

American Nuclear Society

REAFFIRMED

June 17, 2011
ANSI/ANS-19.1-2002 (R2011)

**nuclear data sets for
reactor design calculations**

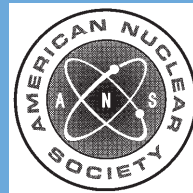
an American National Standard

WITHDRAWN

March 8, 2019
ANSI/ANS-19.1-2002 (R2011)

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reviewed and reaffirmed with the recognition that it may reference other standards and documents that may have been superseded or withdrawn.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

No longer being maintained as an American National Standard. This standard may contain outdated material or may have been superseded by another standard. Please contact the ANS Standards Administrator for details.



published by the
American Nuclear Society
555 North Kensington Avenue
La Grange Park, Illinois 60526 USA

ANSI/ANS-19.1-2002

**American National Standard
Nuclear Data Sets for
Reactor Design Calculations**

Secretariat
American Nuclear Society

Prepared by the
**American Nuclear Society
Standards Committee
Working Group ANS-19.1**

Published by the
**American Nuclear Society
555 North Kensington Avenue
La Grange Park, Illinois 60526 USA**

Approved July 23, 2002
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 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 60526 USA**

Copyright © 2004 by American Nuclear Society. All rights reserved.

Any part of this standard may be quoted. Credit lines should read "Extracted from American National Standard ANSI/ANS-19.1-2002 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 Nuclear Data Sets for Reactor Design Calculations, ANSI/ANS-19.1-2002.)

It is the intent of this American National Standard to present specifications for the preparation of nuclear data sets for use in reactor physics computer programs employed in the design of nuclear reactors and to specify certain data sets as standards. The nuclear data used in reactor design calculations are fundamental physical quantities and, hence, are independent of reactor type. The lack of complete, exact experimental measurements requires the use of evaluated estimates of the data. This standard specifies guidelines for such evaluations and specifies how the resulting data sets should be processed, tested, validated, and documented.

This standard is intended primarily for nuclear data used for reactor core calculations. However, it may be of use in shielding calculations and in other areas, such as dosimetry and fusion.

This standard presents specifications for the preparation of evaluated nuclear data sets, processed continuous data sets, and energy averaged data sets for use in nuclear reactors. ENDF/B-VI is identified as a standard evaluated data set. An MCNP cross-section library is identified as a standard processed continuous data set. It is believed that the development of standard averaged data sets for use in reactor design is an achievable goal, and therefore, procedures have been established in this standard for achieving this objective.

This standard was developed by Working Group ANS-19.1 of the American Nuclear Society Standards Committee, which had the following member at the time it prepared and approved this standard for revision:

D. R. Harris, Chairman, *Rensselaer Polytechnic Institute*

Standards Subcommittee ANS-19 of the American Nuclear Society had the following members at the time it processed and approved this revised standard:

D. Cokinos, *Chairman*
S. Baker
R. D. Cacciapouti
A. L. Casadei
R. T. Chiang
D. J. Diamond
D. R. Harris
J. Katakura
L. Lois
R. D. Mosteller
L. D. Noble
R. T. Perry
C. T. Rombough
R. B. Rothrock
R. B. Rouben
A. Weitzberg
W. B. Wilson

This standard was processed and approved for submittal to ANSI by the N17, Research Reactors, Reactor Physics, Radiation Shielding, and Computational Methods Committee on ANSI/ANS-19.1, *Nuclear Data Sets for Reactor Design Calculations*. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the N17 Committee had the following members:

R. E. Carter, *Individual*
D. Cokinos, *Brookhaven National Laboratory*
B. Dodd, *Health Physics Society/International Atomic Energy Agency*
D. Duffey, *University of Maryland*
W. A. Holt, *American Public Health Association*
William C. Hopkins, *Bechtel Corporation*
L. I. Kopp, *Individual*
T. Marsh, *U.S. Nuclear Regulatory Commission*
J. Miller, *Institute of Electrical and Electronics Engineers/Gamma-Metrics*
J. E. Olhoeft, *Individual*
T. M. Raby, *National Institute of Standards and Technology*
W. J. Richards, *University of California, Davis*
T. Schmidt, *Sandia National Laboratories*
R. Seale, *University of Arizona*
A. O. Smetana, *Savannah River National Laboratory*
J. F. Torrence, *National Institute of Standards and Technology*
E. G. Tourigny, *U.S. Department of Energy*
D. K. Trubey, *Individual*
A. Weitzberg, *Sciencetech, Inc.*
W. L. Whittemore, *GA Technologies, Inc.*

Contents	Section	Page
1	Scope	1
	1.1 General	1
	1.2 Applications	1
2	Definitions	1
3	Evaluated Data Sets	2
	3.1 General	2
	3.2 Data Sources	2
	3.3 Preparation	3
	3.4 Estimation of Accuracy	4
	3.5 Qualification	4
	3.6 Testing	5
	3.7 Documentation	5
4	Processed Continuous Data Sets	5
	4.1 General	5
	4.2 Sources	6
	4.3 Preparation	6
	4.4 Checking	6
	4.5 Qualification	6
	4.6 Documentation	7
5	Averaged Data Sets	7
	5.1 General	7
	5.2 Sources	7
	5.3 Preparation	7
	5.4 Checking	8
	5.5 Qualification	8
	5.6 Documentation	9
6	Data Sets Meeting the Specifications of This Standard	9
	6.1 General	9
	6.2 Standard Evaluated Data Sets	9
	6.3 Standard Processed Continuous Data Sets	9
	6.4 Standard Averaged Data Sets	9
7	References	10
Appendix		
	Appendix	11
Figure		
	Figure 1 Schematic representation of scope	2

Nuclear Data Sets for Reactor Design Calculations

1. Scope

1.1 General

This standard identifies and describes the specifications for developing, preparing, and documenting nuclear data sets to be used in reactor design calculations. The specifications include (a) criteria for acceptance of evaluated nuclear data sets; (b) criteria for processing evaluated data and preparation of processed continuous data and averaged data sets; and (c) identification of specific evaluated, processed continuous, and averaged data sets that meet these criteria for specific reactor types.

1.2 Applications

Nuclear data sets shall consist of basic microscopic nuclear physics data that include but are not limited to the important neutron-induced reactions. The data set, in the processed form, will be primarily utilized as input to fission reactor core design calculations but may have applications to other fields, such as shielding, dosimetry, or fusion studies.

The specific types of data sets considered to fall within the scope of this standard are shown in Figure 1 and defined more precisely in Section 2, "Definitions." As indicated in Figure 1, the scope of this standard does not pertain to experimental techniques for the measurement of nuclear data or to the development of nuclear model theory. The scope does not apply to a few-group collapsed data set, which is representative of a particular application except for a requirement for the documentation of collapsed data sets when such data sets are prepared as part of the testing of the nuclear data sets covered by this standard.

The distinguished features of data sets considered to fall within the scope of this standard are that they can be represented as being applicable to a wide range of reactor compositions, geometries, and spectra.

2 Definitions

benchmark: A well-defined set of physical experiments or mathematical constructs whose results are judged to be sufficiently accurate to be used as calculational reference points. The judgment is made by a group of experts in the subject area.

CSEWG: Cross-Section Evaluation Working Group, comprising representatives from organizations participating in the cooperative effort of developing the best possible evaluated data set (see "The Evaluated Nuclear Data File Version VI (ENDF/B-VI)" [1].¹ The CSEWG secretariat is the National Nuclear Data Center at Brookhaven National Laboratory.

data set: A collection of microscopic cross sections and nuclear constants encompassing the range of materials and reaction processes needed for the application area of interest.

evaluated data set: A data set that is completely and uniquely specified over the ranges of energy and angles important to reactor calculations. Such a data set is a judgment based on information available (experimental measurement results and nuclear theories) as to the best physical description of the interaction processes. An evaluated data set is intended to be independent of specific reactor compositions, geometries, energy group structures, or spectra.

processed continuous data set: A data set prepared by expansion or compaction of an evaluated data set using specified algorithms. Such a data set is intended to be independent of specific reactor compositions, geometries, energy group structures, or spectra.

averaged data set: A data set prepared by averaging an evaluated data set or a processed continuous data set with a specified weighting function over a specified detailed energy group

¹Numbers in brackets refer to corresponding numbers in Section 7, "References."