

# American Nuclear Society

**criticality safety criteria for the handling, storage,  
and transportation of LWR fuel outside reactors**

**an American National Standard**

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reviewed and reaffirmed with the recognition that it may reference other standards and documents that may have been superseded or withdrawn.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

**REAFFIRMED**

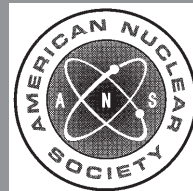
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**American National Standard  
Criticality Safety Criteria for the Handling, Storage,  
and Transportation of LWR Fuel Outside Reactors**

Secretariat  
**American Nuclear Society**

Prepared by the  
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## **American National Standard**

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

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**Foreword** (This foreword is not a part of American National Standard Criticality Safety Criteria for the Handling, Storage, and Transportation of LWR Fuel Outside Reactors, ANSI/ANS-8.17-2004)

Criticality safety is an important component in a comprehensive safety assessment of a facility or an operation involving fissile materials. Designers, operators, and standards writing groups having concern with nonreactor nuclear facilities justifiably have occasion to address criticality safety. The present work was undertaken in the interest of an orderly presentation that embodies criticality safety principles and practices consistent with existing American Nuclear Society standards in the field of criticality safety, Subcommittee 8, Fissionable Materials Outside Reactors, of the ANS Standards Committee. The principal intent of the ANS-8.17 working group has been to provide basic requirements that address the criticality safety aspects of a facility or operation and that can be referenced or used in conjunction with other safety standards or regulations to address the total safety and operational requirements. This standard presents safety criteria applicable to the handling, storage, and transportation of light water reactor fuel rods and elements outside a reactor core.

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<b>Contents</b>	<b>Section</b>	<b>Page</b>
	<b>1</b> Introduction .....	1
	<b>2</b> Scope .....	1
	<b>3</b> Definitions .....	1
	<b>4</b> General Safety Criteria .....	1
	<b>5</b> Criteria to Establish Subcriticality .....	2
	<b>6</b> References .....	3
	<b>Appendix</b>	
	Fuel Unit Handling, Storage, and Transportation: Criticality Safety Considerations .....	4

# Criticality Safety Criteria for the Handling, Storage, and Transportation of LWR Fuel Outside Reactors

## 1 Introduction

The potential for criticality accidents during the handling, storage, and transportation of fuel for nuclear reactors represents a health and safety risk to personnel involved in these activities, as well as to the general public. Appropriate design of equipment and facilities, handling procedures, and personnel training can minimize this risk. While American National Standard "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors," ANSI/ANS-8.1-1998 [1],<sup>1)</sup> provides general criteria for assurance of criticality safety, this standard provides additional guidance applicable to handling, storage, and transportation of light water reactor (LWR) nuclear fuel units in any phase of the fuel cycle outside the reactor core.

## 2 Scope

This standard provides nuclear criticality safety criteria for the handling, storage, and transportation of LWR fuel rods and units outside reactor cores.

## 3 Definitions

### 3.1 Limitations

The definitions given below are of a restricted nature for the purpose of this standard. Other specialized terms are defined in *Glossary of Terms in Nuclear Science and Technology* [2].

### 3.2 Shall, Should, and May

The word "shall" is used to denote a requirement; the word "should" is used to denote a recommendation; and the word "may" is used to denote permission, neither a requirement

nor a recommendation. In order to conform with this standard, all operations shall be performed in accordance with its requirements but not necessarily with its recommendations. When recommendations are not implemented, justification should be documented.

### 3.3 Glossary of Terms

**controlled parameter:** A parameter that is kept within specified limits.

**fuel rod:** A long slender column of material containing fissile nuclides, normally encapsulated by metallic tubing.

**fuel unit:** The fundamental item to be handled, stored, or transported. Examples include an assembly of fuel rods, canned spent fuel, or consolidated fuel rods.

**independent assessment:** A review of a criticality safety evaluation by a competent individual(s), other than the originator, that confirms the adequacy of the evaluation. The reviewer(s) may be from the same organization as the originator.

## 4 General Safety Criteria

**4.1** General administrative and technical practices are contained in American National Standards ANSI/ANS-8.1-1998 [1] and ANSI/ANS-8.19-1996 [3].

**4.2** Methods used to calculate the effective multiplication factor shall be validated in accordance with ANSI/ANS-8.1-1998 [1].

**4.3** Guidance to determine the need for and use of criticality alarms for personnel protection is contained in American National Standard "Criticality Accident Alarm System," ANSI/ANS-8.3-1997 [4].

<sup>1)</sup>Numbers in brackets refer to corresponding numbers in Section 6, "References."