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American Nuclear Society

REAFFIRMED

November 17, 2011
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accommodating user needs in scientific and engineering computer software development

an American National Standard

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Accommodating User Needs in Scientific and Engineering Computer Software Development

Secretariat
American Nuclear Society

Prepared by the
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Foreword

(This Foreword is not a part of the American National Standard "Accommodating User Needs in Scientific and Engineering Computer Software Development," ANSI/ANS-10.5-2006.)

This standard is a revision of American National Standard Guidelines for Considering User Needs in Computer Program Development, ANSI/ANS-10.5-1994 (withdrawn 2004). It was prepared under the supervision of the ANS-10 Subcommittee of the American Nuclear Society's Standards Committee. This subcommittee is sponsored by the Mathematics and Computation Division of the Society. The Mathematics and Computation Division has encouraged the development and interchange of computer software. These recommendations are based on experience in the development and use of computer software for scientific and engineering calculations in the nuclear industry.

A high degree of reliance is placed on results produced by computer calculations. Often, the users of computer programs have limited program expertise and can be unaware of the consequences of misapplication. Similarly, program developers may have limited appreciation of user needs, particularly in the area of adequate documentation, input preparation, and output interpretation. Cooperative interaction between developers and prospective users throughout the development and trial use periods is important to generate a product that can be used with a high degree of reliability. In many projects, the prospective user is not available or not accessible, and the developer must anticipate the needs of users.

This standard provides requirements and recommendations for programming and documentation practices that are important for accommodating user needs. Proper application of this standard will improve the design and utility of computer software by encouraging the developer to consider aspects related to user requirements, which are often overlooked or assigned a low priority. This standard is intended to support the process of software development but is not intended to support a specific order of software life cycle phases. It is recognized that a substantial effort may be required to fully implement these requirements and recommendations. The cost of this effort must be weighed against the potential benefits resulting from ease of use and increased reliability.

This standard is one of three standards directed toward individuals who develop computer programs. The other two are American National Standard Portability of Scientific and Engineering Software ANSI/ANS-10.2-2000 and American National Standard Criteria for the Verification and Validation of Scientific and Engineering Computer Programs for the Nuclear Industry, ANSI/ANS-10.4-1987 (R1998). These standards are under continual maintenance by Subcommittee ANS-10. Historical standard American National Standard Documentation of Computer Software, ANSI/ANS-10.3-1995 (withdrawn 2005) also contains useful information. The user is advised to review the most recent version of these standards for possible changes.

As used here, the definition of criteria is "The bases for judging a particular process or product." The term "should" denotes a guideline; the term "shall" denotes a mandatory requirement.

This standard was drafted by Working Group ANS-10.5. The members at the time this standard was prepared were as follows:

A. O. Smetana, Chair, *Savannah River National Laboratory*

B. R. Frank, *Westinghouse Electric Company*
J. B. Manneschmidt, *Oak Ridge National Laboratory*
R. C. Singleterry, Jr., *National Aeronautics and Space Administration*
C. R. Martin, *Defense Nuclear Facilities Safety Board*

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The members of Subcommittee ANS-10, Mathematics and Computations, at the time this standard was approved, were as follows:

A. O. Smetana, Chair, *Savannah River National Laboratory*

B. R. Frank, *Westinghouse Electric Company*
J. B. Manneschmidt, *Oak Ridge National Laboratory*
B. L. Kirk, *Oak Ridge National Laboratory*
H. T. Hunter, *Oak Ridge National Laboratory*
R. C. Singleterry, Jr., *National Aeronautics and Space Administration*
C. R. Martin, *Defense Nuclear Facilities Safety Board*
P. P. H. Wilson, *University of Wisconsin-Madison*
Y. Orechwa, *U.S. Nuclear Regulatory Commission*
C. A. Sparrow, *Mississippi State University*

Consensus Committee N17, Research Reactors, Reactor Physics, Radiation Shielding, and Computational Methods, had the following membership at the time it reviewed and approved this standard:

T. M. Raby (Chair), *National Institute of Standards and Technology*
A. Weitzberg (Vice Chair), *Individual*

W. H. Bell, *American Institute of Chemical Engineers*
(Alt. R. D. Zimmerman, *American Institute of Chemical Engineers*)
R. E. Carter, *Individual*
D. Cokinos, *Brookhaven National Laboratory*
B. Dodd, *Health Physics Society*
B. K. Grimes, *Individual*
N. E. Hertel, *Georgia Institute of Technology*
W. A. Holt, *Individual*
W. C. Hopkins, *Individual*
L. I. Kopp, *Individual*
P. M. Madden, *U.S. Nuclear Regulatory Commission*
(Alt. A. Adams, *U.S. Nuclear Regulatory Commission*)
J. F. Miller, *Institute of Electrical and Electronics Engineers, Inc.*
J. E. Olhoeft, *Individual*
W. J. Richards, *National Institute of Standards and Technology*
T. R. Schmidt, *Sandia National Laboratories*
A. O. Smetana, *Savannah River National Laboratory*
R. Tsuikimura, *Aerotest Operations, Inc.*
E. G. Tourigny, *U.S. Department of Energy*
S. H. Weiss, *National Institute of Standards and Technology*
(Alt. T. J. Myers, *National Institute of Standards and Technology*)
W. L. Whittemore, *General Atomics*

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Accommodating User Needs in Scientific and Engineering Computer Software Development

1 Scope and objectives

1.1 Scope

This standard presents criteria for accommodating user needs in the preparation of computer software for scientific and engineering applications.

1.2 Objectives

Adherence to these criteria will help ensure proper application and simplify the use of computer programs. The intent is to encourage the development of a product that will be easy to apply correctly.

2 Definitions

The following definitions are applicable specifically to this standard.

default value: The value assigned to a variable by the program when its value is not specified by the user.

external data files: The data files that exist prior to or after execution of a computer program. They include

- library files—used to retain commonly accepted data in a standardized form;
- interface files—used to share data between programs or subprograms;
- restart files—used to retain data between successive executions of the same program.

implementation: Installation of a program for execution on a particular computer system or in the user's computer environment.

input: Data received by a program.

interactive program: A program whose execution may be controlled by the user via an input and response dialogue.

output: Data delivered by a program.

program development: The processes that are involved in producing computer software and its documentation. They include

- initiation;
- requirements definition;
- design;
- coding;
- integration and testing;
- installation and checkout.

user: A person who applies a program to perform a specific task.

3 Introduction

Computer software should be developed so that the needs of the user are anticipated, specifically in the areas of proper application, ease of use, and implementation. In this document the users are considered to be persons who work with a program developed by someone else. They may use the program to obtain results directly, or their task may be to implement the program on a different computer system. This guidance is directed to those individuals who develop computer programs, including both those who do initial development and those who interface with and modify existing programs.

When selecting, implementing, and applying an unfamiliar computer program, the new user must have sufficient information. Specifically, the user is concerned with

(1) proper application;

(2) ease of use;

(3) reliability;

(4) computing costs;

(5) input requirements;

(6) hardware requirements;

(7) interpretation of results;

(8) time required to obtain results;

(9) ease of modification.