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**Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - 1. del: Osnove projektiranja (prevzet ENV 1991-1:1994 z metodo platnice)**

Eurocode 1: Basis of design and actions on structures - Part 1: Basis of design

Eurocode 1: Bases du calcul et actions sur les structures - Partie 1: Bases du calcul

Eurocode 1: Grundlagen der Tragwerksplanung und Einwirkungen auf Tragwerke - Teil 1: Grundlagen der Tragwerkplanung

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Deskriptorji: stavbe, inženirski objekti, gradbene konstrukcije, gradbeni predpisi, projektiranje, varnost, zanesljivost, mehanska trdnost, preverjanje

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ICS 91.010.30; 91.080

Referenčna številka  
SIST ENV 1991-1:1998 (sl),en)

Nadaljevanje na straneh II do III in od 1 do 85

## UVOD

Predstandard SIST ENV 1991-1 (sl,(en)), Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - 1. del: Osnove projektiranja, prva izdaja, 1998, ima status slovenskega predstandarda in je z metodo platnice prevzel evropski predstandard ENV 1991-1, Eurocode 1: Basis of design and actions on structures - Part 1. Basis of design, 1994, v angleškem jeziku.

## NACIONALNI PREGOVOR

Evropski predstandard ENV 1991-1:1994 je pripravil tehnični odbor Evropske organizacije za standardizacijo CEN/TC 250 Konstrukcije, pododbor SC 1 Osnove projektiranja in vplivi na konstrukcije.

Odločitev za prevzem tega predstandarda po metodi platnice je sprejela delovna skupina USM/TC KON/WG 1 Osnove projektiranja, ki je pripravila tudi nacionalni dokument za uporabo v Sloveniji, potrtil pa tehnični odbor USM/TC KON Konstrukcije.

Ta slovenski predstandard je dne 1998-01-10 odobril direktor USM.

Rok veljavnosti tega predstandarda je tri leta od njegove izdaje oziroma do izdaje slovenskega standarda SIST EN 1991-1.

## ZVEZE S STANDARDI

Ta predstandard se uporablja v povezavi z naslednjimi predstandardi:

SIST ENV 1991-2-1:1998	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - Del 2-1: Vplivi na konstrukcije - Gostote, lastna teža in koristne obtežbe
ENV 1991-2-2:1995 <sup>*</sup>	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - Del 2-2: Vplivi na konstrukcije - Vplivi požara na konstrukcije
SIST ENV 1991-2-3:1998	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - Del 2-3: Vplivi na konstrukcije - Obtežbe snega
SIST ENV 1991-2-4:1998	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - Del 2-4: Vplivi na konstrukcije - Vplivi vetra
ENV 1991-2-5:1997 <sup>**</sup>	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - Del 2-5: Vplivi na konstrukcije - Vplivi temperaturnih sprememb
ENV 1991-2-6:1997 <sup>*</sup>	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - Del 2-6: Vplivi na konstrukcije - Vplivi med gradnjo
ENV 1991-2-7 <sup>**</sup>	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - Del 2-7: Vplivi na konstrukcije - Nežgodni vplivi zaradi udarov in eksplozij
ENV 1991-3:1995 <sup>*</sup>	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - 3. del: Prometne obtežbe mostov
ENV 1991-4:1995 <sup>*</sup>	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - 4. del: Vplivi v silosih in rezervoarjih

<sup>\*</sup> Dokument bo predvidoma prevzet kot SIST

<sup>\*\*</sup> Dokument je v fazi izdelave in bo predvidoma prevzet kot SIST

<sup>\*</sup> Dokument bo predvidoma prevzet kot SIST

ENV 1991-5**	Eurocode 1: Osnove projektiranja in vplivi na konstrukcije - 5. del: Vplivi žerjavov in strojev
ENV 1992	Eurocode 2: Projektiranje betonskih konstrukcij
ENV 1993	Eurocode 3: Projektiranje jeklenih konstrukcij
ENV 1994	Eurocode 4: Projektiranje sovprožnih konstrukcij
ENV 1995	Eurocode 5: Projektiranje lesenih konstrukcij
ENV 1996	Eurocode 6: Projektiranje zidanih konstrukcij
ENV 1997	Eurocode 7: Geotehnično projektiranje
ENV 1998	Eurocode 8: Projektiranje konstrukcij na potresnih področjih
ENV 1999	Eurocode 9: Projektiranje konstrukcij iz aluminijevih zlitin

Navedeni so nekateri standardi, ki so že objavljeni kot ENV, večinoma pa so v pripravi in bodo kot ENV predvidoma objavljeni v času veljavnosti tega predstandarda.

#### OSNOVA ZA IZDAJO STANDARDA

- Prevzem predstandarda ENV 1991-1:1994

#### PARAMETRI ZA UPORABO V SLOVENIJI

Za vse parametre, ki določajo stopnjo varnosti in zanesljivosti konstrukcij, se v SIST ENV 1991-1 uporabljajo vse priporočene vrednosti, ki so zapisane v ENV 1991-1 v oglatih oklepajih (uokvirjene vrednosti).

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#### OPOMBI

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- Povsod, kjer se v besedilu predstandarda uporablja izraz "evropski predstandard", v SIST ENV 1991-1:1998 to pomeni "slovenski predstandard".
- Uvod in nacionalni predgovor nista sestavni del predstandarda.

\*\* Dokument je v fazi izdelave in bo predvidoma prevzet kot SIST

EUROPEAN PRESTANDARD

ENV 1991-1

PRÉNORME EUROPÉENNE

EUROPÄISCHE VORNORM

September 1998

ICS 91.010.00

Descriptors: buildings, civil engineering, structures, building codes, design, safety, reliability, mechanical strength, verification

English version

**Eurocode 1 - Basis of design and actions on  
structures - Part 1: Basis of design**

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Eurocode 1 - Bases du calcul et actions sur les  
structures - Partie 1: Bases du calcul

Eurocode 1 - Grundlagen der Tragwerksplanung  
und Einwirkungen auf Tragwerke - Teil 1:  
Grundlagen der Tragwerksplanung

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This European Prestandard (ENV) was approved by CEN on 1993-05-28 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into an European Standard (EN).

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

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

**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

<b>Contents</b>	<b>Page</b>
<b>Foreword</b>	<b>4</b>
<b>1 General</b>	<b>9</b>
1.1 Scope	9
1.2 Normative references	9
1.3 Assumptions	11
1.4 Distinction between principles and application rules	11
1.5 Definitions	12
1.5.1 Common terms used in the Structural Eurocodes (ENVs 1991-1999)	12
1.5.2 Special terms relating to design in general	13
1.5.3 Terms relating to actions	14
1.5.4 Terms relating to material properties	16
1.5.5 Terms relating to geometric data	16
1.6 Symbols	17
<b>2 Requirements</b>	<b>21</b>
2.1 Fundamental requirements	21
2.2 Reliability differentiation	21
2.3 Design situations	23
2.4 Design working life	23
2.5 Durability	24
2.6 Quality assurance	25
<b>3 Limit states</b>	<b>26</b>
3.1 General	26
3.2 Ultimate limit states	26
3.3 Serviceability limit states	26
3.4 Limit state design	27
<b>4 Actions and environmental influences</b>	<b>28</b>
4.1 Principal classifications	28
4.2 Characteristic values of actions	29
4.3 Other representative values of variable and accidental actions	30
4.4 Environmental influences	32
<b>5 Material Properties</b>	<b>33</b>
<b>6 Geometrical data</b>	<b>34</b>



<b>7 Modelling for structural analysis and resistance</b>	<b>35</b>
7.1 General	35
7.2 Modelling in the case of static actions	35
7.3 Modelling in the case of dynamic actions	35
7.4 Modelling for fire actions	36
<b>8 Design assisted by testing</b>	<b>37</b>
8.1 General	37
8.2 Types of tests	37
8.3 Derivation of design values	38
<b>9 Verification by the partial factor method</b>	<b>40</b>
9.1 Introduction	40
9.2 Limitations and simplifications	41
9.3 Design values	41
9.3.1 Design values of actions	41
9.3.2 Design values of the effects of actions	42
9.3.3 Design values of material properties	43
9.3.4 Design values of geometric data	43
9.3.5 Design resistance	44
9.4 Ultimate limit states	44
9.4.1 Verification of static equilibrium and strength	44
9.4.2 Combination of actions	45
9.4.3 Partial factors	48
9.4.4 $\psi$ factors	50
9.4.5 Simplified verification for building structures	50
9.4.6 Partial safety factors for materials	51
9.5 Serviceability limit states	51
9.5.1 Verifications of serviceability	51
9.5.2 Combination of actions	51
9.5.3 Partial factors	53
9.5.4 $\psi$ factors	53
9.5.5 Simplified verification for building structures	53
9.5.6 Partial factors for materials	53
<b>Annexes</b>	
A Partial factor design	55
B Fatigue	67
C Serviceability limit state : verification of structures susceptible to vibrations	69
D Design assisted by testing	75

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## Foreword

### Objectives of the Eurocodes

(1) The Structural Eurocodes comprise a group of standards for the structural and geotechnical design of buildings and civil engineering works.

(2) They cover execution and control only to the extent that is necessary to indicate the quality of the construction products, and the standard of the workmanship, needed to comply with the assumptions of the design rules.

(3) Until the necessary set of harmonized technical specifications for products and for methods of testing their performance are available, some of the Structural Eurocodes cover some of these aspects in informative annexes.

### Background to the Eurocode Programme

(4) The Commission of the European Communities (CEC) initiated the work of establishing a set of harmonized technical rules for the design of building and civil engineering works which would initially serve as an alternative to the different rules in force in the various member states and would ultimately replace them. These technical rules became known as the Structural Eurocodes.

(5) In 1990, after consulting their respective member states, the CEC transferred the work of further development, issue and updating of the Structural Eurocodes to CEN, and the EFTA secretariat agreed to support the CEN work.

(6) CEN Technical Committee CEN/TC 250 is responsible for all Structural Eurocodes.

### Eurocode Programme

(7) Work is in hand on the following Structural Eurocodes, each generally consisting of a number of parts:

EN 1991 Eurocode 1: Basis of design and 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 alloy structures

(8) Separate subcommittees have been formed by CEN/TC250 for the various Eurocodes listed above.

(9) This Part of ENV 1991 is intended to develop for a broader field of application the rules already published in sections 1 and 2 of Parts 1.1 of ENVs 1992, 1993 and 1994. It is being published as European Prestandard ENV 1991-1.

(10) This prestandard is intended for experimental application and for the submission of comments.

(11) After approximately two years CEN members will be invited to submit formal comments to be taken into account in determining future actions.

(12) Meanwhile feedback and comments on this prestandard should be sent to the secretariat of CEN/TC250 at the following address.

BSI  
British Standards House  
389 Chiswick High Road  
London W4  
England

(standards.iteh.ai)

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or to your national standards organization.

## Purpose of this Part of Eurocode 1

### Technical objectives

(13) This Part of Eurocode 1 describes the principles and requirements for safety, serviceability and durability of structures. It is based on the limit state concept used in conjunction with a partial factor method. Regarding modifications of the proposed method, see (24) of the foreword.

(14) For the design of new structures, this Part is intended to be used, for direct application, together with:

- the other Parts of ENV 1991;
- the design Eurocodes (ENVs 1992 to 1999).

Note: The above mentioned European Prestandards are either published or in preparation.



(15) This Part also gives guidelines for the aspects of structural reliability relating to safety, serviceability and durability:

- for design cases not covered by ENVs 1991 to 1999 (other actions, structures not treated, other materials);
- to serve as a reference document for other CEN TC's concerned with structural aspects.

(16) It is intended that the material-independent clauses in section 2 of the design Eurocodes will be superseded by this Part of ENV 1991 at a future stage (EN stage).

#### **Intended users**

(17) This prestandard is intended for the consideration of more categories of users, than are the other Eurocodes. The categories include:

- code drafting committees;
- clients (e.g. for the formulation of their specific requirements on reliability level and durability);
- designers and contractors, as for other Eurocodes;
- public authorities.

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#### **Intended uses**

(18) This prestandard is intended for the design of structures within the scope of the Eurocodes.

(19) As a guidance document, for the design of structures outside the scope of the Eurocodes, this prestandard may be used when relevant for:

- assessing other actions and their combinations;
- modelling material and structural behaviour;
- assessing numerical values of the reliability format.

(20) Numerical values for safety factors and other safety elements are given as indications. Together with the material-dependent indicative values given in the design Eurocodes, they provide an acceptable degree of reliability, assuming that an appropriate level of workmanship and of quality assurance is achieved. Therefore, if this Part is used as a reference document by other CEN/TCs the same indicative values should be taken.

### Division into main text and annexes

(21) Because of the various categories of use mentioned above, this Part is divided into a main text and a series of annexes. This division also takes into account the development expected during the ENV period.

(22) The main text includes most of the principal and operational rules necessary for direct application for designs in the field covered by ENV 1991, and ENVs 1992 to 1999. The principal provisions for bridges are also included.

(23) The annexes are informative only. Other background information and items for further development during the ENV period may be published separately in a CEN report.

### National Application Documents (NADs)

(24) It is intended that, during the ENV period, this prestandard is used for design purposes, in conjunction with the particular National Application Document valid in the country where the designed structures are to be located.

The National Application Documents are intended to authorize experimental use of the Eurocodes as prestandards for design during the ENV period, with due consideration for the current regulations and codes relevant in individual countries, and to facilitate these uses. The NADs may also introduce modifications of the partial factor method in this prestandard. Establishing the NAD is the responsibility of the national competent authorities.

In particular each NAD may specify whether the annexes can be used fully or partly in connection with the main text and what are then the specific conditions for their application, e.g. the application of 3.4(3), and of 8.3(1) together with annex A.

(25) In particular, for this prestandard attention should be paid to:

- confirming or amending the numerical values identified as "boxed" or by [ ]; it is recommended that modifications are introduced only where considered to be necessary; however, for those countries in which reliability differentiation measures are already codified there is no objection to numerical amendments intended to supplement this Eurocode by such operational measures;
- considering the variety of intended users and uses of this prestandard (see (17) above), with regard to the existing national professional organizations and the respective responsibilities of each category of user.

### Intended future developments of this Part

(26) The objective of this Part is to ensure the consistency of design rules for a wide set of construction works made of various materials. It should be understood that this is a long-term objective which will be reached progressively. At the present stage the objective is limited to:

- ensuring the consistency between the Eurocodes already published or in preparation, without contradicting them;

- covering the structures treated in the same Eurocodes in less detail for those for which Parts of Eurocodes are in preparation, e.g. for bridges, silos, etc. Therefore it should be understood that by publication of the present version of this Part it is not intended to inhibit the work of development and improvement of the reliability format.

In parallel with the publication of new Parts of Eurocodes during the ENV period, it is envisaged that some developments may be made to some items, e.g.:

- more precise definition of differentiated reliability levels;

- numerical revision, probabilistic justification of numerical values of partial factors and possibly supplementing this method with a probabilistic approach;

- more precise consideration of various types of limit state equations, soil-structure interaction, non-linear analysis, dynamic actions and the associated analysis and reliability verification format;

- assessment and re-design of existing structures.

## Section 1 General

### 1.1 Scope

(1) This Part 1 of ENV 1991 establishes the principles and requirements for safety and serviceability of structures, describes the basis for design and verification and gives guidelines for related aspects of structural reliability.

(2) Part 1 of ENV 1991 provides the basis and general principles for the structural design of buildings and civil engineering works including geotechnical aspects and shall be used in conjunction with the other parts of ENV 1991 and ENVs 1992 to 1999. Part 1 relates to all circumstances in which a structure is required to give adequate performance, including fire and seismic events.

(3) Part 1 of ENV 1991 may also be used as a basis for the design of structures not covered in ENVs 1992 to 1999 and where other materials or other actions outside the scope of ENV 1991 are involved.

(4) Part 1 of ENV 1991 is also applicable to structural design for the execution stage and structural design for temporary structures, provided that appropriate adjustments outside the scope of ENV 1991 are made.

(5) Part 1 of ENV 1991 also gives some simplified methods of verification which are applicable to buildings and other common construction works.

(6) Design procedures and data relevant to the design of bridges and other construction works which are not completely covered in this Part may be obtained from other Parts of Eurocode 1 and other relevant Eurocodes.

(7) Part 1 of ENV 1991 is not directly intended for the structural appraisal of existing construction in developing the design of repairs and alterations or assessing changes of use but may be so used where applicable.

(8) Part 1 of ENV 1991 does not completely cover the design of special construction works which require unusual reliability considerations, such as nuclear structures, for which specific design procedures should be used.

(9) Part 1 of ENV 1991 does not completely cover the design of structures where deformations modify direct actions.

### 1.2 Normative References

This European Prestandard incorporates by dated or undated reference, provisions from other standards. These normative references are cited at the appropriate places in the text and publications listed hereafter.

- ISO 2631 Evaluation of human exposure to whole-body vibration
- ISO 8930:1987 General principles on reliability for structures  
List of equivalent terms
- ISO 6707-  
1:1989 Building / civil engineering –  
Vocabulary – Part 1: General terms
- ISO 3898:1987 Basis of design for structures  
Notations – General symbols

Note: The following European Prestandard which are published or in preparation are cited at the appropriate places in the text and publications listed hereafter.

- ENV 1991-1 Eurocode 1: Basis of design and actions on structures  
Part 1: Basis of design
- ENV 1991-2-1 Eurocode 1: Basis of design and actions on structures  
Part 2.1: Densities, self-weight and imposed loads
- ENV 1991-2-2 Eurocode 1: Basis of design and actions on structures  
Part 2.2: Actions on structures exposed to fire
- ENV 1991-2-3 Eurocode 1: Basis of design and actions on structures  
Part 2.3: Snow loads
- ENV 1991-2-4 Eurocode 1: Basis of design and actions on structures  
Part 2.4: Wind loads
- ENV 1991-2-5 Eurocode 1: Basis of design and actions on structures  
Part 2.5: Thermal actions
- ENV 1991-2-6 Eurocode 1: Basis of design and actions on structures  
Loads and deformations imposed during execution
- ENV 1991-2-7 Eurocode 1: Basis of design and actions on structures  
Part 2.7: Accidental actions
- ENV 1991-3 Eurocode 1: Basis of design and actions on structures  
Part 3: Traffic loads on bridges
- ENV 1991-4 Eurocode 1: Basis of design and actions on structures  
Part 4: Actions in silos and tanks
- ENV 1991-5 Eurocode 1: Basis of design and actions on structures  
Part 5: Actions induced by cranes and machinery
- ENV 1992 Eurocode 2: Design of concrete structures
- ENV 1993 Eurocode 3: Design of steel structures

ENV 1994	Eurocode 4: Design of composite steel and concrete structures
ENV 1995	Eurocode 5: Design of timber structures
ENV 1996	Eurocode 6: Design of masonry structures
ENV 1997	Eurocode 7: Geotechnical design
ENV 1998	Eurocode 8: Earthquake resistant design of structures
ENV 1999	Eurocode 9: Design of aluminium alloy structures

### 1.3 Assumptions

The following assumptions apply:

- The choice of the structural system and the design of a structure is made by appropriately qualified and experienced personnel.
- Execution is carried out by personnel having the appropriate skill and experience.
- Adequate supervision and quality control is provided during execution of the work, i.e. in design offices, factories, plants, and on site.
- The construction materials and products are used as specified in this Eurocode or in ENVs 1992 to 1999 or in the relevant supporting material or product specifications.
- The structure will be adequately maintained.
- The structure will be used in accordance with the design assumptions.
- Design procedures are valid only when the requirements for the materials, execution and workmanship given in ENVs 1992 to 1996 and 1999 are also complied with.

### 1.4 Distinction between principles and application rules

(1)P Depending on the character of the individual clauses, distinction is made in this Part 1 of ENV 1991 between principles and application rules.

(2)P The principles comprise:

- general statements and definitions for which there is no alternative;
- 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)P The application rules are generally recognized rules which follow the principles and satisfy their requirements. It is permissible to use alternative rules to the application rules given in this Eurocode, provided that it is shown that the alternative rules accord with the relevant principles and have at least the same reliability.

(5) In this Part of ENV 1991 the application rules have only a paragraph number, e.g. as this paragraph.

## 1.5 Definitions

For the purposes of this prestandard, the following definitions apply.

Note: Most definitions are reproduced from ISO 8930:1987.

### 1.5.1 Common terms used in the Structural Eurocodes (ENVs 1991 to 1999)

**1.5.1.1 construction works:** Everything that is constructed or results from construction operations.

Note: This definition accords with ISO 6707:Part 1. The term covers both building and civil engineering works. It refers to the complete construction works comprising structural, non-structural and geotechnical elements.

**1.5.1.2 type of building or civil engineering works:** Type of construction works designating its intended purpose, e.g. dwelling house, retaining wall, industrial building, road bridge.

**1.5.1.3 type of construction:** Indication of principal structural material, e.g. reinforced concrete construction, steel construction, timber construction, masonry construction, composite steel and concrete construction.

**1.5.1.4 method of construction:** Manner in which the execution will be carried out, e.g. cast in place, prefabricated, cantilevered.

**1.5.1.5 construction material:** Material used in construction work, e.g. concrete, steel, timber, masonry.

**1.5.1.6 structure:** Organized combination of connected parts designed to provide some measure of rigidity.

Note: ISO 6707:Part 1 gives the same definition but adds "or a construction works having such an arrangement". In the Structural Eurocodes this addition is not used in order to facilitate unambiguous translation.