SLOVENSKI STANDARD

SIST EN 1990:2004

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Nadomeġļa:

SIST ENV 1991-1:1998

Eurocode – Osnove projektiranja

Eurocode - Basis of structural design

Eurocode: Grundlagen der Tragwerksplanung

Eurocodes structuraux - Eurocodes: Bases de calcul des structures

Ta slovenski standard je istoveten z: **EN 1990:2002**

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EUROPEAN STANDARD

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English version

Eurocode - Basis of structural design

Eurocodes structuraux - Eurocodes: Bases de calcul des structures

Eurocode: Grundlagen der Tragwerksplanung

This European Standard was approved by CEN on 29 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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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 1990:2002) 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of an identical text or by endorsement, at the latest by October 2002, and conflicting national standards shall be withdrawn at the latest by March 2010.

This document supersedes ENV 1991-1:1994.

CEN/TC 250 is responsible for all Structural Eurocodes.

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.

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 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 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).

[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).

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 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.

[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 harmonised ENs 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.

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[4]. Furthermore, all the information accompanying the CE Marking of the construction products which refer to Eurocodes shall clearly mention which Nationally Determined Parameters have been taken into account.

Additional information specific to EN 1990

EN 1990 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.

For the design of new structures, EN 1990 is intended to be used, for direct application, together with Eurocodes EN 1991 to 1999.

EN 1990 also gives guidelines for the aspects of structural reliability relating to safety, serviceability and durability :

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

– for design cases not covered by EN 1991 to EN 1999 (other actions, structures not treated, other materials) ;
– to serve as a reference document for other CEN TCs concerning structural matters.

EN 1990 is intended for use by :
– committees drafting standards for structural design and related product, testing and execution standards ;
– clients (*e.g.* for the formulation of their specific requirements on reliability levels and durability) ;
– designers and constructors ;
– relevant authorities.

EN 1990 may be used, when relevant, as a guidance document for the design of structures outside the scope of the Eurocodes EN 1991 to EN 1999, for :
– assessing other actions and their combinations ;
– modelling material and structural behaviour ;
– assessing numerical values of the reliability format.

Numerical values for partial factors and other reliability parameters are recommended as basic values that provide an acceptable level of reliability. They have been selected assuming that an appropriate level of workmanship and of quality management applies. When EN 1990 is used as a base document by other CEN/TCs the same values need to be taken.

National annex for EN 1990

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 1990 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 1990 through :
– A1.1(1)
– A1.2.1(1)
– A1.2.2 (Table A1.1)
– A1.3.1(1) (Tables A1.2(A) to (C))
– A1.3.1(5)
– A1.3.2 (Table A1.3)
– A1.4.2(2)

Section 1 General

1.1 Scope

(1) EN 1990 establishes Principles and requirements for the safety, serviceability and durability of structures, describes the basis for their design and verification and gives guidelines for related aspects of structural reliability.

(2) EN 1990 is intended to be used in conjunction with EN 1991 to EN 1999 for the structural design of buildings and civil engineering works, including geotechnical aspects, structural fire design, situations involving earthquakes, execution and temporary structures.

NOTE For the design of special construction works (*e.g.* nuclear installations, dams, etc.), other provisions than those in EN 1990 to EN 1999 might be necessary.

(3) EN 1990 is applicable for the design of structures where other materials or other actions outside the scope of EN 1991 to EN 1999 are involved.

(4) EN 1990 is applicable for the structural appraisal of existing construction, in developing the design of repairs and alterations or in assessing changes of use.

NOTE Additional or amended provisions might be necessary where appropriate.

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

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

1.3 Assumptions

(1) Design which employs the Principles and Application Rules is deemed to meet the requirements provided the assumptions given in EN 1990 to EN 1999 are satisfied (see Section 2).

(2) The general assumptions of EN 1990 are :

- the choice of the structural system and the design of the 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 EN 1990 or in EN 1991 to EN 1999 or in the relevant execution standards, or reference material or product specifications;
– the structure will be adequately maintained;
– the structure will be used in accordance with the design assumptions.

NOTE There may be cases when the above assumptions need to be supplemented.

1.4 Distinction between Principles and Application Rules

(1) Depending on the character of the individual clauses, distinction is made in EN 1990 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 1990 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 1990 although the design will remain in accordance with the Principles of EN 1990. When EN 1990 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 EN 1990, the Application Rules are identified by a number in brackets e.g. as this clause.

1.5 Terms and definitions

NOTE For the purposes of this European Standard, the terms and definitions are derived from ISO 2394, ISO 3898, ISO 8930, ISO 8402.

1.5.1 Common terms used in EN 1990 to EN 1999

1.5.1.1
construction works
everything that is constructed or results from construction operations

NOTE This definition accords with ISO 6707-1. 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 the principal structural material, *e.g.* reinforced concrete construction, steel construction, timber construction, masonry construction, steel and concrete composite 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
organised combination of connected parts designed to carry loads and provide adequate rigidity

1.5.1.7
structural member
physically distinguishable part of a structure, *e.g.* a column, a beam, a slab, a foundation pile

1.5.1.8
form of structure
arrangement of structural members

NOTE Forms of structure are, for example, frames, suspension bridges.

1.5.1.9
structural system
load-bearing members of a building or civil engineering works and the way in which these members function together

1.5.1.10
structural model
idealisation of the structural system used for the purposes of analysis, design and verification

1.5.1.11
execution
all activities carried out for the physical completion of the work including procurement, the inspection and documentation thereof

NOTE The term covers work on site; it may also signify the fabrication of components off site and their subsequent erection on site.

1.5.2 Special terms relating to design in general

1.5.2.1
design criteria
quantitative formulations that describe for each limit state the conditions to be fulfilled

1.5.2.2
design situations
sets of physical conditions representing the real conditions occurring during a certain time interval for which the design will demonstrate that relevant limit states are not exceeded

1.5.2.3
transient design situation
design situation that is relevant during a period much shorter than the design working life of the structure and which has a high probability of occurrence

NOTE A transient design situation refers to temporary conditions of the structure, of use, or exposure, *e.g.* during construction or repair.

1.5.2.4
persistent design situation
design situation that is relevant during a period of the same order as the design working life of the structure

NOTE Generally it refers to conditions of normal use.

1.5.2.5
accidental design situation
design situation involving exceptional conditions of the structure or its exposure, including fire, explosion, impact or local failure

1.5.2.6
fire design
design of a structure to fulfil the required performance in case of fire

1.5.2.7
seismic design situation
design situation involving exceptional conditions of the structure when subjected to a seismic event

1.5.2.8
design working life
assumed period for which a structure or part of it is to be used for its intended purpose with anticipated maintenance but without major repair being necessary

1.5.2.9
hazard
for the purpose of EN 1990 to EN 1999, an unusual and severe event, *e.g.* an abnormal action or environmental influence, insufficient strength or resistance, or excessive deviation from intended dimensions

1.5.2.10
load arrangement
identification of the position, magnitude and direction of a free action

1.5.2.11
load case
compatible load arrangements, sets of deformations and imperfections considered simultaneously with fixed variable actions and permanent actions for a particular verification

1.5.2.12
limit states
states beyond which the structure no longer fulfils the relevant design criteria

1.5.2.13
ultimate limit states
states associated with collapse or with other similar forms of structural failure