

Eurocode: Basis of structural design

Eurokoodeks: Ehituskonstruksioonide projekteerimise alused

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 1990:2002+NA:2002 sisaldab Euroopa standardi identset ingliskeelset teksti ning rahvuslikku lisa NA:2002.</p> <p>Standard on kinnitatud Eesti Standardikeskuse 19.12.2002 käskkirjaga ja on jõustunud sellekohase teate avaldamisel EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 24.04.2002.</p> <p>Standard on kättesaadav Eesti Standardikeskusest.</p>	<p>This Estonian Standard EVS-EN 1990:2002+NA:2002 consists of the identical English text of the International Standard and the Estonian National Annex NA:2002.</p> <p>This standard is ratified with the order of Estonian Centre for Standardisation dated 19.12.2002 and is endorsed with the notification published in the official bulletin of the Estonian centre for Standardisation.</p> <p>Date of Availability of the European Standard is 24.04.2002.</p> <p>This standard is available from the Estonian Centre for Standardisation.</p>
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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.

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Contents	Page
FOREWORD.....	5
BACKGROUND OF THE EUROCODE PROGRAMME	5
STATUS AND FIELD OF APPLICATION OF EUROCODES	6
NATIONAL STANDARDS IMPLEMENTING EUROCODES.....	7
LINKS BETWEEN EUROCODES AND HARMONISED TECHNICAL SPECIFICATIONS (ENs AND ETAs) FOR PRODUCTS	7
ADDITIONAL INFORMATION SPECIFIC TO EN 1990.....	7
NATIONAL ANNEX FOR EN 1990.....	8
SECTION 1 GENERAL	9
1.1 SCOPE	9
1.2 NORMATIVE REFERENCES	9
1.3 ASSUMPTIONS	10
1.4 DISTINCTION BETWEEN PRINCIPLES AND APPLICATION RULES.....	10
1.5 TERMS AND DEFINITIONS.....	11
1.5.1 Common terms used in EN 1990 to EN 1999.....	11
1.5.2 Special terms relating to design in general.....	12
1.5.3 Terms relating to actions.....	15
1.5.4 Terms relating to material and product properties.....	18
1.5.5 Terms relating to geometrical data.....	18
1.5.6 Terms relating to structural analysis.....	19
1.6 SYMBOLS	20
SECTION 2 REQUIREMENTS	23
2.1 BASIC REQUIREMENTS	23
2.2 RELIABILITY MANAGEMENT	24
2.3 DESIGN WORKING LIFE	25
2.4 DURABILITY	25
2.5 QUALITY MANAGEMENT.....	26
SECTION 3 PRINCIPLES OF LIMIT STATES DESIGN.....	27
3.1 GENERAL	27
3.2 DESIGN SITUATIONS	27
3.3 ULTIMATE LIMIT STATES	28
3.4 SERVICEABILITY LIMIT STATES.....	28
3.5 LIMIT STATE DESIGN.....	29
SECTION 4 BASIC VARIABLES.....	30
4.1 ACTIONS AND ENVIRONMENTAL INFLUENCES.....	30
4.1.1 Classification of actions.....	30
4.1.2 Characteristic values of actions.....	30
4.1.3 Other representative values of variable actions.....	32
4.1.4 Representation of fatigue actions.....	32
4.1.5 Representation of dynamic actions	32
4.1.6 Geotechnical actions.....	33
4.1.7 Environmental influences.....	33
4.2 MATERIAL AND PRODUCT PROPERTIES	33
4.3 GEOMETRICAL DATA.....	34
SECTION 5 STRUCTURAL ANALYSIS AND DESIGN ASSISTED BY TESTING.....	35
5.1 STRUCTURAL ANALYSIS	35
5.1.1 Structural modelling.....	35
5.1.2 Static actions.....	35
5.1.3 Dynamic actions.....	35

5.1.4 Fire design	36
5.2 DESIGN ASSISTED BY TESTING	37
SECTION 6 VERIFICATION BY THE PARTIAL FACTOR METHOD.....	38
6.1 GENERAL	38
6.2 LIMITATIONS	38
6.3 DESIGN VALUES	38
6.3.1 Design values of actions.....	38
6.3.2 Design values of the effects of actions.....	39
6.3.3 Design values of material or product properties	40
6.3.4 Design values of geometrical data	40
6.3.5 Design resistance	41
6.4 ULTIMATE LIMIT STATES	42
6.4.1 General.....	42
6.4.2 Verifications of static equilibrium and resistance.....	43
6.4.3 Combination of actions (fatigue verifications excluded).....	43
6.4.3.1 General	43
6.4.3.2 Combinations of actions for persistent or transient design situations (fundamental combinations)....	44
6.4.3.3 Combinations of actions for accidental design situations.....	45
6.4.3.4 Combinations of actions for seismic design situations	45
6.4.4 Partial factors for actions and combinations of actions	45
6.4.5 Partial factors for materials and products.....	46
6.5 SERVICEABILITY LIMIT STATES	46
6.5.1 Verifications	46
6.5.2 Serviceability criteria	46
6.5.3 Combination of actions	46
6.5.4 Partial factors for materials.....	47
ANNEX A1 (NORMATIVE) APPLICATION FOR BUILDINGS.....	48
A1.1 FIELD OF APPLICATION	48
A1.2 COMBINATIONS OF ACTIONS	48
A1.2.1 General.....	48
A1.2.2 Values of ψ factors	48
A1.3 ULTIMATE LIMIT STATES.....	49
A1.3.1 Design values of actions in persistent and transient design situations.....	49
A1.3.2 Design values of actions in the accidental and seismic design situations	53
A1.4 SERVICEABILITY LIMIT STATES	54
A1.4.1 Partial factors for actions.....	54
A1.4.2 Serviceability criteria	54
A1.4.3 Deformations and horizontal displacements	54
A1.4.4 Vibrations	56
ANNEX B (INFORMATIVE) MANAGEMENT OF STRUCTURAL RELIABILITY FOR CONSTRUCTION WORKS.....	57
B1 SCOPE AND FIELD OF APPLICATION	57
B2 SYMBOLS	57
B3 RELIABILITY DIFFERENTIATION.....	58
B3.1 Consequences classes	58
B3.2 Differentiation by β values	58
B3.3 Differentiation by measures relating to the partial factors	59
B4 DESIGN SUPERVISION DIFFERENTIATION	59
B5 INSPECTION DURING EXECUTION	60
B6 PARTIAL FACTORS FOR RESISTANCE PROPERTIES	61
ANNEX C (INFORMATIVE) BASIS FOR PARTIAL FACTOR DESIGN AND RELIABILITY ANALYSIS.....	62
C1 SCOPE AND FIELD OF APPLICATIONS.....	62
C2 SYMBOLS.....	62
C3 INTRODUCTION.....	63

EN 1990:2002 (E)

C4 OVERVIEW OF RELIABILITY METHODS.....	63
C5 RELIABILITY INDEX β	64
C6 TARGET VALUES OF RELIABILITY INDEX β	65
C7 APPROACH FOR CALIBRATION OF DESIGN VALUES	66
C8 RELIABILITY VERIFICATION FORMATS IN EUROCODES	68
C9 PARTIAL FACTORS IN EN 1990	69
C10 ψ_0 FACTORS	70
ANNEX D (INFORMATIVE) DESIGN ASSISTED BY TESTING	72
D1 SCOPE AND FIELD OF APPLICATION	72
D2 SYMBOLS	72
D3 TYPES OF TESTS.....	73
D4 PLANNING OF TESTS	74
D5 DERIVATION OF DESIGN VALUES.....	76
D6 GENERAL PRINCIPLES FOR STATISTICAL EVALUATIONS.....	77
D7 STATISTICAL DETERMINATION OF A SINGLE PROPERTY	77
D7.1 General.....	77
D7.2 Assessment via the characteristic value	78
D7.3 Direct assessment of the design value for ULS verifications.....	79
D8 STATISTICAL DETERMINATION OF RESISTANCE MODELS	80
D8.1 General.....	80
D8.2 Standard evaluation procedure (Method (a)).....	80
D8.2.1 General	80
D8.2.2 Standard procedure.....	81
D8.3 Standard evaluation procedure (Method (b)).....	85
D8.4 Use of additional prior knowledge.....	85
BIBLIOGRAPHY	87

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 agreement¹ 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 Documents² referred to in Article 12 of the CPD, although they are of a different nature from harmonised product standards³. 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 :

- 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 ;
- 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. ;
- 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 works⁴. 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.

EN 1990:2002 (E)

- 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 1990:2002 (E)

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.