# SLOVENSKI STANDARD
# oSIST prEN 1991-1-1:2023

**01-maj-2023**

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**Eurocode 1 - Vplivi na konstrukcije - 1-1. del: Specifična teža materialov, lastna teža konstrukcijskih del in koristne obtežbe stavb**

Eurocode 1 - Actions on structures - Part 1-1: Specific weight of materials, self-weight of construction works and imposed loads on buildings

Eurocode 1 - Einwirkungen auf Tragwerke - Teil 1-1: Allgemeine Einwirkungen - Wichte von Baustoffen und Lagergütern, Eigengewicht von Bauwerken und Nutzlasten im Hochbau

Eurocode 1 - Actions sur les structures - Partie 1-1 : Poids spécifique des matériaux, poids propre des ouvrages et charges d'exploitation des bâtiments



**Ta slovenski standard je istoveten z:** **prEN 1991-1-1**

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**ICS:**

| | | |
|---|---|---|
| 91.010.30 | Tehnični vidiki | Technical aspects |
| 91.040.01 | Stavbe na splošno | Buildings in general |

**oSIST prEN 1991-1-1:2023** **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# DRAFT
# prEN 1991-1-1

March 2023

ICS 91.010.30

Will supersede EN 1991-1-1:2002

English Version

# Eurocode 1 - Actions on structures - Part 1-1: General actions - Specific weight of materials, self-weight of construction works and 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: Allgemeine Einwirkungen auf Tragwerke - Wichten, Eigengewicht und Nutzlasten im Hochbau

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 250.

If this draft becomes a European Standard, 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.



This draft European Standard was established by CEN 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 CEN-CENELEC Management Centre has the same status as the official versions.



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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

# Contents

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## European foreword

This document (prEN 1991-1-1:2023) has been prepared by Technical Committee CEN/TC 250 “Structural Eurocodes”, the secretariat of which is held by BSI.

CEN/TC 250 is responsible for all Structural Eurocodes and has been assigned responsibility for structural and geotechnical design matters by CEN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1991-1-1:2002.

The first generation of EN Eurocodes was published between 2002 and 2007. This document forms part of the second generation of the Eurocodes, which have been prepared under Mandate M/515 issued to CEN by the European Commission and the European Free Trade Association.

The Eurocodes have been drafted to be used in conjunction with relevant execution, material, product and test standards, and to identify requirements for execution, materials, products and testing that are relied upon by the Eurocodes.

The Eurocodes recognize the responsibility of each Member State and have safeguarded their right to determine values related to regulatory safety matters at national level through the use of National Annexes.

# Introduction

## 0.1 Introduction to the Eurocodes

The Structural Eurocodes comprise the following standards generally consisting of a number of Parts:

— EN 1990 Eurocode: Basis of structural and geotechnical 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

— New parts are under development, e.g. Eurocode for design of structural glass



The Eurocodes are intended for use by designers, clients, manufacturers, constructors, relevant authorities (in exercising their duties in accordance with national or international regulations), educators, software developers, and committees drafting standards for related product, testing and execution standards.

NOTE Some aspects of design are most appropriately specified by relevant authorities or, where not specified, can be agreed on a project-specific basis between relevant parties such as designers and clients. The Eurocodes identify such aspects making explicit reference to relevant authorities and relevant parties.

## 0.2 Introduction to EN 1991 (all parts)

(1) EN 1991 specifies actions for the structural and geotechnical design of buildings, bridges and other civil engineering works, or parts thereof, including temporary structures, in conjunction with EN 1990 and the other Eurocodes.

(2) EN 1991 does not cover the specific requirements of actions for seismic design. Provisions related to such requirements are given in EN 1998 (all parts), which complement and are consistent with EN 1991.

(3) EN 1991 is also applicable to existing structures for:

— structural assessment,

— strengthening or repair,

— change of use.

NOTE In these cases additional or amended provisions can be necessary.

(4) EN 1991 is also applicable for the design of structures where materials or actions outside the scope of the other Eurocodes are involved.

NOTE In this case additional or amended provisions can be necessary.

### 0.3 Introduction to EN 1991-1-1

EN 1991-1-1 gives rules on the following aspects related to actions, which are relevant to the structural design of buildings and civil engineering works including some geotechnical aspects:

— specific weight of construction materials and stored materials;

— self-weight of construction works; and

— imposed loads for buildings.

### 0.4 Verbal forms used in the Eurocodes

The verb “shall” expresses a requirement strictly to be followed and from which no deviation is permitted in order to comply with the Eurocodes.

The verb “should” expresses a highly recommended choice or course of action. Subject to national regulation and/or any relevant contractual provisions, alternative approaches could be used/adopted where technically justified.

The verb “may” expresses a course of action permissible within the limits of the Eurocodes.

The verb “can” expresses possibility and capability; it is used for statements of fact and clarification of concepts.



### 0.5 National Annex for EN 1991-1-1



National choice is allowed in this standard where explicitly stated within notes. National choice includes the selection of values for Nationally Determined Parameters (NDPs).

The national standard implementing EN 1991-1-1 can have a National Annex containing all national choices to be used for the design of buildings and civil engineering works to be constructed in the relevant country.

When no national choice is given, the default choice given in this standard is to be used.

When no national choice is made and no default is given in this standard, the choice can be specified by a relevant authority or, where not specified, agreed for a specific project by appropriate parties.

National choice is allowed in EN 1991-1-1 through the following clauses:

| | | | |
|---|---|---|---|
| 5.4.3 (1) | 5.4.3 (2) – 2 choices | 5.4.3 (3) | 5.4.3 (4) |
| 5.4.3 (5) | 6.2.2 (2) | 6.5.2 (1) | 6.5.2 (2) |
| 6.5.3.1 (2) | 6.5.3.1 (3) | 6.5.3.2 (2) | 6.5.3.2 (5) |
| 6.5.3.2 (6) | 6.5.3.2 (7) | 6.5.3.4 (3) – 3 choices | 6.5.6.1 (1) |
| 6.5.6.2 (1) – 2 choices | 6.5.6.3 (1) | 6.6.2 (1) – 2 choices | 6.6.2 (2) |

National choice is allowed in EN 1991-1-1 on the application of the following informative annexes:

— Annex A.

The National Annex can contain, directly or by reference, non-contradictory complementary information for ease of implementation, provided it does not alter any provisions of the Eurocodes.

# 1 Scope

## 1.1 Scope of EN 1991-1-1

(1) EN 1991-1-1 gives rules on the following aspects related to actions, which are relevant to the structural design of buildings and civil engineering works including some geotechnical aspects:

— specific weight of construction materials and stored materials;

— self-weight of construction works;

— imposed loads for buildings.

(2) Mean values for specific weight of specific construction materials, additional materials for bridges, stored materials and products are given. In addition, for specific materials and products the angle of repose is provided.

(3) Methods for the assessment of the characteristic values of self-weight of construction works are given.

(4) Characteristic values of imposed loads are given for the following areas in buildings according to the category of use:

— residential, social, commercial and administration areas;

— areas for archive, storage and industrial activities;

— garage and vehicle traffic areas (excluding bridges);

— roofs;

— stairs and landings;

— terraces and balconies.



NOTE The loads on traffic areas given in this standard refer to vehicles up to a gross vehicle weight of 160 kN. Further information can be obtained from prEN 1991-2:2021.

(5) Characteristic values of horizontal loads on parapets and partition walls acting as barriers are provided.

NOTE Forces due to vehicle impact are specified in EN 1991-1-7 and prEN 1991-2:2021.

## 1.2 Assumptions

(1) The general assumptions of FprEN 1990:2022 apply.

(2) EN 1991-1-1 is intended to be used with EN 1990, the other Parts of EN 1991 and the other Eurocode parts for the design of structures.

# 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE See the Bibliography for a list of other documents cited that are not normative references, including those referenced as recommendations (i.e. in "should" clauses), permissions ("may" clauses), possibilities ("can" clauses), and in notes.

FprEN 1990:2022, *Eurocode — Basis of structural and geotechnical design*

# 3 Terms, definitions and symbols

## 3.1 Terms and definitions

For the purposes of this document, the terms and definitions provided in EN 1990 and the following apply.

**3.1.1**
**specific weight**
overall weight per unit volume of a material, including a normal distribution of micro-voids, voids and pores

Note 1 to entry: In everyday usage this term is frequently called to "density" (which is strictly mass per unit volume).



**3.1.2**
**angle of repose**
angle which the natural slope of the sides of a heaped pile of loose material makes to the horizontal



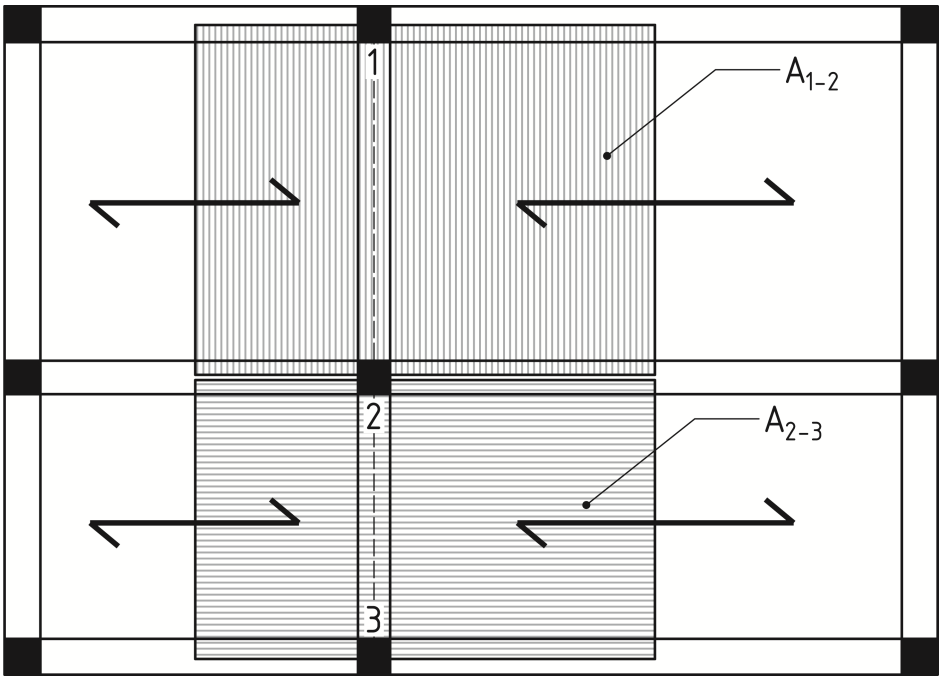
**3.1.3**
**gross vehicle weight**
self-weight of the vehicle together with the maximum weight of the goods it is permitted to carry

**3.1.4**
**partitions**
non-load bearing walls

**3.1.5**
**tributary area**
area whose loading is assumed to contribute to the loading on the structural member supporting that area

Note 1 to entry: The tributary area can change depending on the support conditions. An example of tributary areas for a beam supporting two single span one-way decks is given in Figure 3.1. An example of tributary areas for columns is given in Figure 3.2, which takes account of the continuity effects of the slab.

Note 2 to entry: On each floor, the sum of tributary areas equals the total area of the slab.



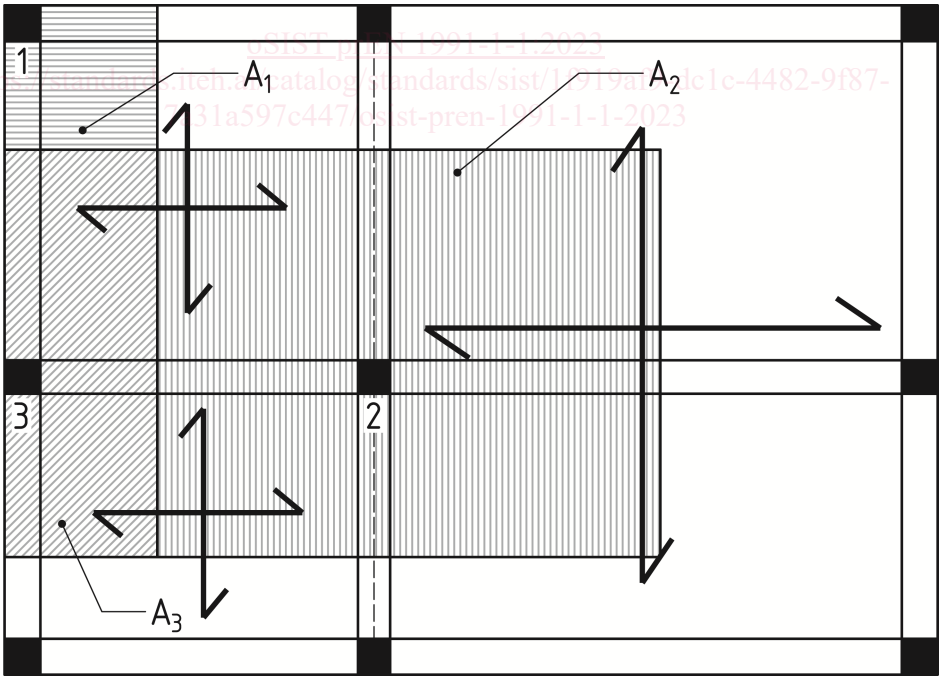

**Key**

$A_{1-2}$ tributary area related to beam 1-2

$A_{2-3}$ tributary area related to beam 2-3

**Figure 3.1 — Example of tributary area related to a beam (slabs are only spanning over one bay)**






**Key**

$A_1$ tributary area related to column 1

$A_2$ tributary area related to column 2

$A_3$ tributary area related to column 3

**Figure 3.2 — Example of tributary area related to columns supporting a slab (two way spanning)**

**3.1.6**
**imposed loads on buildings**
loads arising from occupancy

**3.1.7**
**synchronised rhythmic crowd load**
load induced by coordinated jumping and stamping, e.g. by spectators on grandstands at sporting events and concerts, coordinated jumping or dancing at fitness centres or similar

Note 1 to entry: Structures with elements subject to dancing and jumping are liable to inadvertent or deliberate synchronized movement of occupants, sometimes accompanied by music with a strong beat, such as occurs at pop concerts and aerobics events.

**3.1.8**
**grandstand**
large, often roofed structure that can include standing and/or seated accommodation for spectators at sporting or other events

**3.1.9**
**stage**
structure that includes a performance area, which is used for a wide variety of functions at public and private events

## 3.2 Symbols and abbreviations



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

### 3.2.1 Latin upper-case symbols



| | |
|---|---|
| $A$ | tributary area |
| $A_{ref}$ | defined area for the application of $q_k$ on roofs |
| $G_{k,inf}$ | lower characteristic value of a permanent action |
| $G_{k,\,sup}$ | upper characteristic value of a permanent action |
| $Q_k$ | characteristic value of a variable concentrated action |
| $Q_{k,dyn}$ | characteristic value of a dynamic action |
| $Q_{k,p}$ | self-weight of movable partitions |

### 3.2.2 Latin lower-case symbols

| | |
|---|---|
| $g_k$ | weight per unit area, or weight per unit length |
| $l$ | overall length of a forklift |
| $n$ | number of storeys |
| $q_k$ | characteristic value of a uniformly distributed load, or line load |
| $q_{k,p}$ | characteristic value of the uniformly distributed load representing partitions |
| $w_{f,axle}$ | width of axle relevant to a forklift |
| $w_{f,overall}$ | overall width of a forklift |

### 3.2.3 Greek lower-case symbols

$\alpha_A$ reduction factor for imposed loads for floors and accessible roofs

$\alpha_n$ reduction factor for imposed loads for columns and walls

$\gamma$ specific weight

$\varphi$ dynamic amplification factor

$\psi_0$ combination factor applied to a variable action to determine its combination value (see FprEN 1990:2022)

$\phi$ angle of repose (degrees)

## 4 Specific weight of construction and stored materials

(1) Characteristic values of specific weight of construction and stored materials should be specified.

(2) Mean values should be used as characteristic values unless cases (4) and (5) occur.

NOTE Annex A gives mean values for specific weight and angles of repose for stored materials and products.

(3) When a range is given in Annex A, the selection of the appropriate mean values for specific weight and angles of repose may be as agreed for a specific project by the relevant parties.

NOTE When a range is given, it is assumed that the mean value will be highly dependent on the source of the material.



(4) For materials which are not covered by the Tables in Annex A (e.g. new and innovative materials), the characteristic value of the specific weight should be determined in accordance with FprEN 1990:2022, 6.1.2.2.



(5) Where materials are used with a significant scatter of specific weights e.g. due to their source, water content, the characteristic value of the specific weights should be assessed in accordance with FprEN 1990:2022, 6.1.2.2.

(6) Specific weights derived from direct measurements and tests may be used.

NOTE Further information about testing and statistical evaluations is given in FprEN 1990:2022, Annex D.

## 5 Self-weight of construction works

### 5.1 Design situations

(1) The self-weight of the structure or structural member shall be determined for each relevant design situation.

NOTE For the selection of design situations see FprEN 1990:2022, 5.2.

(2) Where elements other than structural are classified as permanent actions, the total self-weight (including both structural members and elements other than structural) should be treated as a single action when introducing relevant combinations of actions according to the single source principle.

NOTE 1 For the classification of self-weight of elements other than structural, see 5.2 (2).

NOTE 2 For the single source principle, see FprEN 1990:2022, 6.1.1.