

Revision of
N16.8-1975

American Nuclear Society

REAFFIRMED

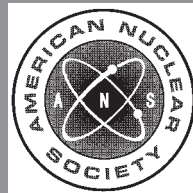
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**criteria for nuclear criticality safety controls
in operations with shielding and confinement**

an American National Standard

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ANSI/ANS-8.10-1983 (R1999)
Revision of
N16.8-1975

**American National Standard
Criteria for Nuclear Criticality Safety Controls
in Operations with Shielding and Confinement**

Secretariat
American Nuclear Society

Prepared by the
**American Nuclear Society
Standards Committee
Working Group ANS-8.10**

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American National Standard

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Foreword

(This Foreword is not a part of American National Standard Criteria for Nuclear Criticality Safety Controls in Operations with Shielding and Confinement, ANSI/ANS-8.10-1983.)

This standard amplifies the conditions necessary for the control of criticality in fissionable materials set forth in American National Standard for Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors, ANSI/ANS-8.1-1983. Criteria for the prevention of criticality are presented herein for facilities which provide adequate protection for personnel and the public against radiation and releases of radioactive materials resulting from accidental criticality. This standard recognizes the usefulness and protective features of shielding against radiation and confinement of radioactive materials, and allows a relaxation of criticality safety criteria when shielding and confinement meet criteria specified in this standard. In the context of this standard the shielding and confinement properties may exist because of the radioactivity of material processed in normal operations, or they may be designed into the facility expressly to protect against the effects of accidents.

This standard was initiated as the result of a survey, conducted in September 1968, to establish the need for and the feasibility of such a standard. A Work Group was appointed by Subcommittee 8 of the Standards Committee of the American Nuclear Society in November 1968, and submitted the first draft in June 1969. In response to comments and discussions, the Work Group subsequently prepared twelve succeeding drafts over a five-year period. Some of the later revisions were the consequence of recommendations from American National Standard Committee N16 during 1972. The standard was then adopted by the American National Standards Committee N16 in 1974, under the title "Criteria for Nuclear Criticality Safety Controls in Operations Where Shielding Protects Personnel."

The prescribed five-year review of N16.8-1975/ANS-8.10 was performed by a Work Group of Subcommittee 8 of the ANS Standards Committee, the originating body. The Work Group was composed of B. F. Gore and E. D. Clayton of the Battelle Pacific Northwest Laboratories. They recommended a single substantive change in the standard, along with minor wording changes in the standard and in its title to reflect the broadened content. This revision defines a criterion for determining the adequacy of a facility's confinement of radioactive materials under accident conditions based upon a maximum radiation dose which could be received by a member of the public located outside the restricted area surrounding the facility. Definition of this criterion removes perceived ambiguity in the wording of the previous version.

This revised standard was prepared under the guidance of ANS Subcommittee 8, Fissionable Materials Outside Reactors, which had the following membership at the time of its approval of this revision:

J. D. McLendon, Chairman, *Union Carbide Corporation*
Elizabeth B. Johnson, Secretary, *Oak Ridge National Laboratory*
F. M. Alcorn, *Babcock & Wilcox Company*
H. K. Clark, *Savannah River Laboratory*
E. D. Clayton, *Battelle Pacific Northwest Laboratories*

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W. G. Morrison, *Exxon Nuclear Idaho Company*
David R. Smith, *Los Alamos National Laboratory*
J. T. Thomas, *Oak Ridge National Laboratory*
G. E. Whitesides, *Oak Ridge National Laboratory*
F. E. Woltz, *Goodyear Atomic Corporation*

The American National Standards Committee N16, Nuclear Criticality Safety, which reviewed and approved this revision in 1982, had the following membership:

Dixon Callihan, Chairman
Elizabeth B. Johnson, Secretary

<i>Organization Represented</i>	<i>Name of Representative</i>
Allied General Nuclear Services	William R. Waltz
American Institute of Chemical Engineers	Alex F. Perge
American Nuclear Society	Dixon Callihan
American Society for Testing and Materials (Liaison only)	Ricardo Artigas
Atomic Industrial Forum, Inc.	D. Frank Cronin
Exxon Nuclear Company	Leo E. Hansen
Health Physics Society	Fred W. Sanders Norman C. Dyer (Alt.)
Institute of Nuclear Materials Management	Leo E. Hansen
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U. S. Nuclear Regulatory Commission	George H. Bidinger
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Criteria for Nuclear Criticality Safety Controls in Operations with Shielding and Confinement

1. Introduction

Guidance for the prevention of criticality accidents in the handling, storing, processing, and transporting of fissionable materials is presented in American National Standard for Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors, ANSI/ANS-8.1-1983 [1].¹ That standard recognizes that, if adequate shielding against radiation and confinement of radioactive materials are provided, the hazards normally attendant with criticality in a facility lacking shielding and confinement are minimized. It is stated in 4.1.1 of ANSI/ANS-8.1-1983 [1] that "Distinction may be made between shielded and unshielded facilities, and the criteria may be less stringent when adequate shielding and confinement assure the protection of personnel."

This standard provides criteria for the prevention of nuclear accidents in facilities with shielding and confinement and a definition of the adequacy of the shielding and confinement required. This standard does not apply to those operations requiring entry of personnel inside the shielded process areas wherein fissile and fissionable materials are contained. The standard does not include engineering specifications for shield design nor for establishing its adequacy. Nothing in this standard shall be interpreted as discouraging additional safety features that can be conveniently incorporated.

2. Scope

This standard is applicable to operations outside of nuclear reactors with ^{235}U , ^{233}U , ^{239}Pu , and other fissile and fissionable materials in which shielding and confinement are provided for protection of personnel and the public, except the assembly of these materials under controlled conditions, such as in critical experiments. Criteria are provided that may be used for criticality control under these conditions. The

¹Numbers in brackets refer to corresponding numbers in Section 6, References.

standard does not include the details of administrative procedures for control (which are considered to be management prerogatives) nor details regarding the design of processes and equipment or descriptions of instrumentation for process control.

3. Definitions

3.1 Limitations. The following definitions are of a restricted nature for the purposes of this standard. Other terms are defined in American National Standard Glossary of Terms in Nuclear Science and Technology, ANSI/N1.1-1976/ANS-9 [2].

3.2 Shall, Should, and May. The word "shall" is used to denote a requirement, the word "should" to denote a recommendation, and the word "may" to denote permission, neither a requirement nor a recommendation. To conform with this standard, all operations shall be performed in accordance with its requirements but not necessarily with its recommendations.

3.3 Glossary of Terms

criticality accident (accident). The release of energy as a result of accidentally producing a self-sustaining or divergent neutron chain reaction.

primary method of criticality control. A control parameter on which principal reliance is placed in assuring that subcritical conditions are maintained.

restricted area. An area to which public access is controlled for purpose of protection of individuals from exposure to radiation and radioactive materials.

4. Criteria for Adequate Shielding and Confinement

4.1 Conditions. The provisions of this standard may be applied only in those shielded facilities which meet the following criteria: