INTERNATIONAL STANDARD

ISO 15928-1

First edition
2003-12-01

Houses — Description of performance —

Part 1: Structural safety

Constructions d'habitation — Description des performances —

Partie 1: Sécurité de la structure

Reference number
ISO 15928-1:2003(E)

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Published in Switzerland

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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.

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.

ISO 15928-1 was prepared by Technical Committee ISO/TC 59, *Building construction*, Subcommittee SC 15, *Performance criteria for single family attached and detached dwellings*.

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

— *Part 1: Structural safety*

Further parts are in preparation.

Introduction

The objective of the ISO 15928 series of standards is to identify the methods that will be used to describe the performance of houses. Each standard will relate to a separate attribute. The standards will not specify levels of performance and they are not intended to replace national standards or regulations, but provide a standardized framework to enable national standards and regulations to be developed in accordance with WTO requirements. These standards will not provide design methods and/or design criteria.

Based on the framework provided by these standards, purchasers, regulators and standards-preparers in respective countries can describe their requirements in standardized performance terms. Additionally, the manufacturers/providers will be able to respond by describing the performance of their products in a similar manner.

The purpose of this International Standard 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 World Trade Organization (WTO) *Agreement on technical barriers to trade*, 1997, 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."

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 user needs, 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.

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

Annex A includes background information on this part of ISO 15928, guidance on its use, and suggestions on good practice.

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

NOTE Structural serviceability, durability and other attributes will be covered in future parts of ISO 15928.

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*

3 Terms and definitions

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

3.1
basic ground snow depth
ground snow depth for a particular site before modifications are made for surrounding environment

3.2
basic wind speed
wind speed at a specified height and a specified terrain for a particular site before modifications are made for surrounding environment

3.3
house
building occupied for residential purposes which may be separated or linked horizontally, but not linked vertically, which has its own access and does not share any common space

3.4
load
value of a force corresponding to an action

3.5
parameters (structural)
group of variables used to quantitatively describe the structural safety performance

NOTE Structural parameters consist of variables describing

— magnitudes of the actions,

— magnitudes of structural resistance, and

— other conditions that may affect the structural safety performance.

3.6
performance
behaviour of houses related to users' needs

3.7
structural safety performance
behaviour of houses under possible actions related to human lives

NOTE In the above definitions, “action” is defined as in ISO 2394.

4 Structural safety performance

4.1 User needs

The risk of collapse or other kind of severe damage resulting from structural failure, which may affect the life safety of the house occupants in the house, or people in its vicinity, 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 during its design working life.

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 In addition, it is expected that the house would not be damaged by unexpected events, such as explosion, impact or consequences of human error, to an extent disproportionate to the original cause.

NOTE 3 Likely actions may include those arising from soil/structure interaction, probable ground movements, compatibility of connections between subsystems and the effects of openings.

NOTE 4 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.

4.3 Principles for describing structural safety performance

The structural safety performance may be described by nominating the structural actions on the house and the resistance of the structure under the effect of those actions.

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 structural 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 structure 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.

NOTE 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) a combination of the above.

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

6.2 Analysis

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 2394:1998, 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.