design Approach for Providing Protection" and 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 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 concepts to the attention of the designer.

1.3 Limits of Application of the Criteria. The designer shall implement the requirements of this standard through the use of other, more detailed, standards. For example, guidance to define one such hazard, namely pipe rupture, is addressed by American National Standard Design Basis for Protection of Light Water Nuclear Power Plants Against Effects of Postulated Pipe Rupture, ANSI/ANS-58.2-1988 [1].[1]

Guidance on protection of nuclear safety-related electrical equipment is found in American National Standard Criteria for Independence of Class 1E Equipment and Circuits, ANSI/IEEE 384-1981 [2] or its successor. It is neither desirable nor practical to list all possible codes and standards that may be applied to a particular plant design. It is the designer's responsibility to locate the relevant guidance for each particular design.

An approach to design for protection is presented in Section 3, "Design Approach for Providing Protection," which recognizes the fact that a designer assesses protection of the entire system, including mechanical, structural, instrumentation and control, and electrical components. It is emphasized here that the designer assesses entire systems and perhaps groupings of systems in determining whether a hazard can cause unacceptable damage. The electrical designer assesses possible hazards due to mechanical systems interaction, such as pipe rupture and missiles as well as electrical hazards, as discussed in ANSI/IEEE 384 [2]; and the mechanical designer assesses the possibility of hazards in the electrical layout, such as collapse of nonseismically designed cable trays during an earthquake or transformer fires, as well as mechanical hazards. The structural designer determines whether certain accidents could overload or damage structures so that they could not fulfill their design requirements. Nuclear safety-related electrical or mechanical components in some cases may be located in nonseismic Category I structures. In such cases, the designer shall ensure that either the structure will not fail or that failure of the structure is considered as acceptable damage. Specific guidance on spatial separation criteria for electrical systems from other electrical systems is also available in ANSI/IEEE 384 [2].

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

Section 5, "Plant Hazards," identifies the possible hazards to the plant against which protection shall be evaluated.

Section 6, "Assessment of Need for Protection," presents criteria that assist the designer in assessing the need for protection of nuclear safety-related systems and components.

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

[1] Numbers in brackets refer to corresponding numbers in Section 9, "References."