

American Nuclear Society

REAFFIRMED

August 3, 2015

ANSI/ANS-8.20-1991 (R2015)

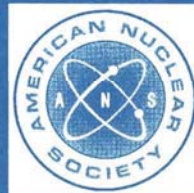
September 16, 2005

ANSI/ANS-8.20-1991 (R2005)

nuclear criticality safety training

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reviewed and reaffirmed with the recognition that it may reference other standards and documents that may have been superseded or withdrawn.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



published by the

American Nuclear Society

555 North Kensington Avenue

La Grange Park, Illinois 60526 USA

This is a preview of "ANSI/ANS-8.20-1991 (...". [Click here to purchase the full version from the ANSI store.](#)

ANSI/ANS-8.20-1991

**American National Standard
for Nuclear Criticality Safety Training**

Secretariat
American Nuclear Society

Prepared by the
**American Nuclear Society
Standards Committee
Working Group ANS-8.20**

Published by the
**American Nuclear Society
555 North Kensington Avenue
La Grange Park, Illinois 60525 USA**

Approved May 20, 1991
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.

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 60525 USA

Copyright © 1991 by American Nuclear Society.

Any part of this standard may be quoted. Credit lines should read "Extracted from American National Standard ANSI/ANS-8.20-1991 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 a part of American National Standard for Nuclear Criticality Safety Training, ANSI/ANS-8.20-1991.)

This standard presents the training outline, procedures, and responsibilities for providing appropriate nuclear criticality safety training for employees associated with fissile material operations outside reactors. The usefulness of this standard lies in its provisions for the establishment of training objectives, the designation of personnel requiring training, the skeletal framework of training program content, and criteria for program documentation and evaluation. The two appendixes include relevant references and resources and various methods for conducting training. Heretofore, no generally accepted guidance for nuclear criticality safety training has been available.

This standard was initiated by the Training Work Group of the U.S. Department of Energy Nuclear Criticality Technology and Safety (U.S. DOE NCT&S) Project in recognition of the need for and the feasibility of a standard for the establishment of consistent, appropriate nuclear criticality safety training in fissile material operations outside nuclear reactors.

A group, ANS-8.20, under Subcommittee 8 of the Standards Committee of the American Nuclear Society, was established to formulate the proposed standard. Several drafts were prepared for review by the members of the NCT&S Project Training Work Group. The membership of the Training Work Group was expanded to include representatives from not only the U.S. DOE, its field offices, and its contractors, but also from the U.S. Nuclear Regulatory Commission (U.S. NRC), private nuclear industry companies, and universities.

This standard was developed by ANS-8.20, which had the following membership:

M. R. Crowell, Chairman, <i>Oak Ridge Associated Universities</i>	C. M. Hopper, <i>Oak Ridge National Laboratory</i>
F. M. Alcorn, <i>Babcock & Wilcox Company</i>	N. Ketzlach, <i>The Ralph M. Parsons Company</i>
L. C. Dolan, <i>Martin Marietta Energy Systems, Inc.</i>	L. L. Lowry, <i>Lawrence Livermore National Laboratory</i>
M. C. Evans, <i>British Nuclear Fuels plc</i>	T. P. McLaughlin, <i>Los Alamos National Laboratory</i>

Invaluable assistance was given in the review process of this standard by R. A. Knief of *GPU Nuclear Corporation*, G. A. Price of *Brookhaven National Laboratory*, and other members of the Training Work Group of the NCT&S Project.

This standard was prepared under the direction of ANS-8, Fissionable Materials Outside Reactors. The membership of ANS-8 at the time of its approval of this standard was as follows:

J. T. Thomas, Chairman, <i>Martin Marietta Energy Systems, Inc.</i>	C. M. Hopper, <i>Oak Ridge National Laboratory</i>
E. B. Johnson, Secretary, <i>Oak Ridge National Laboratory</i>	N. Ketzlach, <i>The Ralph M. Parsons Company</i>
F. M. Alcorn, <i>Babcock & Wilcox Company</i>	R. Kiyose, <i>University of Tokyo</i> (retired)
R. D. Carter, <i>Westinghouse Hanford Company</i>	T. P. McLaughlin, <i>Los Alamos National Laboratory</i>
H. K. Clark, <i>Savannah River Laboratory</i> (retired)	W. G. Morrison, <i>Exxon Idaho Nuclear Company</i> (retired)
E. D. Clayton, <i>Battelle Pacific Northwest Laboratories</i> (retired)	D. A. Reed, <i>Martin Marietta Energy Systems, Inc.</i>
D. M. Dawson, <i>Science Applications International Corporation</i>	D. R. Smith, <i>Los Alamos National Laboratory</i> (retired)
M. C. Evans, <i>British Nuclear Fuels plc</i>	H. Toffer, <i>Westinghouse Hanford Company</i>
	G. E. Whitesides, <i>Martin Marietta Energy Systems, Inc.</i>

Consensus Committee N16, Nuclear Criticality Safety, had the following membership at the time of its approval of this standard:

Dixon Callihan, Chairman
David R. Smith, Vice Chairman
Elizabeth B. Johnson, Secretary

<i>Organization</i>	<i>Representative</i>
Advanced Nuclear Fuels Corporation	L. D. Gerrald
American Institute of Chemical Engineers	L. Robert LaRiviere
American Nuclear Society	Dixon Callihan
American Society for Testing and Materials (Liaison only)	Ricardo Artigas
Health Physics Society	John W. Cure III
Institute of Nuclear Materials Management	Milton E. McLain, Jr. (Alternate)
	C. Leslie Brown
	W. T. Mee (Alternate)
U.S. Department of Energy	Blake P. Brown
U.S. Nuclear Regulatory Commission	George H. Bidinger
Westinghouse Savannah River Company	William R. Waltz
Individual Members	Elizabeth B. Johnson
	Hugh C. Paxton
	Fred W. Sanders
	David R. Smith

Contents	Section	Page
	1. Introduction	1
	2. Scope	1
	3. Objective	1
	4. Definitions	1
	4.1 Limitations	1
	4.2 Shall, Should, May	1
	4.3 Glossary of Terms	1
	5. Program Responsibilities	1
	6. Program Structure	2
	7. Program Content	2
	7.1 Fission Chain Reactions and Accident Consequences	2
	7.2 Neutron Behavior in Fissioning Systems	2
	7.3 Criticality Accident History	2
	7.4 Response to Criticality Alarm Signals	2
	7.5 Control Parameters	2
	7.6 Policy and Procedures	3
	8. Evaluation	3
	8.1 Training Program	3
	8.2 Personnel	3
	8.3 Documentation	3
	9. References	3
	Appendix A Bibliography	4
	Appendix B Training Methods	6

This is a preview of "ANSI/ANS-8.20-1991 (...". [Click here](#) to purchase the full version from the ANSI store.

Nuclear Criticality Safety Training

1. Introduction

This standard provides a framework for the training of employees associated with fissionable material operations outside reactors where potential exists for criticality accidents. An effective nuclear criticality safety training program requires the cooperative involvement of management, supervision, and the criticality safety staff.

General guidance for nuclear criticality safety is found in American National Standard for Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors, ANSI/ANS-8.1-1983 (R1988) [1].¹ Criteria for the administration of a nuclear criticality safety program for operations outside reactors in which there exists a potential for criticality accidents are found in American National Standard Administrative Practices for Nuclear Criticality Safety, ANSI/ANS-8.19-1984 (R1989) [2].

2. Scope

This standard provides criteria for nuclear criticality safety training for personnel associated with operations outside reactors where a potential exists for criticality accidents. It is not sufficient for the training of nuclear criticality safety staff.

3. Objective

The objective of this standard is to identify the basic characteristics of an effective nuclear criticality safety training program. The program is directed toward those who manage, work in, or work near facilities where the potential exists for a criticality accident. These personnel include, but are not limited to, the following:

- (1) those who work with fissionable material and their supervisors
- (2) operations support personnel
- (3) design personnel
- (4) maintenance personnel

- (5) emergency response personnel
- (6) managers and other administrative personnel
- (7) others who enter areas where fissionable material is processed, stored or handled.

4. Definitions

4.1 Limitations. The definitions given below are of a restricted nature for the purposes of this standard.

4.2 Shall, Should, 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. In order to conform with this standard, all operations shall be performed in accordance with its requirements but not necessarily with its recommendations.

4.3 Glossary of Terms

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

criticality safety staff. Specialists skilled in the techniques of nuclear criticality safety assessment and familiar with plant operations while, to the extent practicable, administratively independent of process supervision.

nuclear criticality safety. Protection against the consequences of an inadvertent nuclear chain reaction, preferably by the prevention of the reaction.

training. Instruction that imparts knowledge and skills necessary for safe and efficient on-the-job performance.

5. Program Responsibilities

5.1 Management shall establish a nuclear criticality safety training program that provides confidence in the continuing proficiency of personnel.

5.2 Supervisors shall ensure that their staffs are suitably trained.

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