
**Houses — Description of
performance —**

**Part 1:
Structural safety**

Constructions d'habitation — Description des performances —

Partie 1: Sécurité de la structure

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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.

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 documents 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 59, *Buildings and civil engineering works*, Subcommittee SC 15, *Performance description of houses*.

This second edition cancels and replaces the first edition (ISO 15928-1:2003), which has been technically revised.

ISO 15928 consists of the following parts, under the general title *Houses — Description of performance*:

- *Part 1: Structural safety*
- *Part 2: Structural serviceability*
- *Part 3: Structural durability*
- *Part 4: Fire safety*
- *Part 5: Operating energy*

The following part is under preparation:

- *Part 6: Sustainable development contributions*

Introduction

This part of ISO 15928 is one of a series of standards. The objective of the ISO 15928- series is to identify the methods that will be used to describe the performance of houses. The ISO 15928- series is confined to buildings occupied for residential purposes that may be separated or linked horizontally, but not linked vertically, and which have their own access and do not share any common space.

Each part of the ISO 15928- series relates to a separate attribute. The parts of ISO 15928 do not specify levels of performance and they are not intended to replace national standards or regulations, but provide a standardized framework to be used for development of national standards and regulations consistent with World Trade Organization (WTO) requirements. The parts of ISO 15928 do not provide design methods and/or design criteria.

Based on the framework provided by the ISO 15928- series, purchasers, regulators and standards-preparers in respective countries can describe their requirements in standardized performance terms, as appropriate. Additionally, the manufacturers/providers can respond by describing the performance of their products in a similar manner.

The purpose of this part of ISO 15928 is to provide a standardized system of describing performance that can be used to specify performance requirements and performance levels, or to rate houses, in terms of structural safety.

NOTE The WTO *Agreement on technical barriers to trade*, Clause 2.8, states: “Whenever appropriate, members shall specify technical regulations based on product requirements in terms of performance, rather than design or descriptive characteristics.”

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Houses — Description of performance —

Part 1: Structural safety

1 Scope

This part of ISO 15928 sets out a method for describing the structural safety performance of houses. It covers objectives, provides performance descriptions, establishes parameter descriptions, and outlines evaluation processes. It includes a description of permanent, imposed, wind, seismic, snow and other actions as well as structural resistance.

This part of ISO 15928 is intended for use in the evaluation of the design and construction of houses, in the international trading of houses or their sub-systems, and in developing risk-management tools for the protection of houses.

The ISO 15928- series does not specify a level of performance and it is not intended to provide a design method and/or criteria.

It describes the structural safety of a house as a whole.

NOTE 1 [Annex A](#) includes background information on this part of ISO 15928, guidance on its use, and suggestions on good practice.

NOTE 2 Details on references referred to in Notes are provided in a Bibliography.

NOTE 3 Structural serviceability, durability and other attributes are covered in other parts of ISO 15928.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2394, *General principles on reliability for structures*

ISO 6707-1, *Buildings and civil engineering works — Vocabulary — Part 1: General terms*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2394, ISO 6707-1 and the following apply.

3.1 action

force acting on a structure, or cause of deformation imposed on a structure or constrained within it

Note 1 to entry: In North America, the term 'load' is preferred and used in place of 'action'.

Note 2 to entry: In ISO 15928, the term 'load' is used to indicate the value of a force corresponding to an action.

Note 3 to entry: See ISO 6707-1:2014, 9.3.22 for the definition of 'force'.

3.2

basic ground snow depth

ground snow depth for a particular site before modifications are made for surrounding environment

3.3

basic wind speed

wind speed at a specified height and a specified terrain for a particular site before modifications are made for surrounding environment

3.4

house

building occupied for residential purposes and designed as one unit (dwelling) with its own access

Note 1 to entry: The house can be a separate building, or linked horizontally with another house but not linked vertically.

Note 2 to entry: Where houses are linked, each has its own access and does not share any space in common with another.

Note 3 to entry: Where houses are linked, services including those related to energy usage and supply, heating and ventilation may be shared.

Note 4 to entry: Where houses are linked, the wall between the houses is typically designed and constructed to limit the probability of fire spread between houses.

Note 5 to entry: See ISO 6707-1:2014, 3.1.3 for the definition of 'building'.

3.5

objective

statement concerning the purpose of the description of performance which is to express user needs

3.6

parameters

<structural safety> group of variables used to quantitatively describe the structural safety performance

3.7

performance

behaviour of houses related to use

3.8

representative value of an action

value used as a reference for the description of performance

4 Structural safety performance

4.1 Objective

The structural capacity of a house to resist all actions which may affect the safety of the occupants of the house and may also lead to property damage to the house or an adjacent property, shall be such that the risk of collapse or other kind of severe damage resulting from structural failure shall not exceed a level acceptable to the user.

4.2 Performance description

The performance description is the capacity of the whole house and its parts, with an appropriate degree of reliability, to maintain their strength and stability under all actions likely to occur.

The structural safety performance may be described by the magnitudes of the structural actions on the house and the resistance behaviour of the house under the effects of those actions.

NOTE 1 The appropriate degree of reliability can be judged with due regard to the possible consequences of failure and the expense level of effort and procedures necessary to reduce the risk of failure. Aspects that are important in achieving the proper degree of reliability include choice of structural systems, design and analysis, durability design, quality control, maintenance and protective measures.

NOTE 2 For the purposes of this part of ISO 15928, the durability of materials are not considered to have a bearing on the structural performance of the house.

5 Parameters for the description of performance

5.1 Parameters for describing actions

5.1.1 Permanent actions

The permanent actions, other than self-weight, are described by the magnitude(s) in kilonewtons and the location(s) of the imposed load(s).

5.1.2 Imposed actions

The imposed actions are described by the representative values of one or more of:

- a) a uniformly distributed floor or roof load, in kilopascals,
- b) a concentrated floor or roof load, in kilonewtons, over a specified area, in square metres,
- c) a concentrated wall impact load, in kilonewtons, applied at a specified height, in metres, above the floor, and
- d) a uniformly distributed horizontal line load, in kilonewtons per metre, applied at a specified height, in metres, above the floor.

NOTE 1 ISO 2103[1] provides minimum recommended imposed actions for different types of use and occupancy.

NOTE 2 An example of d) is the load on a hand rail.

5.1.3 Wind actions

Wind actions are described by the representative value of the wind velocity, in metres per second, derived from the basic wind speed, factored as appropriate to take into account local effects, terrain, shielding, topography, altitude, etc., based on one of the following wind velocity types:

- a) 3-s gust;
- b) 1-min mean;
- c) 10-min mean;
- d) hourly mean.

The effect of windborne debris on internal pressures should be considered.

NOTE Refer to ISO 4354[2] for details on the conversion of wind velocity to wind forces and conversion between different types of wind velocity.

5.1.4 Seismic actions

Seismic actions are described by stating the representative value of one of the following parameters:

- a) the effective peak ground acceleration, expressed as a fraction of gravity;
- b) the base shear coefficient;
- c) the ground acceleration response spectrum for the site.

The proportion of the imposed loads to be included in the seismic mass shall also be nominated.

The representative value shall be based on a consideration of the seismic activity, the soil characteristics of the construction site and the response behaviour of the structure.

NOTE ISO 3010[3] provides additional information on seismic action on structures.

5.1.5 Snow actions

The snow actions are described by stating the representative values of:

- a) the ground snow depth, in metres, derived from the basic snow depth, factored to take into account local effects such as terrain, shielding, topography, etc.;
- b) the snow density, in kilograms per cubic metre, i.e. the density to be used in converting the ground snow depth into a load; and
- c) the duration, in days per year.

NOTE ISO 4355[4] provides information on the conversion of ground snow depths to roof snow loads.

5.1.6 Other actions

Consideration shall be given to the description of other actions arising from floods, tornados, tsunamis, potentially unstable sites, windborne debris, temperature, impact, explosion etc., if these actions are likely to affect the safety of the house.

5.1.7 Combinations of actions

Consideration shall be given to the description of the combinations of the actions to account for the probability of simultaneous occurrence of two or more actions.

5.2 Parameters for describing structural resistance

5.2.1 General

The resistance of the house under the effects of the actions can be described in terms of limit state criteria or allowable stress criteria for materials with recognized engineering properties in accordance with 5.2.2 or 5.2.3 and ISO 2394 where appropriate. Materials without recognized engineering properties may be described in accordance with ISO 2394.

Reference should be made to relevant International Standards when available.

5.2.2 Resistance based on limit state criteria

The following information shall be provided:

- a) strength reduction factor (resistance factor or partial safety factors);
- b) characteristic material strengths;

- c) testing methods from which the characteristic material strengths are determined.

5.2.3 Resistance based on allowable stress criteria

The following information shall be provided:

- a) factor of safety for stress criteria;
- b) characteristic material strengths;
- c) testing methods from which the characteristic strengths are determined.

6 Evaluation

6.1 General

Evaluation may be carried out by:

- a) analysis,
- b) testing,
- c) service experience, or
- d) combination of the above.

The characteristic values of material properties used for analysis should be derived from International or other appropriate test standards.

6.2 Analysis

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Action effects on individual structural members shall be determined by methods of structural analysis that take into account equilibrium, general stability, geometric compatibility, and both short- and long-term material properties. Members that tend to accumulate residual deformations under repeated service loads shall have included in their analysis the added eccentricities expected to occur during the design working life.

6.3 Testing

Testing shall incorporate a realistic representation of materials, loading conditions, boundary conditions and construction practices. Testing for evaluating structural response shall be full scale unless all scale effects can be appropriately estimated.

NOTE See ISO 2394:2015, Annex D, for the use of testing in design.

6.4 Service experience

Service experience shall comprise a sufficient number of representative examples, exposed to similar or more severe service conditions, together with adequate documentation.

6.5 Combination

A combination of analysis, testing and service experience may be used for evaluation. Simplified analytical procedures using a combination of testing and service experience may be used.