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N289.5-12

Seismic instrumentation requirements for nuclear power plants and nuclear facilities

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Contents

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Preface

This is the second edition of CSA N289.5, *Seismic instrumentation requirements for nuclear power plants and nuclear facilities*. It supersedes the previous edition, published in 1991 under the title *Seismic instrumentation requirements for CANDU nuclear power plants*. The title of this Standard has been changed to reflect an extension of its scope: it now addresses not only CANDU® reactors but also any other nuclear power plant and nuclear facilities.

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

Standards in the CSA N289 Series of Standards were initiated in response to the recognition on the part of the utilities and industries concerned with nuclear facilities in Canada of a need for consistent standards for seismic design and qualification of nuclear structures, systems, and components (SSCs) of nuclear power plants. Although this compilation includes regulatory requirements (see below) in addition to those of a technical nature, users of these Standards should recognize that they have the force of law only when adopted by the Canadian Nuclear Safety Commission (CNSC) or, in countries other than Canada, the appropriate regulatory body.

The CSA N289 Series consists of five Standards:

(a) N289.1, *General requirements for seismic design and qualification of CANDU nuclear power plants* — provides guidelines for identifying structures and systems requiring seismic qualification based on nuclear safety considerations;

(b) N289.2, *Ground motion determination for seismic qualification of nuclear power plants* — determines the appropriate seismic ground motion parameters for a particular site;

(c) N289.3, *Design procedures for seismic qualification of nuclear power plant*s — provides design requirements and methods
   (i) for determining the engineering representation of ground motion, ground response spectra, and floor response spectra for use in the design and seismic qualification of SSCs; and
   (ii) for performing seismic qualification of specified SSCs by analytical methods;

(d) N289.4, *Testing procedures for seismic qualification of nuclear power plant structures, systems, and components* — provides design requirements and methods for seismic qualification of specific components and systems by testing; and

(e) N289.5, *Seismic instrumentation requirements for nuclear power plants and nuclear facilities* — establishes the requirements for seismic instrumentation.

The CSA N-Series Standards provide an interlinked set of requirements for the management of nuclear facilities and activities. The CSA N286 Standard 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. 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 Regulations. Thus, requirements additional to those specified in this Standard might be imposed by the CNSC.

This Standard was prepared by the Subcommittee on Seismic Instrumentation Requirements for Nuclear Power Plants and Nuclear Facilities, under the jurisdiction of the Technical Committee on Seismic Design 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 periodic review, 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.

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0 Introduction

0.1 Objective

This Standard provides a basis for specifying requirements for seismic instrumentation. The recorded data of seismic activity will be used to compare actual and predicted responses, and to assess the need for further detailed inspections. This Standard aids owners of nuclear power plants and nuclear facilities in the determination of the extent and nature of instrumentation to be installed. It also is intended to aid owners and equipment suppliers by specifying instrumentation commensurate with Canadian nuclear safety principles.

Note: *See Table 1 for a summary of the requirements for, and the number and locations of, accelerometers for various nuclear facilities.*

0.2 Application

Users of this Standard will apply only one clause from Clauses 4 to 7 depending on the type of facility. Unless specifically stated otherwise, all other clauses and annexes in this Standard apply to all facilities listed in Clause 1.1, regardless of type.

Note: *For example, owners of new nuclear power plants and new on-site nuclear facilities would apply Clauses 1 to 3, 5, and 8 to 10.*

1 Scope

1.1 General

1.1.1 Requirements for nuclear power plants and nuclear facilities

This Standard describes the requirements for seismic instrumentation systems for nuclear power plants and nuclear facilities to monitor site-specific seismic responses. These plants and facilities include

(a) existing nuclear power plants and on-site nuclear facilities (e.g., spent fuel bays, dry fuel storage) (see Clause 4);
Note: *"On-site" generally means within the protected area.*
(b) new nuclear power plants and on-site nuclear facilities (e.g., spent fuel bays, dry fuel storage) (see Clause 5);
(c) new small reactors and on-site nuclear facilities (see Clause 6);
(d) new enriched fuel processing, fabrication, and storage facilities (see Clause 7); and
(e) new high- and intermediate-level radioactive waste storage facilities not in proximity to a nuclear power plant (see Clause 7).

Notes:

(1) *"Existing nuclear power plants and nuclear facilities" refers to those licensed for operation prior to the publication date of this Standard.*

(2) *The requirements for new builds and existing plants might differ. Where requirements differ for new builds and existing plants, the difference is explicitly stated.*