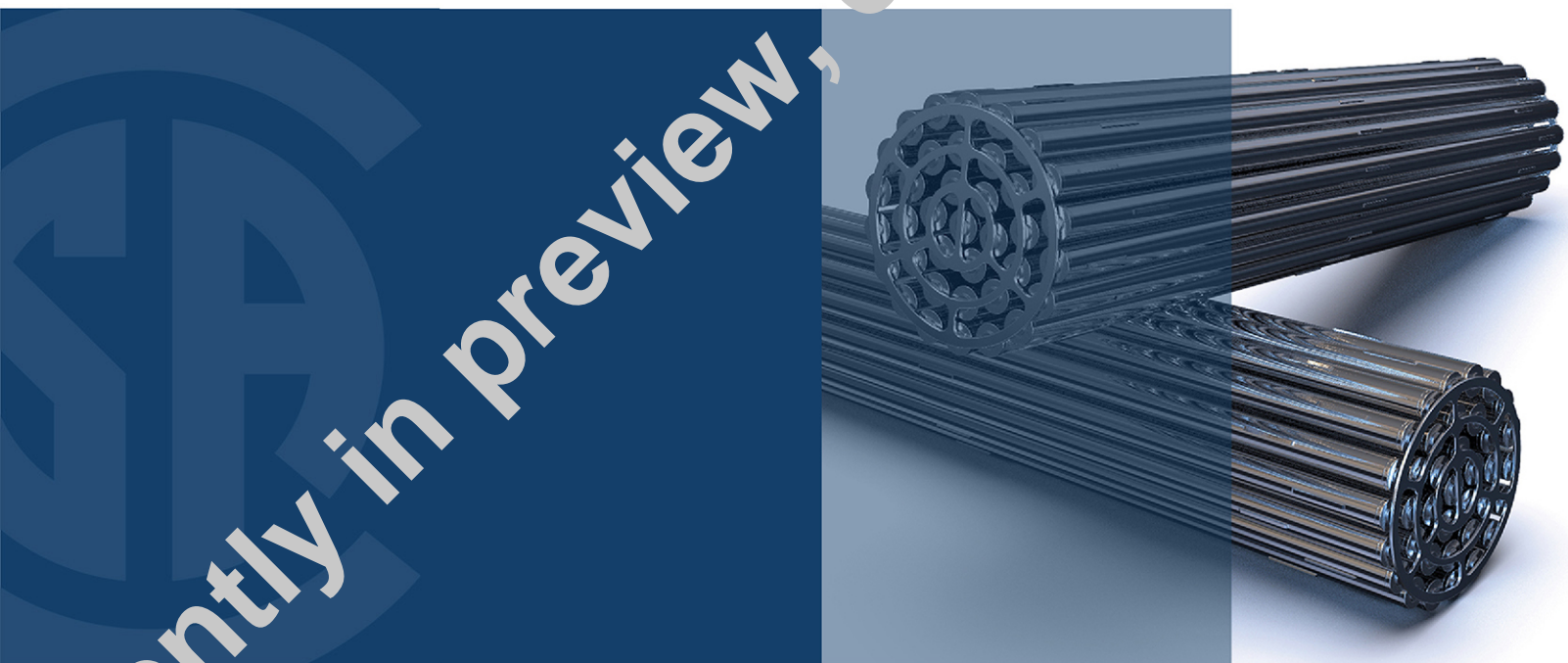


Requirements for reactor control systems of nuclear power plants



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Preface

This is the third edition of CSA N290.4, *Requirements for reactor control systems of nuclear power plants*. It supersedes the previous editions published in 2011 and in 1982 under the title *Requirements for the reactor regulating systems of CANDU nuclear power plants*. This edition addresses not only CANDU reactors but also other types of water-cooled power reactors.

The development of the original Standard was initiated by the Canadian Nuclear Association to help prospective owners of nuclear power plants, as well as designers, manufacturers, fabricators, and installers of nuclear power plant components. The Standard compiles good engineering practice, judgement, and experience with the various requirements of regulatory authorities.

Changes to this edition include the following:

- a) updates to align with CNSC REGDOC-2.5.2, and for improved integration with industry standards;
- b) updates to address design extension conditions to the extent they are applicable to reactor control systems (other requirements for beyond design basis accidents are addressed in CSA N290.16);
- c) additional requirements regarding start-up instrumentation have been provided; and
- d) requirements to enable a guaranteed shutdown state have been included.

The specific objective of this Standard is to establish the minimum requirements for the design, procurement, qualification, and installation of reactor control systems in nuclear power plants in order to ensure that they will operate as intended. The purpose of this Standard is not to limit improved system design but to provide a minimum base against which innovations and new techniques can be compared.

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 may provide more specific direction for those requirements.

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.

This Standard was prepared by the Subcommittee on Requirements for Reactor Control Systems of Nuclear Power Plants, under the jurisdiction of the Technical Committee on Reactor Control Systems, Safety Systems, and Instrumentation 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:
- define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;
 - provide an explanation of circumstances surrounding the actual field condition; and
 - 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:
- Standard designation (number);
 - relevant clause, table, and/or figure number;
 - wording of the proposed change; and
 - rationale for the change.

CSA N290.4:19

Requirements for reactor control systems of nuclear power plants

1 Scope

1.1

This Standard specifies requirements for the reactor control system (RCS) of water-cooled nuclear power plants (NPPs).

1.2

This Standard pertains to all components of the RCS, including mechanical, process, digital items, electrical, and instrumentation and control design used for the control of the neutron flux and the thermal power of the reactor.

Note: *Moderator purification systems which can be used to control flux are excluded from the scope of this Standard.*

1.3

In this Standard, “control” refers to both manual and automatic action.

1.4

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.

Notes to tables and figures are considered part of the table or figure and may be written as requirements.

Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

2 Reference publications

This Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below, including all amendments published thereto.

CSA (Canadian Standards Association)

N285.0-17/N285.6 Series-17

*General requirements for pressure-retaining systems and components in CANDU nuclear power plants/
Material Standards for reactor components for CANDU nuclear power plants*