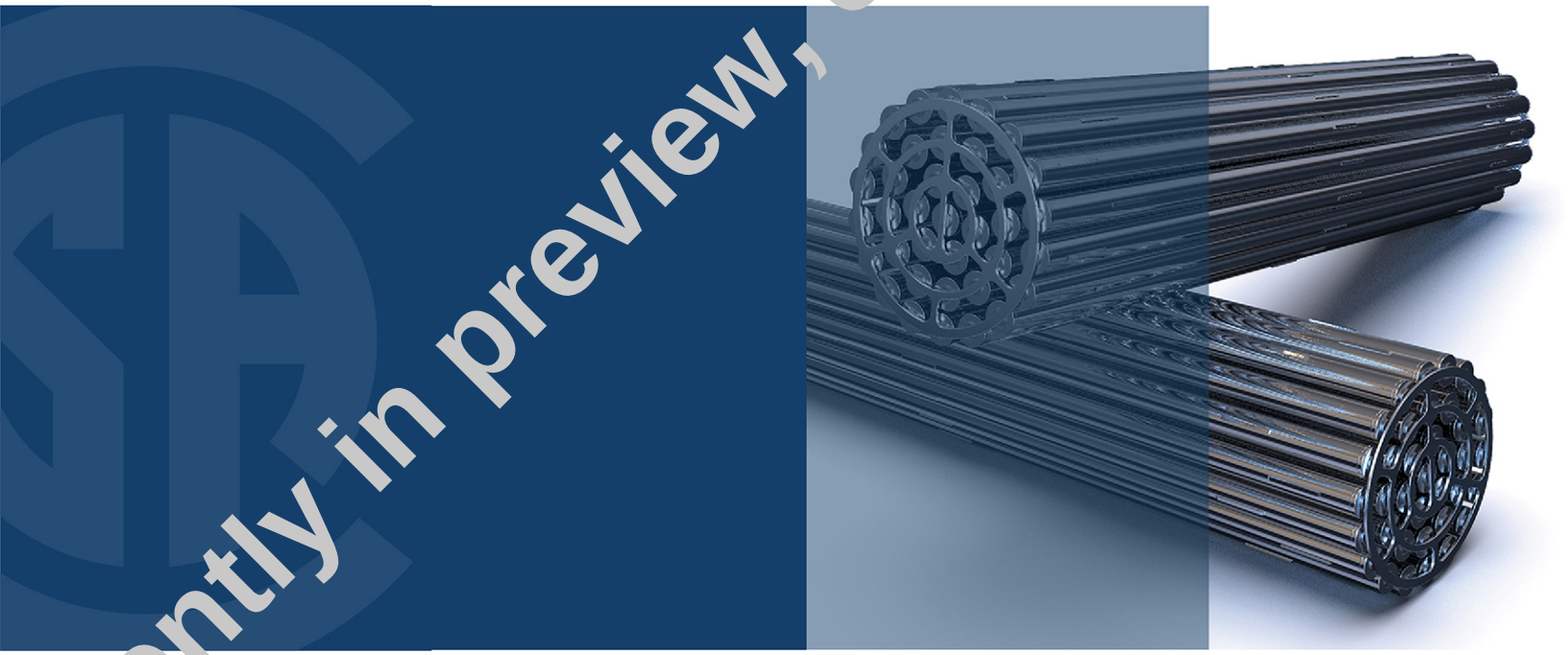
CSA N287.6:22

Pre-operational proof and leakage rate testing requirements for concrete containment structures for nuclear power plants



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.

Standards Update Service

CSA N287.6:22
January 2022

Title: *Pre-operational proof and leakage rate testing requirements for concrete containment structures for nuclear power plants*

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 **2129291**.

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.

CSA N287.6:22

Pre-operational proof and leakage rate testing requirements for concrete containment structures for nuclear power plants

Published in January 2022 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.

ICS 27.120.20
ISBN 978-1-4883-3907-3

Contents

Technical Committee on Concrete Containment and Safety-Related Structures

J. Tcherner	SNC-Lavalin Nuclear Inc./Candu Energy Inc., Mississauga, Ontario, Canada *Category: Service Industry*	*Chair*
JP. D. Brock	Framatome Canada, Pickering, Ontario, Canada *Category: Service Industry*	*Vice-Chair*
M. Moland	New Brunswick Power Corporation, Maces Bay, New Brunswick, Canada *Category: Owner/Operator/Producer*	*Vice-Chair*
T. S. Aziz	TSAziz Consulting Inc., Mississauga, Ontario, Canada *Category: General Interest*	
R. Cullen	Kinectrics Inc., Toronto, Ontario, Canada *Category: Service Industry*	
T. Dziedziejko	AECON Infrastructure, Caledon, Ontario, Canada *Category: Service Industry*	
A. El Aghoury	Canadian Nuclear Laboratories Limited (CNL), Chalk River, Ontario, Canada *Category: Owner/Operator/Producer*	
R. J. El Frenn	DYWIDAG-Systems International, Canada, Ltd., Gormley, Ontario, Canada *Category: Supplier/Fabricator/Contractor*	
J. Gibson	Bruce Power, Tiverton, Ontario, Canada *Category: Owner/Operator/Producer*	
X. M. Han	Milton, Ontario, Canada	*Non-voting*
B. Kadhom	National Research Council of Canada, Ottawa, Ontario, Canada *Category: Government and/or Regulatory Authority*	

R. Kianoush	Ryerson University, Toronto, Ontario, Canada *Category: General Interest*	
K. McBride	Hilti Canada, Mississauga, Ontario, Canada *Category: Supplier/Fabricator/Contractor*	
T. Nitheanandan	Canadian Nuclear Safety Commission, Ottawa, Ontario, Canada *Category: Government and/or Regulatory Authority*	
D. K. Panesar	University of Toronto, Toronto, Ontario, Canada *Category: General Interest*	
P. K. Siriya	Ontario Power Generation Inc., Pickering, Ontario, Canada *Category: Owner/Operator/Producer*	
R. Sobotka	Terrestrial Energy, Oakville, Ontario, Canada *Category: Supplier/Fabricator/Contractor*	
P. R. Trunk	P R Trunk Ltd., Midland, Ontario, Canada	*Non-voting*
S. van Rassel	Dayton Superior Co., Toronto, Ontario, Canada *Category: Supplier/Fabricator/Contractor*	
T. W. Whyte	Ontario Power Generation Inc., Pickering, Ontario, Canada	*Non-voting*
C. Zou	CSA Group, Toronto, Ontario, Canada	*Project Manager*

Subcommittee on Pre-operational Proof and Leakage Rate Testing Requirements for Concrete Containment Structures for Nuclear Power Plants

J. Tcherner	SNC-Lavalin Nuclear Inc./Candu Energy Inc., Mississauga, Ontario, Canada	*Chair*
M. Baker	Ontario Power Generation, Pickering, Ontario, Canada	
J. Gibson	Bruce Power, Tiverton, Ontario, Canada	
R. Hickingbottom	Ontario Power Generation Inc. Nuclear, Pickering, Ontario, Canada	
M. King	NB Power, Maces Bay, New Brunswick, Canada	
T. Nitheanandan	Canadian Nuclear Safety Commission, Ottawa, Ontario, Canada	
G. D. Zakaib	Retired Professional, Toronto, Ontario, Canada	
C. Zou	CSA Group, Toronto, Ontario, Canada	*Project Manager*

Preface

This is the fifth edition of CSA N287.6, *Pre-operational proof and leakage rate testing requirements for concrete containment structures for nuclear power plants*. It supersedes the previous editions, published in 2011, 1994, 1980, and 1978.

The major changes to this edition include the following:
- terminology was clarified by modifying definitions to align with common definitions and other nuclear standards;
- personnel qualification requirements were added;
- requirements for entry into containment were added;
- requirements for leakage rate calculations and associated instrumentation were clarified;
- documentation requirements were clarified;
- alignment to N287.7 was improved; and
- the requirements of Annex C were clarified.

This Standard reflects Canadian regulatory requirements, the operating experience of the Canadian nuclear industry, and international practices. The Standard was originally written for CANDU® reactors but can be used for other concrete containment structures as applicable.

Note: *CANDU (CANada Deuterium Uranium) is a registered trademark of Atomic Energy of Canada Limited (AECL).*

The CSA N-Series Standards provide an interlinked set of requirements for the management of nuclear facilities and activities. CSA N286 provides overall direction to management to develop and implement sound management practices and controls, while the other CSA Group nuclear Standards provide technical requirements and guidance that support the management system. This Standard works in harmony with CSA N286 and does not duplicate the generic requirements of CSA N286; however, it might provide more specific direction for those requirements.

This Standard specifies examination and testing requirements that will ensure that concrete containment structures are built using techniques and work practices that meet the quality and standards commensurate with the safety principles necessary to comply with the Canadian nuclear safety philosophy.

This Standard is part of the CSA N287 series of Standards, which provides the requirements for concrete containment structures for nuclear power plants. These Standards were initiated in response to a recognition by the utilities and industries concerned with nuclear power plant structures in Canada of a need for consistent standards for the design, construction, and testing of concrete containment structures for nuclear power plants.

The CSA N287 series of Standards consists of eight Standards. The objectives of each Standard are summarized as follows:
- CSA N287.1, *General requirements for concrete containment structures for nuclear power plants*, specifies general requirements for the design, construction, testing, commissioning, and in-service examination and testing of concrete containment structures for nuclear power plants and is directed to the owners, designers, manufacturers, fabricators, and constructors;
- CSA N287.2, *Material requirements for concrete containment structures for nuclear power plants*, specifies requirements for materials used for concrete containment structures;
- CSA N287.3, *Design requirements for concrete containment structures for nuclear power plants*, specifies requirements for the design of concrete containment structures;