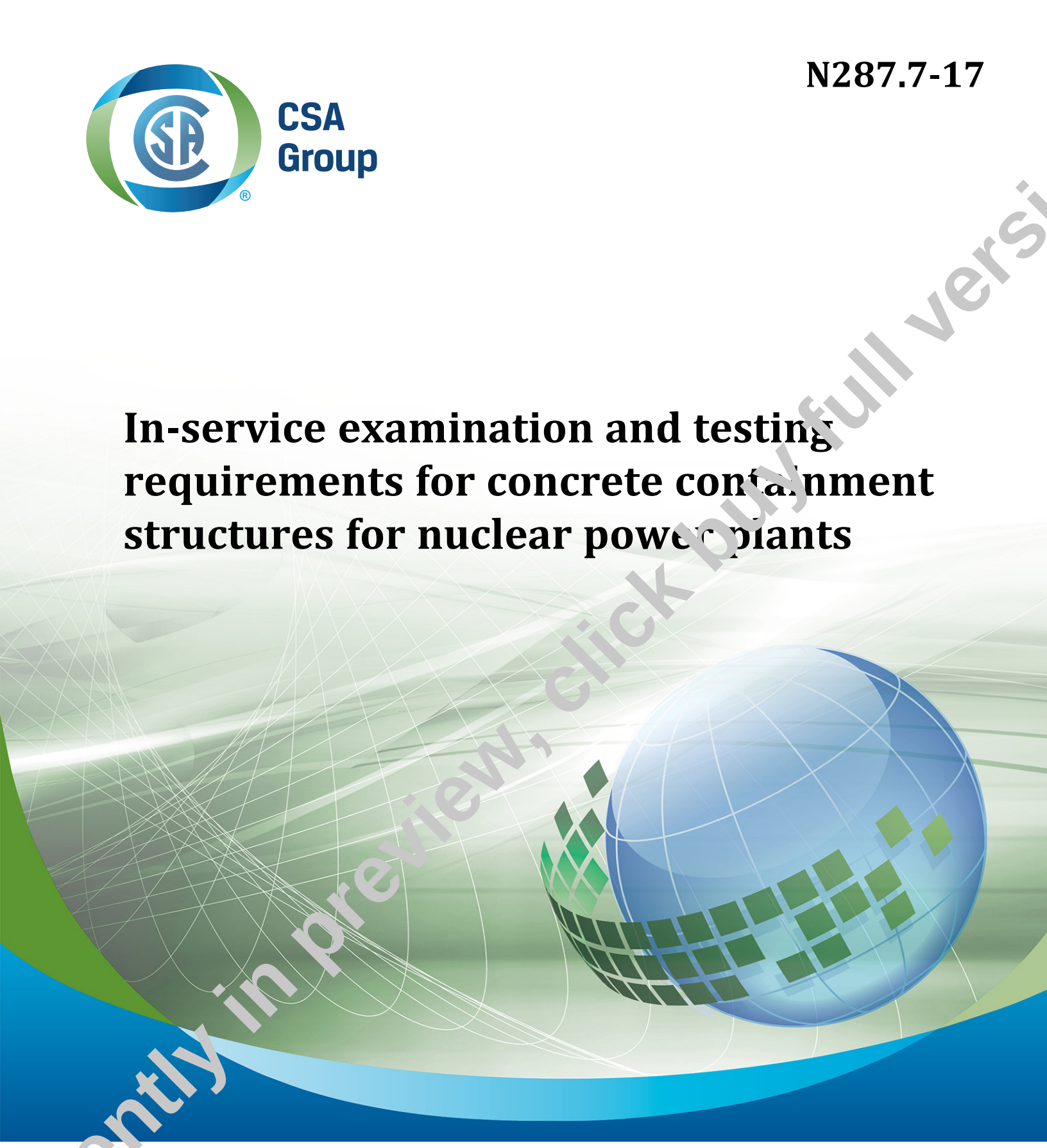
CSA Group

N287.7-17

In-service examination and testing requirements for concrete containment structures for nuclear power plants



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Preface

This is the fifth edition of CSA N287.7, *In-service examination and testing requirements for concrete containment structures for nuclear power plants*. It supersedes the previous editions published in 2008, 1996, 1980, and 1975 under the title *In service examination and testing requirements for concrete containment structures for CANDU® nuclear power plants*. It reflects Canadian regulatory requirements, 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. The title has been changed to reflect this.

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

The following are the significant technical changes to this edition:

- Terminology has been clarified by modifying definitions to align with common definitions and other nuclear standards.
- Performance based pressure test requirements have been clarified for vacuum retaining containment structures that are designed for negative pressure only.
- When the pre-operational proof test in accordance with CSA N287.6 is to be performed has been clarified.
- Table 1 has been modified to address industry concerns related to availability of instrumentation.
- Personnel responsibilities and qualification requirements have been added.
- Requirements for entry into containment during ILRT have been added.
- Material leakage rate test requirements have been clarified.
- Supplemental ILRT requirements have been clarified.
- Documentation requirements have been clarified.
- Annex F has been clarified, considering limitations of existing containment structures.

This Standard provides uniform rules whereby, through systematic and periodic examination, the structural and leak-tight integrity of concrete containment structures can be assessed. This Standard is part of the N287 series of Standards, which provides the requirements for concrete containment structures for nuclear power plants. These Standards were initiated in response to the recognition by the utilities and industries concerned with nuclear structures in Canada of a need for Standards applicable to the design, construction, and testing of concrete containment structures for nuclear power plants.

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.

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;
- CSA N287.4, *Construction, fabrication, and installation requirements for concrete containment structures for CANDU nuclear power plants*, specifies construction, fabrication, and installation requirements for concrete containment structures for CANDU nuclear power plants;
- CSA N287.5, *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 concrete containment structures for nuclear power plants;
- CSA N287.6, *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;
- CSA N287.7, *In-service examination and testing requirements for concrete containment structures for 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; and
- CSA N287.8, *Aging management for concrete containment structures for nuclear power plants*, provides aging management requirements for concrete containment structures for nuclear power plants and is directed to the owners/operators, designers, manufacturers, fabricators, and constructors.

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 Regulations. Requirements additional to those specified in this Standard could be imposed by the Canadian Nuclear Safety Commission.

This Standard was prepared by the Subcommittee on In-Service Examination and Testing Requirements for Concrete Containment Structures for Nuclear Power Plants, under the jurisdiction of the Technical Committee on Concrete Containment and Safety Related Structures for Nuclear Power Plants 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 a 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; and*
   d) *rationale for the change.*

N287.7-17
In-service examination and testing requirements for concrete containment structures for nuclear power plants

1 Scope

1.1
This Standard provides requirements for in-service examinations of concrete containment structure which includes, but is not limited to the following structural and non-structural elements:

a) concrete;
b) reinforcement (pre-stressed and non-pre-stressed);
c) steel (e.g., liner, embedded parts, anchors);
d) non-metallic liners and coating systems;
e) joint sealants; and
f) elements necessary to support containment structure (e.g. foundations).

1.2
This Standard also provides requirements for integrated leakage rate testing (ILRT) of the containment boundary.

1.3
In-service examination of containment system components designed in accordance with the CSA N285 series of Standards are beyond the scope of this Standard.

Note: *CSA N285.5 provides requirements for periodic inspection of CANDU nuclear power plant containment components that are made of metallic or plastic materials and that form the containment boundary or are part of fluid handling systems that penetrate the containment structure.*

1.4
This Standard is used in concert with the following standards, as applicable:

a) CSA N287.1, which outlines general requirements for concrete containment structures for nuclear power plants; and
b) CSA N287.8, which outlines aging management requirements for concrete containment structures for nuclear power plants.

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.

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.