CSA Group

CSA N287.1:14
(reaffirmed 2019)

General requirements for concrete containment structures for nuclear power plants

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CSA Group

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CSA N287.1:14
February 2014

Title: *General requirements for concrete containment structures for nuclear power plants*

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Published in February 2014 by CSA Group
A not-for-profit private sector organization
178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3

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or call toll-free 1-800-463-6727 or 416-747-4044.

ISBN 978-1-77139-350-8

Contents

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Preface

This is the fourth edition of CSA N287.1, *General requirements for concrete containment structures for nuclear power plants.* It supersedes the previous editions, published in 1993, 1982, and 1977 under the title *General requirements for concrete containment structures for CANDU nuclear power plants*. The title has been changed to reflect a change in scope, from addressing only CANDU® reactors to including all types of nuclear power plants.

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

The purpose of this Standard is to provide general requirements to ensure that the design, construction, and testing of concrete containment structures will meet a quality and standard commensurate with the safety principles necessary to comply with the Canadian nuclear safety philosophy.

The CSA N-series of Standards provides 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 its generic requirements; however, it might provide more specific direction for those requirements.

The Standards in the CSA N287 series of 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 seven Standards. The objectives of each Standard are summarized as follows:

a) CSA N287.1-14, *General requirements for concrete containment structures for nuclear power plants,* specifies general requirements for the design, construction, testing, and commissioning of concrete containment structures for nuclear power plants designated as class containment and is directed to the owners, designers, manufacturers, fabricators, and constructors of the concrete components and parts;
b) CSA N287.2-08, *Material requirements for concrete containment structures for CANDU nuclear power plants,* specifies requirements for materials used in concrete containment structures;
c) CSA N287.3-14, *Design requirements for concrete containment structures for nuclear power plants,* specifies requirements for the design of concrete containment structures;
d) CSA N287.4-09, *Construction, fabrication, and installation requirements for concrete containment structures for CANDU nuclear power plants,* specifies construction, fabrication, and installation requirements that apply to concrete containment structures of a containment system designated as class containment components, parts, and appurtenances for CANDU® nuclear power plants;
e) CSA N287.5-11, *Examination and testing requirements for concrete containment structures for nuclear power plants,* specifies examination and testing requirements that apply to the work of any organization participating in the construction, fabrication, or installation of parts or components of concrete containment structures for nuclear power plants;
f) CSA N287.6-11, *Pre-operational proof and leakage rate testing requirements for concrete containment structures for nuclear power plants,* specifies requirements for proof by demonstration, before first criticality, that the design and construction of a concrete containment structure are satisfactory with respect to quality and performance as demonstrated by achieving the specified requirements of CSA N287.6, including commissioning leakage rate target; and

g) CSA N287.7-08, *In-service examination and testing requirements for concrete containment structures for CANDU nuclear power plants,* specifies uniform requirements whereby, through systematic and periodic examination, the structural and leak-tight integrity of concrete containment structures can be assessed as demonstrated by achieving the specified requirements of CSA N287.7, including the operational leakage rate target.

In the preparation of these Standards, it was the decision of the Committee to make use of existing Standards, Codes, and other reference material wherever possible.

Users of this Standard are reminded that the design, manufacture, construction, commissioning, operation, and decommissioning of nuclear facilities in Canada are subject to the provisions of the *Nuclear Safety and Control Act*, and its supporting Regulations. Thus, requirements additional to those specified in this Standard might be imposed by the Canadian Nuclear Safety Commission.

This Standard was prepared by the Subcommittee on General Requirements for Concrete Containment Structures for Nuclear Power Plants, under the jurisdiction of the Technical Committee on Concrete Containment and Safety-Related Structures and the Strategic Steering Committee on Nuclear Standards, and has been formally approved by the Technical Committee.

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 five years from the date of publication, and 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; and*
   d) *rationale for the change.*

CSA N287.1:14
General requirements for concrete containment structures for nuclear power plants

1 Scope

1.1

This Standard provides general requirements for the design, fabrication, construction, installation, examination, and commissioning as well as the in-service examination, testing, and evaluation of reinforced (prestressed and non-prestressed) concrete containment structures for nuclear power plants designated as class containment. It is directed to the owners/operators, designers, manufacturers, fabricators, and constructors of the concrete components and parts.

Notes:

1) *This Standard is applicable to new nuclear power plants' concrete containment structures to be built in Canada. Application of the Standard to concrete containment structures to be built outside Canada is subject to approval of the authority having jurisdiction (AHJ). The application of the Standard to existing or operating nuclear power plants is as agreed upon by the owner/operator and the AHJ.*
2) *The requirements of the CSA N287 series of Standards generally exceed the requirements of the* National Building Code of Canada*.*
3) *In Canada, CNSC RD-337 provides the regulatory requirements for the design of new containment structures.*

1.2

This Standard defines the responsibilities of organizations and individuals with respect to the functions mentioned in Clause 1.1 together with the pertinent documentation required as a statement of quality assurance.

Note: *A basic interaction organizational chart and basic interaction chart for documentation are provided in Annex A.*

1.3

This Standard includes general requirements for metallic and nonmetallic parts, such as containment liners, anchorage systems, and appurtenances, that form part of the containment boundary and that are placed in their final position within the concrete or are attached to the concrete.

1.4

This Standard includes definitions that are applicable in this Standard and in the other Standards forming the N287 series of Standards.

1.5

In this Standard, "shall" is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; "should" is used to express a recommendation or that which is advised but not required; and "may" is used to express an option or that which is permissible within the limits of the standard.