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Eurocode 1 - Einwirkungen auf Tragwerke - Teil 1-3: Allgemeine Einwirkungen, Schneelasten

Eurocode 1 - Actions sur les structures - Partie 1-3: Actions générales - Charges de neige

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Eurocode 1 - Actions sur les structures - Partie 1-3: Actions générales - Charges de neige

Eurocode 1 - Einwirkungen auf Tragwerke - Teil 1-3: Allgemeine Einwirkungen-Schneelasten

This European Standard was approved by CEN on 9 October 2002.

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Foreword

This document (EN 1991-1-3:2003) has been prepared by Technical Committee CEN/TC250 “Structural Eurocodes”, the Secretariat of which is held by BSI.

This European Standard shall be given the status of a National Standard, either by publication of an identical text or by endorsement, at the latest by January 2004, and conflicting National Standards shall will be withdrawn at latest by January 2004.

This document supersedes ENV 1991-2-3:1995.

CEN/TC250 is responsible for all Structural Eurocodes.

Annexes A and B are normative. Annexes C, D and E are informative.

According to the CEN-CENELEC Internal Regulations, the National Standard Organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Background of the Eurocode programme

In 1975, the Commission of the European Community decided on an action programme in the field of construction, based on article 95 of the Treaty. The objective of the programme was the elimination of technical obstacles to trade and the harmonisation of technical specifications.

Within this action programme, the Commission took the initiative to establish a set of harmonised technical rules for the design of construction works which, in a first stage, would serve as an alternative to the national rules in force in the Member States and, ultimately, would replace them.

For fifteen years, the Commission, with the help of a Steering Committee with Representatives of Member States, conducted the development of the Eurocodes programme, which led to the first generation of European codes in the 1980’s.

In 1989, the Commission and the Member States of the EU and EFTA decided, on the basis of an agreement[1] between the Commission and CEN, to transfer the preparation and the publication of the Eurocodes to the CEN through a series of Mandates, in order to provide them with a future status of European Standard (EN). This links *de facto* the Eurocodes with the provisions of all the Council’s Directives and/or Commission’s Decisions dealing with European

[1] Agreement between the Commission of the European Communities and the European Committee for Standardisation (CEN) concerning the work on EUROCODES for the design of building and civil engineering works (BC/CEN/03/89).

standards (e.g. the Council Directive 89/106/EEC on construction products and Council Directives 93/37/EEC, 92/50/EEC and 89/440/EEC on public works and services and equivalent EFTA Directives initiated in pursuit of setting up the internal market).

The Structural Eurocode programme comprises the following standards generally consisting of a number of Parts:

EN 1990	Eurocode:	Basis of Structural Design
EN 1991	Eurocode 1:	Actions on structures
EN 1992	Eurocode 2:	Design of concrete structures
EN 1993	Eurocode 3:	Design of steel structures
EN 1994	Eurocode 4:	Design of composite steel and concrete structures
EN 1995	Eurocode 5:	Design of timber structures
EN 1996	Eurocode 6:	Design of masonry structures
EN 1997	Eurocode 7:	Geotechnical design
EN 1998	Eurocode 8:	Design of structures for earthquake resistance
EN 1999	Eurocode 9:	Design of aluminium structures

Eurocode standards recognise the responsibility of regulatory authorities in each Member State and have safeguarded their right to determine values related to regulatory safety matters at national level where these continue to vary from State to State.

Status and field of application of Eurocodes

The Member States of the EU and EFTA recognise that EUROCODES serve as reference documents for the following purposes :
– as a means to prove compliance of building and civil engineering works with the essential requirements of Council Directive 89/106/EEC, particularly Essential Requirement N°1 – Mechanical resistance and stability – and Essential Requirement N°2 – Safety in case of fire ;

– as a basis for specifying contracts for construction works and related engineering services ;

– as a framework for drawing up harmonised technical specifications for construction products (ENs and ETAs)

The Eurocodes, as far as they concern the construction works themselves, have a direct relationship with the Interpretative Documents[2] referred to in Article 12 of the CPD, although they are of a different nature from harmonised product standards[3]. Therefore, technical aspects arising from the Eurocodes

[2] According to Art. 3.3 of the CPD, the essential requirements (ERs) shall be given concrete form in interpretative documents for the creation of the necessary links between the essential requirements and the mandates for hENs and ETAGs/ETAs.

[3] According to Art. 12 of the CPD the interpretative documents shall :
a) give concrete form to the essential requirements by harmonising the terminology and the technical bases and indicating classes or levels for each requirement where necessary ;
b) indicate methods of correlating these classes or levels of requirement with the technical specifications, e.g. methods of calculation and of proof, technical rules for project design, etc. ;
c) serve as a reference for the establishment of harmonised standards and guidelines for European technical approvals.
The Eurocodes, *de facto*, play a similar role in the field of the ER 1 and a part of ER 2.

work need to be adequately considered by CEN Technical Committees and/or EOTA Working Groups working on product standards with a view to achieving a full compatibility of these technical specifications with the Eurocodes.

The Eurocode standards provide common structural design rules for everyday use for the design of whole structures and component products of both a traditional and an innovative nature. Unusual forms of construction or design conditions are not specifically covered and additional expert consideration will be required by the designer in such cases.

National Standards implementing Eurocodes

The National Standards implementing Eurocodes will comprise the full text of the Eurocode (including any annexes), as published by CEN, which may be preceded by a National title page and National foreword, and may be followed by a National Annex.

The National Annex may only contain information on those parameters which are left open in the Eurocode for national choice, known as Nationally Determined Parameters, to be used for the design of buildings and civil engineering works to be constructed in the country concerned, *i.e.* :

– values for partial factors and/or classes where alternatives are given in the Eurocode,

– values to be used where a symbol only is given in the Eurocode,

– country specific data (geographical, climatic etc.), e.g. snow map,

– the procedure to be used where alternative procedures are given in the Eurocode.

It may also contain

– decisions on the application of informative annexes,

– references to non-contradictory complementary information to assist the user to apply the Eurocode.

Links between Eurocodes and harmonised technical specifications (ENs and ETAs) for products

There is a need for consistency between the harmonised technical specifications for construction products and the technical rules for works[4]. Furthermore, all the information accompanying the CE Marking of the construction products which refer to Eurocodes should clearly mention which Nationally Determined Parameters have been taken into account.

Introduction - Additional information specific for EN 1991-1-3

EN 1991 1-3 gives design guidance and actions from snow for the structural design of buildings and civil engineering works.

[4] see Art.3.3 and Art.12 of the CPD, as well as clauses 4.2, 4.3.1, 4.3.2 and 5.2 of ID 1.

EN 1991 1-3 is intended for clients, designers, contractors and public authorities.

EN 1991 1-3 is intended to be used with EN 1990:2002, the other Parts of EN 1991 and EN 1992- EN 1999 for the design of structures.

National Annex for EN1991-1-3

This standard gives alternative procedures, values and recommendations for classes with notes indicating where national choices may have to be made. Therefore the National Standard implementing EN 1991-1-3 should have a National Annex containing nationally determined parameters to be used for the design of buildings and civil engineering works to be constructed in the relevant country.

National choice is allowed in EN 1991-1-3 through clauses:
1.1(2), 1.1(4)
2(3), 2(4)
3.3(1), 3.3(3),
4.1(1), 4.2(1), 4.3(1)
5.2(1), 5.2(4), 5.2(5), 5.2(6), 5.2(7), 5.3.3(4), 5.3.4(3), 5.3.5(1), 5.3.5(3), 5.3.6(1), 5.3.6(3)
6.2(2), 6.3(1), 6.3(2)
A(1) (through Table A1)

1. Section 1 General

1.1. Scope

(1) EN 1991-1-3 gives guidance to determine the values of loads due to snow to be used for the structural design of buildings and civil engineering works.

(2) This Part does not apply for sites at altitudes above 1 500 m, unless otherwise specified.

NOTE 1: Advice for the treatment of snow loads for altitudes above 1 500 m may be found in the National Annex.

(3) Annex A gives information on design situations and load arrangements to be used for different locations.

NOTE: These different locations may be identified by the National Annex.

(4) Annex B gives shape coefficients to be used for the treatment of exceptional snow drifts.

NOTE: The use of Annex B is allowed through the National Annex.

(5) Annex C gives characteristic values of snow load on the ground based on the results of work carried out under a contract specific to this Eurocode, to DGIII / D3 of the European Commission.

The objectives of this Annex are:

- to give information to National Competent Authorities to help them to redraft and update their national maps;
- to help to ensure that the established harmonised procedures used to produce the maps in this Annex are used in the member states for treating their basic snow data.

(6) Annex D gives guidance for adjusting the ground snow loads according to the return period.

(7) Annex E gives information on the bulk weight density of snow.

(8) This Part does not give guidance on specialist aspects of snow loading, for example:

- impact snow loads resulting from snow sliding off or falling from a higher roof;
- the additional wind loads which could result from changes in shape or size of the construction works due to the presence of snow or the accretion of ice;
- loads in areas where snow is present all year round;
- ice loading;
- lateral loading due to snow (e.g. lateral loads exerted by drifts);
- snow loads on bridges.

1.2. Normative references

This European Standard incorporates by dated or undated references provisions from other publications. These normative references are cited at the appropriate place in the text, and publications are listed hereafter.
For dated references, subsequent amendments to, or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

EN 1990:2002	Eurocode: Basis of structural design
EN 1991-1-1:2002	Eurocode 1: Actions on structures Part 1-1: General actions: Densities self weight and imposed loads for buildings

NOTE: The following European Standards, which are published or in preparation, are cited in normative clauses

EN 1991-2	Eurocode 1: Actions on structures Part 2: Traffic loads on bridges

1.3. Assumptions

The statements and assumptions given in EN 1990:2002, 1.3 apply to EN 1991-1-3.

1.4. Distinction between Principles and Application Rules

The rules given in EN 1990:2002, 1.4 apply to EN 1991-1-3.

1.5. Design assisted by testing

In some circumstances tests and proven and/or properly validated numerical methods may be used to obtain snow loads on the construction works.

NOTE: The circumstances are those agreed for an individual project, with the client and the relevant Authority.

1.6. Terms and Definitions

For the purposes of this European standard, a basic list of terms definitions given in EN 1990:2002, 1.5 apply together with the following.

1.6.1
characteristic value of snow load on the ground
snow load on the ground based on an annual probability of exceedence of 0,02, excluding exceptional snow loads.

1.6.2
altitude of the site
height above mean sea level of the site where the structure is to be located, or is already located for an existing structure.

1.6.3
exceptional snow load on the ground
load of the snow layer on the ground resulting from a snow fall which has an exceptionally infrequent likelihood of occurring.

NOTE: See notes to 2(3) and 4.3(1).

1.6.4
characteristic value of snow load on the roof
product of the characteristic snow load on the ground and appropriate coefficients.

NOTE: These coefficients are chosen so that the probability of the calculated snow load on the roof does not exceed the probability of the characteristic value of the snow load on the ground.

1.6.5
undrifted snow load on the roof
load arrangement which describes the uniformly distributed snow load on the roof, affected only by the shape of the roof, before any redistribution of snow due to other climatic actions.

1.6.6
drifted snow load on the roof
load arrangement which describes the snow load distribution resulting from snow having been moved from one location to another location on a roof, e.g. by the action of the wind.

1.6.7
roof snow load shape coefficient
ratio of the snow load on the roof to the undrifted snow load on the ground, without the influence of exposure and thermal effects.

1.6.8
thermal coefficient
coefficient defining the reduction of snow load on roofs as a function of the heat flux through the roof, causing snow melting.

1.6.9
exposure coefficient
coefficient defining the reduction or increase of load on a roof of an unheated building, as a fraction of the characteristic snow load on the ground.

1.6.10
load due to exceptional snow drift
load arrangement which describes the load of the snow layer on the roof resulting from a snow deposition pattern which has an exceptionally infrequent likelihood of occurring.

1.7. Symbols

(1) For the purpose of this European standard, the following symbols apply.

NOTE: The notation used is based on ISO 3898

(2) A basic list of notations is given in EN 1990:2002 1.6, and the additional notations below are specific to this Part.

Latin upper case letters

C_e	Exposure coefficient
C_t	Thermal coefficient
C_{esl}	Coefficient for exceptional snow loads
A	Site altitude above sea level [m]
S_e	Snow load per metre length due to overhang [kN/m]
F_s	Force per metre length exerted by a sliding mass of snow [kN/m]

Latin lower case letters

b	Width of construction work [m]
d	Depth of the snow layer [m]
h	Height of construction work [m]
k	Coefficient to take account of the irregular shape of snow (see also 6.3)
l_s	Length of snow drift or snow loaded area [m]

s Snow load on the roof [kN/m^2]

s_k Characteristic value of snow on the ground at the relevant site [kN/m^2]

s_{Ad} Design value of exceptional snow load on the ground [kN/m^2]

Greek Lower case letters

α Pitch of roof, measured from horizontal [^{o}]

β Angle between the horizontal and the tangent to the curve for a cylindrical roof [^{o}]

γ Weight density of snow [kN/m^3]

μ snow load shape coefficient

ψ_0 Factor for combination value of a variable action

ψ_1 Factor for frequent value of a variable action

ψ_2 Factor for quasi-permanent value of a variable action

NOTE: For the purpose of this standard the units specified in the above list apply.

2. Section 2 Classification of actions

(1)P Snow loads shall be classified as variable, fixed actions (see also 5.2), unless otherwise specified in this standard, see EN 1990:2002, 4.1.1 (1)P and 4.1.1 (4).

(2) Snow loads covered in this standard should be classified as static actions, see EN 1990:2002, 4.1.1 (4).

(3) In accordance with EN 1990:2002, 4.1.1 (2), for the particular condition defined in 1.6.3, exceptional snow loads may be treated as accidental actions depending on geographical locations.

NOTE: The National Annex may give the conditions of use (which may include geographical locations) of this clause.

(4) In accordance with EN 1990:2002, 4.1.1 (2), for the particular condition defined in 1.6.10, loads due to exceptional snow drifts may be treated as accidental actions, depending on geographical locations.

NOTE: The National Annex may give the conditions of use (which may include geographical locations) of this clause.