American Nuclear Society

non-real-time, high-integrity software for the nuclear industry—developer requirements

an American National Standard
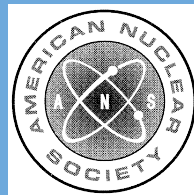
REAFFIRMED

August 13, 2018

ANSI/ANS-10.7-2013 (R2018)

REAFFIRMED

April 19, 2023

ANSI/ANS-10.7-2013 (R2023)

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reviewed and reaffirmed with the recognition that it may reference other standards and documents that may have been superseded or withdrawn.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

**American National Standard
Non-Real-Time, High-Integrity Software for the
Nuclear Industry—Developer Requirements**

Secretariat
American Nuclear Society

Prepared by the
**American Nuclear Society
Standards Committee
Working Group ANS-10.7**

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

Approved March 18, 2013
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.

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

Inquiry Requests

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Inquiry Format

Inquiry requests must include the following:

(1) the name, company name if applicable, mailing address, and telephone number of the inquirer;

(2) reference to the applicable standard edition, section, paragraph, figure, and/or table;

(3) the purposes of the inquiry;

(4) the inquiry stated in a clear, concise manner;

(5) a proposed reply, if the inquirer is in a position to offer one.

Inquiries should be addressed to

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Foreword

The purpose of this standard is to provide quality assurance requirements for non-real-time, high-integrity software developed for nuclear industry applications. The standard does not recommend a specific approach to software development but does recommend that quality assurance activities be carried out in parallel with software development. For a specific project, the project sponsor should determine the level of the verification and validation effort to be applied. Compliance with this standard does not automatically guarantee compliance with any other standard.

This standard complements the following ANS-10 standards relating to computer program development:

- ANSI/ANS-10.2-2000 (R2009), "Portability of Scientific and Engineering Software";
- ANSI/ANS-10.3-1995 (W2005), "Documentation of Computer Software";
- ANSI/ANS-10.4-2008, "Verification and Validation of Non-Safety-Related Scientific and Engineering Computer Programs for the Nuclear Industry";
- ANSI/ANS-10.5-2006 (R2011), "Accommodating User Needs in Scientific and Engineering Computer Software Development."

This standard builds upon NUREG/CR-6263, "High-Integrity Software for Nuclear Power Plants: Candidate Guidelines, Technical Basis and Research Needs," which was prepared for the U.S. Nuclear Regulatory Commission to assist with development of a technical basis for regulatory positions related to the use of high-integrity software in nuclear power plants. NUREG/CR-6263 was the result of a comprehensive review of the present state of software engineering processes and design attributes. While the focus of that effort was on real-time, high-integrity software, this standard focuses on non-real-time, high-integrity software, such as for design and analysis. Therefore, the requirements of this standard were carefully adapted from the former and new requirements developed and added for model development and validation, which are key aspects of analytical, non-real-time software (computer codes). NUREG/CR 6263 and NUREG/CR-5930, NIST SP 500-204, "High-Integrity Software Standards and Guidelines," were developed for application to nuclear power plants, and therfore, this standard is primarily applicable to nuclear power plants and other nuclear facilities and operations with similar high consequences and hazards.

In addition, an effort has been made to maintain consistency in terminology and concepts with various software standards being developed under the sponsorship of the Institute of Electrical and Electronics Engineers and to identify areas of disagreement.

This standard might reference documents and other standards that have been superseded or withdrawn at the time the standard is applied. A statement has been included in the references section that provides guidance on the use of references.

This standard does not incorporate the concepts of generating risk-informed insights, performance-based requirements, or a graded approach to quality assurance. The user is advised that one or more of these techniques could enhance the application of this standard. For example, the software requirements of this standard, which have been developed for high-consequence applications, could be appropriately tailored or graded for applications of lower consequence.

This standard has been written by Working Group ANS-10.7 of the American Nuclear Society's Standards Committee. The membership of this group during the preparation of the final drafts consisted of the following:

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