N286.7-16
(reaffirmed 2021)

Quality assurance of analytical, scientific, and design computer programs

REVISED FEBRUARY 2016

Legal Notice for Standards

Canadian Standards Association (operating as "CSA Group") develops standards through a consensus standards development process approved by the Standards Council of Canada. This process brings together volunteers representing varied viewpoints and interests to achieve consensus and develop a standard. Although CSA Group administers the process and establishes rules to promote fairness in achieving consensus, it does not independently test, evaluate, or verify the content of standards.

Disclaimer and exclusion of liability

This document is provided without any representations, warranties, or conditions of any kind, express or implied, including, without limitation, implied warranties or conditions concerning this document's fitness for a particular purpose or use, its merchantability, or its non-infringement of any third party's intellectual property rights. CSA Group does not warrant the accuracy, completeness, or currency of any of the information published in this document. CSA Group makes no representations or warranties regarding this document's compliance with any applicable statute, rule, or regulation.

IN NO EVENT SHALL CSA GROUP, ITS VOLUNTEERS, MEMBERS, SUBSIDIARIES, OR AFFILIATED COMPANIES, OR THEIR EMPLOYEES, DIRECTORS, OR OFFICERS, BE LIABLE FOR ANY DIRECT, INDIRECT, OR INCIDENTAL DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES, HOWSOEVER CAUSED, INCLUDING BUT NOT LIMITED TO SPECIAL OR CONSEQUENTIAL DAMAGES, LOST REVENUE, BUSINESS INTERRUPTION, LOST OR DAMAGED DATA, OR ANY OTHER COMMERCIAL OR ECONOMIC LOSS, WHETHER BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE), OR ANY OTHER THEORY OF LIABILITY, ARISING OUT OF OR RESULTING FROM ACCESS TO OR POSSESSION OR USE OF THIS DOCUMENT, EVEN IF CSA GROUP HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES.

In publishing and making this document available, CSA Group is not undertaking to render professional or other services for or on behalf of any person or entity or to perform any duty owed by any person or entity to another person or entity. The information in this document is directed to those who have the appropriate degree of experience to use and apply its contents, and CSA Group accepts no responsibility whatsoever arising in any way from any and all use of or reliance on the information contained in this document.

CSA Group is a private not-for-profit company that publishes voluntary standards and related documents. CSA Group has no power, nor does it undertake, to enforce compliance with the contents of the standards or other documents it publishes.

Intellectual property rights and ownership

As between CSA Group and the users of this document (whether it be in printed or electronic form), CSA Group is the owner, or the authorized licensee, of all works contained herein that are protected by copyright, all trade-marks (except as otherwise noted to the contrary), and all inventions and trade secrets that may be contained in this document, whether or not such inventions and trade secrets are protected by patents and applications for patents. Without limitation, the unauthorized use, modification, copying, or disclosure of this document may violate laws that protect CSA Group's and/or others' intellectual property and may give rise to a right in CSA Group and/or others to seek legal redress for such use, modification, copying, or disclosure. To the extent permitted by licence or by law, CSA Group reserves all intellectual property rights in this document.

Patent rights

Attention is drawn to the possibility that some of the elements of this standard may be the subject of patent rights. CSA Group shall not be held responsible for identifying any or all such patent rights. Users of this standard are expressly advised that determination of the validity of any such patent rights is entirely their own responsibility.

Authorized use of this document

This document is being provided by CSA Group for informational and non-commercial use only. The user of this document is authorized to do only the following:

If this document is in electronic form:

- load this document onto a computer for the sole purpose of reviewing it;
- search and browse this document; and
- print this document if it is in PDF format.

Limited copies of this document in printed or paper form may be distributed only to persons who are authorized by CSA Group to have such copies, and only if this Legal Notice appears on each such copy.

In addition, users may not and may not permit others to

- alter this document in any way or remove this Legal Notice from the attached standard;
- sell this document without authorization from CSA Group; or
- make an electronic copy of this document.

If you do not agree with any of the terms and conditions contained in this Legal Notice, you may not load or use this document or make any copies of the contents thereof, and if you do make such copies, you are required to destroy them immediately. Use of this document constitutes your acceptance of the terms and conditions of this Legal Notice.

Revision History

N286.7-16, Quality assurance of analytical, scientific, and design computer programs

Errata — February 2016	Revision symbol (in margin)
Clauses A.1.9, A.1.10, and A.2.2.2	Δ

Standards Update Service

N286.7-16
January 2016

Title: *Quality assurance of analytical, scientific, and design computer programs*

To register for e-mail notification about any updates to this publication
- go to **www.csagroup.org/store/**
- click on **Product Updates**

The **List ID** that you will need to register for updates to this publication is **24243.7**

If you require assistance, please e-mail **techsupport@csagroup.org** or call 416-747-2233.

Visit CSA Group's policy on privacy at **www.csagroup.org/legal** to find out how we protect your personal information.

N286.7-16

Quality assurance of analytical, scientific, and design computer programs

Published in January 2016 by CSA Group
A not-for-profit private sector organization
178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3

To purchase standards and related publications, visit our Online Store at www.csagroup.org/store/
or call toll-free 1-800-463-6727 or 416-747-4044.

ISBN 978-1-4883-0294-7

Contents

Preface

This is the third edition of CSA N286.7, *Quality assurance of analytical, scientific, and design computer programs*. It supersedes the previous editions, published in 1999 and 1994.

This Standard identifies the quality assurance requirements to support the management system for high energy reactor facilities (see Clause 7.1 of CSA N286) where analytical tools are utilized in the life cycle of nuclear facilities.

The CSA N-Series of Standards provides an interlinked set of requirements for the management of nuclear facilities. CSA N286 provides overall direction to management to develop and implement sound management practices and controls, while the other CSA nuclear Standards provide technical requirements and guidance that support the management system.

CSA N286 is based on a set of 12 principles. As part of those management system requirements, it requires that conduct of work is carried out using authorized and controlled software, which includes engineering tools and analytical software. For analytical software used in scientific, design or safety analysis work supporting high energy reactor facilities, it refers to the requirements of this Standard.

The general management system requirements (Clause 4 of CSA N286) still apply but the technical requirements and supporting management system guidance might differ. This Standard is a quality assurance standard with specific ties to a management system meeting the applicable requirements of CSA N286. To prevent duplication, specific references to N286 are provided within this Standard. The business is responsible to ensure the applicable requirements of this Standard are complied with whether self-performed or subcontracted.

The Canadian nuclear industry has recognized the need to establish rigorous and effective requirements for application of quality assurance process to computer programs. In 1999, CSA had issued the CSA N286.7 Standard that specifies requirements for analytical tools used to design, analyze or support safety related systems of the nuclear power plants replacing the draft issued in 1994. CSA N286.7-99 contained high-level requirements that need interpretation or clarification in order to be implemented. This resulted in development of the CSA N286.7.1-09 Guidance document having a main purpose to assist practitioners within management organizations in the preparation and implementation of software quality assurance processes in compliance with CSA N286.7-99.

This Standard amalgamates the CSA N286.7.1 guidance document, *Guideline for the application of N286.7*, within the body of the Standard. As such, the N286.7.1 Standard will not be maintained.

During the preparation of this Standard, stakeholders recognized two distinct areas of related activity and this Standard has been organized to reflect this:

a) Design, development and maintenance of analytical software; and
b) Acquisition, qualification, control and use of analytical software tools within the overall management system.

This Standard was prepared by the Subcommittee on Quality Assurance of Analytical, Scientific, and Design Computer Programs under the jurisdiction of the Technical Committee on Management Systems for Nuclear Facilities and the Strategic Steering Committee on Nuclear Standards.

Notes:

1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*

3) *This Standard was developed by consensus, which is defined by* CSA Policy governing standardization — Code of good practice for standardization *as "substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity". It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Standard.*
4) *To submit a request for interpretation of this Standard, please send the following information to inquiries@csagroup.org and include "Request for interpretation" in the subject line:*
   a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
   b) *provide an explanation of circumstances surrounding the actual field condition; and*
   c) *where possible, phrase the request in such a way that a specific "yes" or "no" answer will address the issue.*

   Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization *and are available on the Current Standards Activities page at standardsactivities.csa.ca.*
5) *This Standard is subject to review within five years from the date of publication. Suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include "Proposal for change" in the subject line:*
   a) *Standard designation (number);*
   b) *relevant clause, table, and/or figure number;*
   c) *wording of the proposed change;*
   d) *rationale for the change.*

N286.7-16
Quality assurance of analytical, scientific, and design computer programs

1 Scope

1.1

1.1.1
This Standard addresses quality assurance requirements for software used in design, safety analysis, and supporting activities.

1.1.2
This Standard specifies the requirements for the quality assurance program applicable to the design, development, maintenance, modification, acquisition, and use of analytical, scientific, and design computer programs that are used in high energy reactor applications.

Note: *High energy reactor as defined in Clause 7.1 of CSA N286.*

Such computer programs are used by or for the business to perform or support
a) design and analysis of equipment, systems, structures, and components that impact safety, as identified by management;
b) deterministic and probabilistic safety analyses and operational reliability studies;
c) reactor physics and fuel management calculations; and
d) transfer of data between computer programs or pre- or post-processing calculations associated with Items a), b), and c) of Clause 1.1.2.

1.1.3
The quality assurance requirements for software used to perform or support the activities are described in this Standard. This Standard recognizes that the scope has two parts and has been organized to reflect this:
a) design, development and maintenance of software; and
b) acquisition, qualification, control and use of software.

1.2
This Standard applies to software used by or for the business as described in Clause 1.1.2 including the following:
a) in-house developed computer programs: (i.e., software developed within the business);
b) third-party computer programs: (i.e., software developed by a supplier);
c) legacy software; and
d) programmed applications (e.g., scripts, macros, and spreadsheet-based analysis) written within software normally excluded from this Standard.