
Bases for design of structures — General requirements

Bases du calcul des constructions — Exigences générales

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 22111 was prepared by Technical Committee ISO/TC 98, *Bases for design of structures*, Subcommittee SC 2, *Reliability of structures*.

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Introduction

This International Standard incorporates the general principles of structural design set out in ISO 2394. It covers the partial factors method, and ISO 2394 should be consulted for other methods.

This International Standard is relevant to the design of any structure, and as with all standards, a degree of judgement should be used in the normal course of engineering.

It has been drafted with wording and format suitable for direct use by practising engineers when the appropriate levels of safety have been chosen, and the relevant national loading and materials standards referenced by National Authorities. It is a template intended to facilitate the widespread use of International Standards.

The annexes give guidance on adoption of this International Standard but need not be included in the National Standard.

This International Standard has the following aims.

- a) To facilitate international practice in structural design.
- b) To obtain international standardization of the process for setting up rules for structural design, while allowing each economy to specify its own levels of structural performance, in accordance with its own needs.
- c) To provide a means of promoting commonality, interchangeability, consistency and comparability of structural standards developed by different economies. Regulators, standards writers, designers and academics could then adopt such standards with confidence in their international acceptance.
- d) To encourage regulatory authorities in each country to describe their mandatory requirements in an internationally agreed format.
- e) To facilitate future coordination between the various specialist subcommittees and working groups for ISO structural Standards.
- f) To create transparency in the process of comparison of National Standards.

Voorbeeld
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Bases for design of structures — General requirements

1 Scope

This International Standard specifies the general requirements for the structural design of buildings and industrial and civil engineering structures using reliability-based concepts.

This International Standard is applicable to the design of complete structures, the structural elements making up the structure and the foundation. Information on the assessment of existing structures is given in ISO 13822.

To allow for the differences in design practice between different countries, certain parameters are left to be quantified by national building codes or standards.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 2394:1998, *General principles on reliability for structures*

ISO 3898:1997, *Bases for design of structures — Notations — General symbols*

ISO 8930:1987, *General principles on reliability for structures — List of equivalent terms*

ISO 13822:2001, *Bases for design of structures — Assessment of existing structures*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8930 and the following apply.

3.1

accidental action

action that is unlikely to occur with a significant value on a given structure over a given reference period

NOTE Adapted from ISO 8930:1987.

3.2

accompanying action

for a particular combination of actions, an action taken as being at a reduced value with respect to its maximum extreme design value

3.3

characteristic value of an action

principal representative value of an action

NOTE 1 Adapted from ISO 8930:1987.

NOTE 2 It is chosen

- a) either, when a statistical basis is available, so that it can be considered to have a prescribed probability of not being exceeded (towards unfavourable values) during a reference period, or
- b) on acquired experience, or
- c) on physical constraints.

3.4 combination value of a variable action

value chosen, insofar as it can be determined on a statistical basis, so that the probability that the effects caused by the combination will be exceeded is approximately the same as by the characteristic value of an individual action

NOTE 1 It may be expressed as a certain part of the characteristic value by using a factor $\psi_0 \leq 1,0$.

NOTE 2 Adapted from ISO 8930:1987.

3.5 deformability

deformability is the capacity to resist displacement-based actions

NOTE Examples of displacement-based actions are indirect actions such as seismic ground motions, differential settlement and volume changes in structural materials.

3.6 design situation

set of conditions under which the design is required to demonstrate that relevant limit states are not exceeded during a specific time interval

NOTE Adapted from ISO 2394:1998.

3.7 design working life

duration of the period during which a structure or a structural element, when designed, is assumed to perform for its intended purpose with expected maintenance but without major repair being necessary

NOTE Adapted from ISO 2394:1998.

3.8 direct action

set of concentrated or distributed forces acting on the structure

[ISO 8930:1987]

3.9 durability

ability of a structure or a structural element to maintain adequate performance for a given time under expected actions and environmental influences

3.10 dynamic action

action which causes significant accelerations of the structure or structural members

[ISO 8930:1987]

3.11 fixed action

action which has a fixed distribution on a structure, such as its magnitude and direction, determined unambiguously for the whole structure when determined at one point on the structure

NOTE Adapted from ISO 8930:1987.

3.12**free action**

action which may have any distribution in space over the structure, within certain limits

[ISO 8930:1987]

3.13**frequent value of a variable action**

value determined, insofar as it can be determined on a statistical basis, so that either the total time, within the reference period, during which it is exceeded is only a small part of the reference period, or the frequency of it being exceeded is limited to a given value

NOTE 1 It may be expressed as a determined part of the characteristic value by using a factor $\psi_1 \leq 1,0$.

NOTE 2 Adapted from ISO 8930:1987.

3.14**indirect action**

set of deformations or accelerations imposed on a structure or constrained within it

NOTE Adapted from ISO 8930:1987.

3.15**leading action**

for a particular combination of actions, the action that is taken to be at its maximum extreme design value

3.16**limit states**

states beyond which a structure no longer satisfies the design requirements

[ISO 8930:1987]

NOTE These boundaries between desired and undesired performance of the structure are often represented mathematically by "limit-state functions".

3.17**maintenance**

total set of activities performed during the design working life of a structure to enable it to fulfil the requirements for reliability

[ISO 2394:1998]

3.18**occupancy action**

variable action imposed on the structure due to the intended use or occupancy of the structure

3.19**partial factors format**

calculation format in which allowance is made for the uncertainties and variabilities assigned to the basic variables by means of representative values, partial factors and, if relevant, additive quantities

[ISO 2394:1998]

NOTE The load and resistance factor format is a version of the partial factor format.

3.20**permanent action**

action which is likely to act throughout a given reference period of time, and for which the variation in magnitude with time around its mean value is negligible, or for which the variation is monotonic (i.e. always in the same direction) until the action attains a certain limiting value

NOTE Adapted from ISO 8930:1987.

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