



# SLOVENSKI STANDARD

SIST EN 1991-1-1:2004

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BUXca Yý U.

SIST ENV 1991-2-1:1998

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**Eurocode 1: Vplivi na konstrukcije – 1-1. del: Splošni vplivi – Gostote, lastna teža, koristne obtežbe stavb**

Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings

Eurocode 1: Einwirkungen auf Tragwerke - Teil 1-1: Wichten, Eigengewicht und Nutzlasten im Hochbau

Eurocode 1: Actions sur les structures - Partie 1-1: Actions générales - Poids volumiques, poids propres, charges d'exploitation bâtiments

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**Ta slovenski standard je istoveten z: EN 1991-1-1:2002**

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**ICS:**

91.010.30	V^@ã}ãããã	Technical aspects
91.040.01	Stavbe na splošno	Buildings in general

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**en**

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English version

## Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings

Eurocode 1: Actions sur les structures - Partie 1-1: Actions  
générales - Poids volumiques, poids propres, charges  
d'exploitation bâtiments

Eurocode 1: Einwirkungen auf Tragwerke - Teil 1-1:  
Wichten, Eigengewicht und Nutzlasten im Hochbau

This European Standard was approved by CEN on 30 November 2001.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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## CONTENTS

	Page
<b>FOREWORD</b> .....	<b>4</b>
BACKGROUND OF THE EUROCODE PROGRAMME .....	4
STATUS AND FIELD OF APPLICATION OF EUROCODES .....	5
NATIONAL STANDARDS IMPLEMENTING EUROCODES.....	6
LINKS BETWEEN EUROCODES AND HARMONISED TECHNICAL SPECIFICATIONS (ENs AND ETAs) FOR PRODUCTS .....	6
ADDITIONAL INFORMATION SPECIFIC FOR EN 1991-1-1 .....	6
NATIONAL ANNEX FOR EN 1991-1-1 .....	7
<b>SECTION 1 GENERAL</b> .....	<b>8</b>
1.1 SCOPE .....	8
1.2 NORMATIVE REFERENCES .....	9
1.3 DISTINCTION BETWEEN PRINCIPLES AND APPLICATION RULES .....	9
1.4 TERMS AND DEFINITIONS.....	10
1.5 SYMBOLS .....	11
<b>SECTION 2 CLASSIFICATION OF ACTIONS</b> .....	<b>12</b>
2.1 SELF-WEIGHT .....	12
2.2 IMPOSED LOADS .....	12
<b>SECTION 3 DESIGN SITUATIONS</b> .....	<b>14</b>
3.1 GENERAL .....	14
3.2 PERMANENT LOADS .....	14
3.3 IMPOSED LOADS .....	14
3.3.1 <i>General</i> .....	14
3.3.2 <i>Additional provisions for buildings</i> .....	15
<b>SECTION 4 DENSITIES OF CONSTRUCTION AND STORED MATERIALS</b> .....	<b>16</b>
4.1 GENERAL .....	16
<b>SECTION 5 SELF-WEIGHT OF CONSTRUCTION WORKS</b> .....	<b>17</b>
5.1 REPRESENTATION OF ACTIONS .....	17
5.2 CHARACTERISTIC VALUES OF SELF-WEIGHT .....	17
5.2.1 <i>General</i> .....	17
5.2.2 <i>Additional provisions for buildings</i> .....	17
5.2.3 <i>Additional provisions specific for bridges</i> .....	18
<b>SECTION 6 IMPOSED LOADS ON BUILDINGS</b> .....	<b>19</b>
6.1 REPRESENTATION OF ACTIONS .....	19
6.2 LOAD ARRANGEMENTS.....	19
6.2.1 <i>Floors, beams and roofs</i> .....	19
6.2.2 <i>Columns and walls</i> .....	19
6.3 CHARACTERISTIC VALUES OF IMPOSED LOADS .....	20
6.3.1 <i>Residential, social, commercial and administration areas</i> .....	20
6.3.1.1 Categories.....	20
6.3.1.2 Values of actions .....	21
6.3.2 <i>Areas for storage and industrial activities</i> .....	24
6.3.2.1 Categories.....	24
6.3.2.2 Values for Actions.....	24
6.3.2.3 Actions induced by forklifts .....	25
6.3.2.4 Actions induced by transport vehicles.....	26

6.3.2.5 Actions induced by special devices for maintenance.....	27
6.3.3 <i>Garages and vehicle traffic areas (excluding bridges)</i> .....	27
6.3.3.1 Categories.....	27
6.3.3.2 Values of actions.....	27
6.3.4 <i>Roofs</i> .....	28
6.3.4.1 Categories.....	28
6.3.4.2 Values of actions.....	29
6.4 HORIZONTAL LOADS ON PARAPETS AND PARTITION WALLS ACTING AS BARRIERS.....	30
LOADED AREAS.....	31
<b>ANNEX A (INFORMATIVE) TABLES FOR NOMINAL DENSITY OF CONSTRUCTION MATERIALS, AND NOMINAL DENSITY AND ANGLES OF REPOSE FOR STORED MATERIALS.....</b>	<b>32</b>
<b>ANNEX B (INFORMATIVE) VEHICLE BARRIERS AND PARAPETS FOR CAR PARKS .....</b>	<b>43</b>

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## Foreword

This document (EN 1991-1-1:2002) has been prepared by Technical Committee CEN/TC 250 "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 October 2002, and conflicting national standards shall be withdrawn at the latest by March 2010.

CEN/TC 250 is responsible for all Structural Eurocodes.

This document supersedes ENV 1991-2-1:1995.

The annexes A and B are informative.

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

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## 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 1980s.

In 1989, the Commission and the Member States of the EU and EFTA decided, on the basis of an agreement<sup>1</sup> between the Commission and CEN, to transfer the preparation and the publication of the Eurocodes to 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 standards (e.g. the Council Directive 89/106/EEC on

<sup>1</sup> 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).

construction products - CPD - 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.

## iTeh STANDARD PREVIEW

### Status and field of application of Eurocodes

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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<sup>2</sup> referred to in Article 12 of the CPD, although they are of a different nature from harmonised product standards<sup>3</sup>. Therefore, technical aspects arising from the Eurocodes work need to be adequately considered by

<sup>2</sup> 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 harmonised ENs and ETAGs/ETAs.

<sup>3</sup> 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.

## EN 1991-1-1:2002 (E)

CEN Technical Committees and/or EOTA Working Groups working on product standards with a view to achieving 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 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<sup>4</sup>. 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.

### Additional information specific for EN 1991-1-1

EN 1991-1-1 gives design guidance and actions for the structural design of buildings and civil engineering works, including the following aspects:

- densities of construction materials and stored materials ;
- self-weight of construction elements, and
- imposed loads for buildings.

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<sup>4</sup> 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 1991-1-1 is intended for clients, designers, contractors and public authorities.

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

### **National annex for EN 1991-1-1**

This standard gives alternative procedures, values and recommendations for classes with notes indicating where National choices have to be made, therefore the National Standard implementing EN 1991-1-1 should have a National Annex containing all 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 1991-1-1 through:

- 2.2(3),
- 5.2.3(1) to 5.2.3(5),
- 6.3.1.1 (Table 6.1),
- 6.3.1.2(1)P (Table 6.2),
- 6.3.1.2(10) & (11),
- 6.3.2.2 (1)P (Table 6.4),
- 6.3.2.2 (3),
- 6.3.3.2(1) (Table 6.8),
- 6.3.4.2 (Table 6.10) and
- 6.4 (1)(P) (Table 6.12)

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## Section 1 General

### 1.1 Scope

(1) EN 1991-1-1 gives design guidance and actions for the structural design of buildings and civil engineering works including some geotechnical aspects for the following subjects:

- Densities of construction materials and stored materials;
- Self-weight of construction works;
- Imposed loads for buildings.

(2) Section 4 and Annex A give nominal values for densities of specific building materials, additional materials for bridges and stored materials. In addition for specific materials the angle of repose is provided.

(3) Section 5 provides methods for the assessment of the characteristic values of self-weight of construction works.

(4) Section 6 gives characteristic values of imposed loads for floors and roofs according to category of use in the following areas in buildings:

- residential, social, commercial and administration areas;
- garage and vehicle traffic areas;
- areas for storage and industrial activities;
- roofs;
- helicopter landing areas.

(5) The loads on traffic areas given in Section 6 refer to vehicles up to a gross vehicle weight of 160 kN. The design for traffic areas for heavy vehicles of more than 160 kN gross weight needs to be agreed with the relevant authority. Further information may be obtained from EN 1991-2.

(6) For barriers or walls having the function of barriers, horizontal forces are given in Section 6. Annex B gives additional guidance for vehicle barriers in car parks.

NOTE Forces due to vehicle impact are specified in EN 1991-1-7 and EN 1991-2.

(7) For the design situations and effects of actions in silos and tanks caused by water or other materials see EN 1991-3.

## 1.2 Normative References

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the 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).

NOTE 1 The Eurocodes were published as European Prestandards. The following European Standards which are published or in preparation are cited in normative clauses :

EN 1990	Eurocode : Basis of Structural Design
EN 1991-1-7	Eurocode 1: Actions on structures: Part 1-7: Accidental actions from impact and explosions
EN 1991-2	Eurocode 1: Actions on structures: Part 2: Traffic loads on bridges
EN 1991-3	Eurocode 1: Actions on structures: Part 3: Actions induced by cranes and machinery
EN 1991-4	Eurocode 1: Actions on structures: Part 4: Actions in silos and tanks

NOTE 2 The Eurocodes were published as European Prestandards. The following European Standards which are published or in preparation are cited in NOTES to normative clauses :

EN 1991-1-3	Eurocode 1: Actions on structures: Part 1-3: Snow loads
EN 1991-1-4	Eurocode 1: Actions on structures: Part 1-4: Wind actions
EN 1991-1-6	Eurocode 1: Actions on structures: Part 1-6: Actions during execution

## 1.3 Distinction between Principles and Application Rules

(1) Depending on the character of the individual clauses, distinction is made in this Part between Principles and Application Rules.

(2) The Principles comprise:

- general statements and definitions for which there is no alternative, as well as
- requirements and analytical models for which no alternative is permitted unless specifically stated.

(3) The Principles are identified by the letter P following the paragraph number.

(4) The Application Rules are generally recognised rules which comply with the Principles and satisfy their requirements.

(5) It is permissible to use alternative design rules different from the Application Rules given in EN 1991-1-1 for works, provided that it is shown that the alternative rules accord with the relevant Principles and are at least equivalent with regard to the structural safety, serviceability and durability which would be expected when using the Eurocodes.

NOTE If an alternative design rule is substituted for an Application Rule, the resulting design cannot be claimed to be wholly in accordance with EN 1991-1-1 although the design will remain in accordance with

## EN 1991-1-1:2002 (E)

the Principles of EN 1991-1-1. When EN 1991-1-1 is used in respect of a property listed in an Annex Z of a product standard or an ETAG, the use of an alternative design rule may not be acceptable for CE marking.

(6) In this Part the Application Rules are identified by a number in brackets, e.g. as this clause.

### 1.4 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in ISO 2394, ISO 3898, ISO 8930 and the following apply. Additionally for the purposes of this standard a basic list of terms and definitions is provided in EN 1990, 1.5.

#### 1.4.1

##### **bulk weight density**

the bulk weight density is the overall weight per unit volume of a material, including a normal distribution of micro-voids, voids and pores

NOTE: In everyday usage this term is frequently abbreviated to “density” (which is strictly mass per unit volume).

#### 1.4.2

##### **angle of repose**

the angle of repose is the angle which the natural slope of the sides of a heaped pile of loose material makes to the horizontal

#### 1.4.3

##### **gross weight of vehicle**

the gross weight of a vehicle includes the self-weight of the vehicle together with the maximum weight of the goods it is permitted to carry

#### 1.4.4

##### **structural elements**

structural elements comprise the primary structural frame and supporting structures. For bridges, structural elements comprise girders, structural slabs and elements providing support such as cable stays

#### 1.4.5

##### **non structural elements**

non structural elements are those that include completion and finishing elements connected with the structure, including road surfacing and non-structural parapets. They also include services and machinery fixed permanently to, or within, the structure

**1.4.6****partitions**

non load bearing walls

**1.4.7****movable partitions**

movable partitions are those which can be moved on the floor, be added or removed or re-built at another place

**1.5 Symbols**

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

NOTE The notation used is based on ISO 3898: 1997.

(2) A basic list of symbols is provided in EN 1990 clause 1.6 and the additional notations below are specific to this part of EN 1991.

*Latin upper case letters*

A	loaded area
$A_0$	basic area
$Q_k$	characteristic value of a variable concentrated load

*Latin lower case letters*

$g_k$	weight per unit area, or weight per unit length
$n$	number of storeys
$q_k$	characteristic value of a uniformly distributed load, or line load

*Lower case Greek letters*

$\alpha_A$	reduction factor
$\alpha_n$	reduction factor
$\gamma$	bulk weight density
$\varphi$	dynamic magnification factor
$\psi_0$	factor for combination value of a variable action, see table A.1.1 of EN 1990
$\phi$	angle of repose (degrees)