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Design of nuclear power plants against seismic events —

Part 1: Principles

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Partie 1: Principes

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection*, Subcommittee SC 6, *Reactor technology*.

A list of all parts in the ISO 4917 series can be found on the ISO website.

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Introduction

In accordance with IAEA Safety Standards Series No. SSR-2/1, protective measures against seismic events are required, provided earthquakes must be taken into consideration.

Earthquakes comprise that group of design basis external events that requires taking preventive plant engineering measures against damage and which are relevant with respect to radiological effects on the environment.

This document will be applied under the presumption that the geology and tectonics of the plant site have been investigated with special emphasis on the existence of active geological faults and lasting geological ground displacements, and that the site has been deemed suitable for a nuclear installation.

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Design of nuclear power plants against seismic events —

Part 1: Principles

1 Scope

This document applies to nuclear power plants with water cooled reactors and, in particular, to the design of components and civil structures against seismic events in order to meet the safety objectives. For other nuclear facilities the applicability of the document must be checked in advance, before it might be applied correspondingly. Seismic isolation is not addressed in [the series of ISO 4917](#).

The following safety objectives are defined in order to ensure the protection of people and the environment against radiation risks:

- a) ~~a)~~ controlling reactivity;
- b) ~~b)~~ cooling fuel assemblies;
- c) ~~c)~~ confining radioactive substances;
- d) ~~d)~~ limiting radiation exposure.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

~~IAEA Specific Safety Guide No. SSG-9 (Rev. 1), *Seismic Hazards in Site Evaluation for Nuclear Installations*, INTERNATIONAL ATOMIC ENERGY AGENCY VIENNA, (2022)~~

~~IAEA Safety Standards Series No. SSG-67, *Seismic Design for Nuclear Installations*, INTERNATIONAL ATOMIC ENERGY AGENCY VIENNA (2021)~~

[IAEA Safety Standards Series No., SSG-67, *Seismic Design for Nuclear Installations*, INTERNATIONAL ATOMIC ENERGY AGENCY VIENNA, \(2021\)](#)

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain ~~terminological~~[terminology](#) databases for use in standardization at the following addresses:

— IEC Electropedia: available at <https://www.electropedia.org/>

— ISO Online browsing platform: available at <https://www.iso.org/obp> <https://www.iso.org/obp>

— IEC Electropedia: available at <https://www.electropedia.org/>

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3.1 action

impact of an external force (e.g. seismic action)

3.2 action effect

internal force inside a structure (e.g. force, moment)

3.3 active geological fault

fault showing evidence of past movements (e.g. recent seismicity or geological evidence) within such a period that it is reasonable to assume that further movements can occur

Note_1_to_entry: For areas of low seismicity evidence of last movements in the quaternary (until $\approx 2,6 \cdot 10^6$ a) or including Pliocene (until $\approx 5,3 \cdot 10^6$ a) **maycan** be appropriate to consider. For higher seismic areas shorter periods **maycan** be considered.

Note_2_to_entry: A geological fault need also to be considered active if a structural relationship with a known active geological fault is demonstrated or likely. In this case the movement of one fault **maycan** cause the movement of the other.

Note_3_to_entry: The definition is equivalent to "capable fault" in IAEA Glossary (2018).

3.4 beyond design basis earthquake

decisive level of ground motion which exceeds the design basis earthquake

3.5 building response spectrum

~~<in structure response spectrum> response spectrum (3.33) at a specific point or level of the building structure (it corresponds to floor response spectrum)~~

3.6 civil structure

building structure that is connected to the ground and consists of structural and non-structural elements (building materials and structural members)

Note_1_to_entry: ——— It may be necessary to perform the verification of earthquake safety for "civil structures" in their entirety as well as for the individual parts ("structural members").

3.76 complete quadratic combination CQC

stochastically based superposition relationship for oscillating systems in order to take account of the coupling of eigenmodes in modal analyses

3.87 component

electrical, instrumentation and control, and mechanical equipment that ensures the operation of the nuclear facility, including distribution systems and their support structures

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